R. Stephen Sennott, Editor

ENCYCLOPEDIA OF 20TH-CENTURY ARCHITECTURE

Volume 3

P – Z
Index

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ENCYCLOPEDIA OF 20TH-CENTURY ARCHITECTURE

Board of Advisors

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Index

R.Stephen Sennott, Editor

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PAIMIO SANATORIUM

Designed by Alvar Aalto and Aino Aalto; completed 1933

Paimio, Finland

The Tuberculosis Sanatorium in Paimio, Finland, the contract won in competition by Finnish architects Alvar and Aino Aalto in 1929, completed in 1933, synthesized two potent modernist agendas. First, the design embraces modernism's utopian social commitment and its deep confidence in rational design processes. Second, the building expresses explicitly the elemental organizational tactics of functionalist architecture and its concomitant machine imagery. Metaphorically, if Le Corbusier's Villa Savoye was a machine for living in, the Aaltos' Paimio Sanatorium was a machine for becoming healthier in.

Following World War I, avant-garde architects proclaimed the emergence of a spirited and vital new, modern age. This was to be a more orderly and healthy age, brought forth by applying the lessons of modern industrial technique and rational thinking to the outlived historicism of prewar architecture as well as to the disorder and squalor of existing urban environments. Rooted in a strong sense of social commitment and relying on the effectiveness of serial production and rational processes as design strategies, modern architects sought a better, healthier world. The Aaltos' Tuberculosis Sanatorium at Paimio was both a symbol of the social role of the new architecture and a potent visual paradigm of the new world that modern architecture intended to bring into being.

Sun. Light. Fresh air. The physical presence of these natural elements informed the basis of building design and engendered the qualities of good health associated with modernist social thinking. Moreover, as a polemic, sun, light, and fresh air were vital images of the modern, healthier world. Few other building types were as convincing a symbol of modern architecture as was the sanatorium. The actual medical treatment for tuberculosis at the time—lots of sun, light, and fresh air—provided a strong image base for the design of the building and coincided with the metaphor of "health" central to modernist thought.

The completion of the Paimio Sanatorium acknowledged Alvar Aalto's prominent place among the modern architects of the day because it bore witness to his understanding and mastery of modernism's social as well as compositional tenets. However, the sanatorium was not the Aaltos' first modernist work. Having fostered connections to the international avant-garde in the mid-1920s, they moved their office to the city of Turku in 1927 and completed two important "functionalist" works. "Functionalism" was the term used by Finnish architects to label the new, modern architecture. The first important work was the Standard Apartment Building in Turku (1929), and the second was the *Turun Sanomat* Newspaper Building (1927), which was the first work in Finland to incorporate Le Corbusier's "Five Points of a New Architecture," setting the Aaltos apart from their contemporaries. During this period, the Aaltos were active advocates and propagandists for Finnish functionalism.

Conceptually, the Paimio Sanatorium is a straightforward modernist composition: an articulated but linked set of relatively discrete functional elements expressed in both plan and volumes. The building complex is functionally zoned, with each element placed in the landscape according to its requirement for sun and view. The primary functional elements include the patient's wing, comprised of an elongated suite of rooms with an open-air terrace extension, and the communal dining and assembly areas. These two pieces are linked by a seven-story volume, the entry, and control area, which houses the vertical circulation. A circulation passage connects through these elements to the service area—with its expressed water tank, smokestack, and staircase—which in turn joins the garage. The housing units for both the doctors and the staff are separated from the main building, being located in the surrounding forest. We have, then, the rational and orderly composition of differing human activities rendered into a highly visible and expressed set of spaces and forms.

The Aaltos employed the material vocabulary that came to be associated with the modernist machine aesthetic: concrete, white stucco, steel, and glass. The overall image of the building comes from its concrete frame rendered in white stucco. The whiteness not only stands in contrast to the fir forest setting in which it is located but also provides an image of cleanliness and healthiness. Each activity volume incorporates a different glazing pattern to articulate its particular function, further reinforcing the elemental nature of the organization. The industrial glazing, with its steel sash and serially produced image, complements the pipe-rail balustrades painted in primary colors; the bright, colorful awnings; and other machined elements that give the building a somewhat nautical quality.

Despite its mechanistic appearance, Paimio went beyond the conventions of modernist elemental composition. Volumetrically and in plan, its discrete elements are not unified geometrically or orthogonally, as in Gropius's more regularized Bauhaus building (1926), but form a more haptic pattern: a chain of architectural pieces in the landscape. Eschewing the modernist tendency to place buildings as isolated elements on the landscape, Paimio appears as a dialogue between the internal world of space and activity and the exterior concerns of context and form. For example, the patient wing and communal areas splay away from each other to form a *cour de hounor,* allowing the entry court with its undulating canopy to gain more spatial prominence. Although the white, rational image stands in contrast to the deep green forest, the sanatorium is actually a sun trap. The patient wing, facing southeast, provides each patient with morning sunlight. The open-air terraces at the east end of the wing have been rotated further south to catch more sun. The dining and lounge area is oriented, with equal care, to receive the sun at different times during the day.

Paimio is not without precedent, for the Aaltos were traveling throughout Europe, meeting with the avant-garde architects and artists during the period of its design. Influences from the Dutch architect Jan Duiker and his Zonnestraal Sanatorium (1926–28), the French architects Andre Lurçat and Le Corbusier, and Russian constructivism are evident in the work. Yet it was the Aaltos' ability to meld these influences into an independent synthesis that is extraordinary. Moreover, their entry for the earlier Kinkomaa Sanatorium competition (1927) used a similar elemental composition strategy, whereas their later competition entries for the Kälviä Sanatorium (1929) and the Zagrev Central Hospital (1931) demonstrate further refinement of the ideas seen in Paimio. The sanatorium stands as witness to the Aaltos' mastery of modernist design canons and social programs, and its functionalist expression placed their name with those of Gropius, Mies van der Rohe, and Le Corbusier, among others, in the international scene of the day.

The development of detail in Paimio is extraordinary. Attention was paid to the venting of the windows, panel heating elements, nonsplash washbasins, and light fixtures that did not cast light into a bedridden patient's eyes. The suite of furnishings developed for Paimio—chairs and tables incorporating continuously curved, bentwood frames and backs and made of laminated, molded birch—represent the culmination of a series of furniture studies and wood experiments that began in 1927. In the Paimio furniture, the Aaltos combined serial production with Finnish laminated plywood technology. The free-form quality of these pieces informed his buildings immediately following the sanatorium and signaled their movement away from functionalist tenets toward the more personal style that emerged in the late 1930s.

WILLIAM C.MILLER

Paimio Tuberculosis Sanatorium, elevation, designed by Alvar Alto and Aino Alto (1933)

Photo © G.Welin/Alvar Aalto Archives

S*ee also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France); Finland; Gropius, Walter (Germany); Villa Savoye, Poissy, France**

Further Reading

Over the course of Alvar Aalto's 50-year career (Aino Aalto died in 1949), much has been published on his architecture. The year 1998 marked the celebration of the centenary of his birth, and a number of new interpretive works have appeared. In most publications addressing the larger spectrum of his career, great emphasis is placed on the significance of the Tuberculosis Sanatorium at Paimio to Alvar and Aino Aalto's overall development. The references listed below include those that have important or interesting discussion or documentation of the Sanatorium.

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PALACE OF THE SOVIETS COMPETITION (1931)

The 1931 competition for the Palace of the Soviets in Moscow represents a turning point in Soviet architecture. The competition prefaced the gradual demise of the Soviet avant-garde movement known as Constructivism and the rise of a more historically attuned approach to architecture that dominated in the Soviet Union up to and beyond the Cold War. More specifically, the competition rejected the modernist aesthetic in favor of a new architectural language, which was officially endorsed in 1937 at the First Conference of Soviet Architects and was known as "socialist realism."

Ostensibly, the Palace of the Soviets was intended to celebrate the anticipated completion of the first Five Year Plan (to occur in 1933). The Palace of the Soviets competition was also a deliberate Soviet response to the international competition for the headquarters of the League of Nations, held in Geneva four years earlier. The project was influenced heavily by the government and implemented by the Palace Construction Council, a subsidiary of the Party Central Committee. The competition brief for the building, which was developed by the Construction Council, called for a range of cultural and political spaces. The primary function of the Palace was to house the nation's highest governing body, the elected assembly of the Supreme Soviet. In addition, it was also intended to support Revolutionary festivals, conferences and musical and theatrical productions. The building included two large halls (one seating 15000 people, the other 6000), two smaller halls each seating 500 people, and two more seating 200 people. The brief called for a new relationship between form and content that was capable of representing socialist doctrine, class struggle, and the dominance of the proletariat. The site chosen for the competition was on the Moskva River in Moscow, and it was decided that the Cathedral of the Christ-Savior (built between 1838 and 1880 to celebrate the Russian defeat of Napoleon) would be demolished to create a new site southwest of the Kremlin for the Palace.

Initially, in February 1931, 12 Soviet architects were invited to submit proposals for a preliminary closed round of the competition. The prominent Soviet modernist and Constructivist schools of SASS (formally OSA), ASNOVA, and ARU as well as the rival school of VOPRA all submitted team proposals (at the request of the Construction Council). Individual entries from Alexei Shchusev, Nikolai Ladovsky, Alexander Nikolsky, Boris Iofan, Genrikh Liudvig, and Daniil Fridman were also submitted.

On 18 July 1931, the competition was extended into a more open event and the already commissioned designs (exhibited in August 1931) were included in this later stage. Further to this, 12 architects were invited to submit proposals for this round, including nine international architects such as Le Corbusier, Auguste Perret, Walter Gropius, Erich Mendelsohn, and Hans Poelzig. The three Soviet architects invited, Zholtovski, Iofan, and Krasin, were all experienced professional architects. In total, this revised competition drew 160 entries, with 24 from foreign architects. A further 112 "noncompetitive" entries were received from ordinary Soviet citizens, which, although not being considered for the competition, received considerable attention in the press. Among the individual soviet entries were schemes by leading figures at the time such as Konstantin Melnikov, Ivan Leonidov, Moisei Ginzburg, and the Vesnin brothers.

Of the first-round entries, the majority belonged to the modernist or Constructivist school of thinking. Many of the schemes, both local and international, borrowed heavily from machine forms and industrial imagery. Of the international entrants, Le Corbusier's generated the most interest because of its dynamic exposed roof structure. However, it was his functional and symbolic representation of each of the elements of the brief, and the manipulation of traffic to emphasize entry points, that most characterized his project. In the context of architectural history, Le Corbusier's scheme remains the most influential of the entrants. In contrast, Mendelsohn's scheme used the natural fall of the site to arrange a compact but less expressive arrangement, and Gropius adopted a circular configuration, connecting the two halls through a central circulation core. Of the Soviet schemes, the project submitted by Ginzberg included a large sphere that anchored an otherwise rectilinear composition. The scheme proposed by the Vesnins was composed of a circular and rectilinear form, with a statue of Lenin situated above a tower. Among the more original entries was that of Melnikov, who rejected both the classical and modernist approaches, attempting instead to provide an architectural representation of the achievements of the Revolution. The eventual form he proposed evoked the proletariat symbol of an inverted cone that had been split apart by the forces of revolution.

At the end of this stage, the jury members (including Maxim Gorky among others) awarded two first prizes to the strongly historical designs of the Soviet architects Iofan and Zholtovsky. An additional first prize was awarded to an American architect, Hector Hamilton, with the majority of the remaining prizes being awarded to Soviet architects. Even before awarding the prizes, the Construction Council announced that "the monumentality, simplicity, integrity and elegance of architectural conception of the Palace of Soviets was not found in totally acceptable form" in any of the entries. The jury demonstrated particular dissatisfaction with the modernist proposals that it maintained were too industrial. Le Corbusier's scheme was cited as representing "a complicated machine," which, in its over emphasis on function, was seen as detrimental to the symbolism required by the brief.

On 5 May 1933, following two more stages in the competition that contained only invited Soviet architects (and mostly with a bias toward Russian Revivalism), the ultimate prize was awarded to the neoclassical design of Boris Iofan. Iofan's scheme was over 220 meters in height and consisted of a series of colonnaded tiers stacked on each other and finally culminating in a statue of "the liberated proletariat." A few days after the winning entry was announced, Stalin proposed that the statue should be enlarged four times in size to a height of 75 meters and made in the image of Lenin. This was the beginning of what Kruschev would later denounce as Stalin's "Cult of Personality." The intervention of the war in 1941 prevented Iofan's building ever being realized, despite the completion of documentation by Iofan in collaboration with the academics Shchuko and Gelífreikh. In spite of this, the legacy of the project in not only Soviet but also international architectural circles is immense. Most notably, it announced the end of the energetic architectural avant-garde in the Soviet Union and ushered in a new age of architecture, dominated by political personalities, rather than architectural creativity.

MICHAEL CHAPMAN

S*ee also* **Constructivism; Exhibition Building; Ginzburg, Moisei (Russia); Melnikov, Konstantin (Russia); Mendelsohn, Erich (Germany, United States); Russia/Soviet Union; Vesnin, Alexander, Leonid, and Viktor (Russia)**

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PALAIS STOCLET, BRUSSELS

Designed by Josef Hoffmann; completed 1911 Brussels, Belgium

The Palais Stoclet is a villa designed by Josef Hoffmann in Brussels and built between 1905 and 1911 for the Belgian millionaire Adolphe Stoclet and his wife. Although built in Belgium, the Palais is one of the finest examples of Viennese Art Nouveau, or Jugendstil, and is the most comprehensive realization of the design goals of the Vienna workshops. The building represents an elaborate example of the synthesis of architecture, interior design, and garden design that the Viennese movement accomplished. The Palais is a design *Gesamtkunstwerk,* or total work of art—an important aesthetic goal of Central European art that had, in addition to architectural design, important influences in opera (Wilhelm Wagner) and painting (Wassily Kandinsky). *Gesamtkunstwerk* design sought to create an aesthetic union of all components of a building. To achieve this, a single artist would design all aspects of the building and its furnishings, as in work by Peter Behrens and Henry van de Velde. The Palais, however, represented a collaborative effort involving the full resources of the Vienna workshops. Led by Hoffmann as architect and project coordinator, some 50 craftsmen contributed to the design, execution, and decoration of the entire villa, including its furniture, artwork, light fixtures, wall coverings, bathroom tiles, and cutlery. All aspects of Viennese modernism came together in the Palais Stoclet.

Stylistically, the building represents the Viennese version of Art Nouveau, or what is sometimes referred to as "secession-style," because the forms are geometrical rather than vegetative curves. Brussels had already been the home of Art Nouveau buildings by Victor Horta and Henri van de Velde. The addition of the Palais Stoclet made Brussels one of the few cities where organic and geometrical forms of Art Nouveau were successfully combined.

The son of a wealthy Belgian banker, Stoclet lived in Vienna for about 18 months in 1903–04 and was planning to build a home in the city. Impressed by the proportions of a villa in Vienna's suburbs built for the painter Carl Moll, the Stoclets learned that Josef Hoffmann was the architect and approached him about building a villa. The Stoclets originally intended to build in Vienna, but following the death of Stoclet's father, they returned to Brussels. The Stoclets gave Hoffmann carte blanche with the design and building costs, which used only the finest and costiest materials. Construction took six years, and each time something failed to please either Stoclet or the designers, it was disassembled, redesigned, and rebuilt without regard to the mounting expense. The Palais was to be a perfectly realized artistic dwelling, and its final cost never has been revealed.

The Palais stands in a suburb of Brussels at Avenue de Tervueren 279–281. The building consists of two parts: a large residential block, and a service wing with a garage and workshop for Stoclet, who was an auto enthusiast. The residential block has three floors, plus a basement and an attic. The service wing had only a single floor. The strong horizontal movement of the main structure balances the tall, vertical lines of the stairwell tower. Four human figures sculpted by Franz Metzner crown the tower; they surround a dome of gilded vegetation, similar to Olbrich's Secession building. Figures of Hercules, Apollo, Athena, and the Hindu god Ganesha also adorn the building.

Despite the use of rich materials, the building's effect is serene rather than pompous. The Palais was built of reinforced concrete and brick that was faced with plates of white Norwegian marble. The exterior has a monumental quality created by the elegant use of geometric forms and white surfaces punctuated by regular fenestration. Gilded bronze bands unify the various elements and provide a counterpart to the generally white exterior of the building.

The combination of volumes projecting from a basic rectangular prism was admired widely in art circles, leading to comparison with baroque use of volumes; it created formal drama and the illusion of even greater use of space. The gradual ascension of formal elements was an attempt to blend the building into the countryside. Gardens complement the house.

The interior of the Palais Stoclet was intended for an affluent lifestyle. Most rooms have lavish proportions: the main bedroom is 30 by 18 feet, and Mme Stoclet's dressing room is 20 by 20 feet. Designers and patrons chose luxurious treatments for the public rooms, featuring polychrome marble, rosewood, and parquet floors. The main dining room is especially opulent, with an inlaid mosaic frieze designed by Gustav Klimt that is artistically significant in its own right. The frieze's themes are expectation and fulfillment, amusing choices for a dining room. They were Klimt's only opportunity to actualize his painted mosaics.

The entire household was designed and created as a unit. In an extravagant prefabrication, each room was completely assembled in Vienna for approval before being dismounted and shipped to Brussels for installation. The utensils, furnishings, and architecture were intended to complement one another in total harmony, like an organic system. Subtle relationships reflected the *Gesamtkunstwerk* concept; for example, chairs in the public rooms had backs that were exactly as high as the bronze bands on the exterior of the building. The rooms and

Palais Stoclet, Brussels, designed by Josef Hoffmann (1905–11)

arrangement also were intended to showcase the Stoclets' art collection, but other than the art collection, no preexisting furnishings or decorations were used.

Virtually every figure associated with the Vienna Workshops became involved in the project. Klimt's cartoons for the dining room mosaic were executed by the Vienna workshops using inlay of white marble, gold, silver, enamel, coral, and other semiprecious stones. The painters and designers Koloman Moser, Carl Otto Czeschka, and Leopold Forstner contributed to the furniture and other design elements. Bertold Löfler and Michael Powolny designed the ceramic decorations. Franz Metzner created the exterior sculpture as well as an animal frieze for the nursery. From the wallpaper and draperies to the garden terraces, trellises, and garden furniture, the Palais Stoclet is the supreme achievement of the collaborative ideals of Hoffmann and the Vienna workshops.

TIMOTHY PURSELL

S*ee also* **Art Nouveau (Jugendstil); Hoffman, Josef (Austria)**

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PALLASMAA, JUHANI 1936–

Architect, Finland

Juhani Pallasmaa (born 1936 in Hämeenlinna, Finland) is a Helsinki-based architect, exhibition designer, and town planner. Pallasmaa is also a prolific essayist and the former director of both the Finnish Museum of Architecture and the architecture program at Helsinki University of Technology, where he graduated in 1966.

Pallasmaa's modest oeuvre of built work belies his substantial influence in Finland and abroad. His first project was characteristically intellectual and architectural: Moduli 225, developed in 1969 with Kristian Gullichsen. The stick-built system of prefabricated building components is based on a 75-by-225-cm module and sought a practical outlet for the 1960s interest in proportional systems, as standardization offered not only economies of scale but also the possibility of relating a module of construction directly to a module of proportion. Roughly 50 houses were built. The domestic scope of Moduli 225 characterizes it as both a reinterpretation of traditional Japanese construction as well as a reworking of Finnish architect Alvar Aalto's postwar inquiry into standardized dwellings.

However, Pallasmaa's subsequent teaching and research persuaded him that modern cities suffered more from standardization than they gained. Writing in 1983 that "probably the greatest shortcoming of the Modern Movement is that it has not been able to transform itself into a positive vernacular tradition," Pallasmaa set out to diagnose the causes of this failure as well as to attempt to explain what a "positive vernacular" might be. This ongoing inquiry has involved stitching together psychological, phenomenological, and architectural observations into broad themes while maintaining concern for the social milieu or individual experience. These broad themes—already in play with Moduli 225—center on two poles: a concern for the ordinary (the role of traditional and quotidian in architecture) and the question of architectural and cultural modernism.

Pallasmaa's interest in mute, harmonious proportions is paired with the ideal of an unprepossessing, modest, even anonymous architecture, characterized by unheroic forms and materials. A limited material and formal palette is typically deployed in contrasts: open versus closed, hand-made versus machine-made, edge versus surface. In his buildings and installations, the juxtaposition of disparate materials constitute Pallasmaa's efforts to appeal to the multiple senses—his built work is "experiential" rather than cerebral. Also, the deployment of ordinary materials represents Pallasmaa's own interest in vernacular traditions, albeit as reinvented for a modern age.

Adopting poet Joseph Brodsky's dictum that beauty can only be achieved by working with the every day, Pallasmaa's first important building, the Rovaniemi Art Museum

(1986) recycles a former postal depot into a gallery. The long masonry building was originally reconstructed with bricks salvaged from war-destroyed Lapland; Pallasmaa's retrofit exposes these reclaimed bricks throughout the interior, providing a quiet, poignant backdrop to the art mounted therein. On the exterior, Pallasmaa's interventions are subtle and deliberate: A new entrance threshold of glass and steel projects from the facade, fronted by five columns of different granites, marking the entrance and contrasting with the delicate entry pavilion behind.

Pallasmaa has also reworked the idea of the granite column entrance for the installation "Driveway Square" at the Cranbook Academy (1994), where the columns play a role as part of a cosmic marker. Another project in Lapland, the Sámi Museum and Northern Lapland Visitors Center (1998), inserts a minimalist building of modest scale into an arctic fells landscape, with a sympathetic installation of Sámi cultural artifacts inside.

Anonymity and harmony are hallmarks against which Pallasmaa measures contemporary society and its architectures. Pallasmaa's critical output in the 1980s asserted that Postmodern architecture represented neither reforms of modern architecture nor new "positive" vernaculars. A 1988 essay, "Tradition and Modernity," revisits the modernist canon using criteria different from formal innovation. Pallasmaa constructs an archaeology of modernism with his 1996 text *The Melnikhov House* (with Andrei Gozak)—an analysis of the modern house the Russian architect Konstantin Melnikhov built for himself in Moscow. The contradictions between the house's platonic interlocking cylinders and its complicated, organic construction suggest traditional precedents for Melnikhov's otherwise unorthodox, Platonic home. Pallasmaa evokes Melnikhov's complicated milieu via an examination of materials and details.

Indeed, the idea of home is central to Pallasmaa's thinking. Before 1986 nearly all his built work was housing, including a summer atelier for Tor Arne (1970). His studies concerning the idea of "home" are careful to avoid cliché, including the sentimental or kitsch. Instead, Pallasmaa has relied on the work of French philosopher Gaston Bachelard *(La poétique de l'espace [The Poetics of Space], 1958)* to construct a practical phenomenology of architecture against the tactile and sensual poverty of modern construction. Pallasmaa's work also extends to the scholarly, and his comprehensive survey of Aalto's furniture as well as a monograph of the Villa Mairea, Aalto's own domestic *Gesamtkunstwerk* (total work of art), reflects his expansive approach to domestic architecture.

TIMO LINDMAN

S*ee also* **Aalto, Alvar (Finland); Finland; Gullichsen, Kristian (Finland); Helsinki, Finland; Melnikov, Konstantin (Russia); Villa Mairea, Noormarkku, Finland**

Biography

Winner of the Finnish State Architecture Award, Professor Pallasmaa teaches at the Helsinki University of Technology and maintains an architectural office in Helsinki. He lectures widely and has been a visiting professor in Ethiopia and the United States.

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PAMPULHA BUILDINGS BELO HORIZONTE, BRAZIL

Designed by Oscar Niemeyer; completed 1942

Scattered around the Pampulha artificial lake in what was then the northern edge of the city of Belo Horizonte, the four buildings by Brazilian architect Oscar Niemeyer (completed in 1942) represent a landmark of Brazilian modern architecture.

In 1941 the city's mayor, Jucelino Kubitchek (who would be the president to build Brasilia 15 years later), commissioned the young Niemeyer to design a series of buildings around the Pampulha lake, inaugurating a partnership that would change the architectural and urban face of the country. The designs for the four Pampulha buidings—Capela da Pampulha, Casino, Iate Clube, and Casa do Baile—became the paradigm for Brazilian architectural modernism as well as an international icon.

The Capela da Pampulha, or Chapel of Saint Francis of Assisi, is an intimate chapel built on a small peninsula in a curved piece of land between the lake and its encircling road. The chapel's entire back wall, which faces the street, is covered by a mural *of azulejos* (painted ceramic tiles) by the artist Candido Portinari. *Azulejos* is a Portuguese technique widely used on Brazilian modernist buildings. Gardens by Roberto Burle Marx guide visitors around the chapel to the *adro* (open area in front of churches used as transition space) that spreads between the entrance and the lake edges. The floor is designed in an amoeboid pattern in white marble and black granite that penetrates the chapel and unites inside and outside. From the *adro,* one can see the whole form—its parabolic vaults covered by small ceramic tiles *(pastilhas),* the glazing and *bris-soleil at* the facade, and the inverted bell tower and its inclined canopy—uniting the tower with the main door that marks and defines the entrance.

The Casino was also built on a peninsula between the lake and the road, this time with the entrance to the main cubic volume facing Burle Marx's gardens and the driveway. Elements of the entrance, such as its free-form canopy supported by thin steel columns and the continuous glass wall on the facade, would be exhaustively replicated all around postwar Brazil. Inside the cubic main volume, the ramp dominates, and the round concrete columns punctuate the rhythm of the interior space. At the back, closer to the lake, an elliptical dance hall is integrated with the main volume by another ramp, and its continuous glass wall brings the lake landscape inside the building. Kenneth Frampton (1980) exalted that the "Niemeyer genius reached its height in 1942" at the Casino, where he "reinterpreted the Corbusian notion of *promenade architecturale* in a spatial composition of remarkable balance and vivacity."

For the Iate Clube, Niemeyer experimented with the inverted roof to maximize the view of the lake for those using the main upper hall. This roof form would become a trademark of Brazilian modernism.

In the Casa do Baile (dance hall), a small cylindrical building houses the bar, restaurant area, and stage. Attached to this cylinder is a meandering canopy supported by rounded columns that provide shelter and defme the space. The volumes are covered with painted ceramic *azulejos*. The canopy is the highlight of the building and, following the curves of the lake, defines the external space for those under it and frames the view for those passing by the road.

Church of St. Francis of Assisi, Pampulha, Brazil, designed by Oscar Niemeyer (1942)

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At Pampulha, Niemeyer (now working alone) produced an architecture that was, for the first time, distanced from the Le Corbusian syntax of his early influence and that was certainly more mature and personal than his designs for the Brazilian Pavilion at the New York World's Fair (1939) or the Hotel (1940) in Ouro Preto. If Niemeyer was applying the Le Corbusian idea of spatial promenade, he was also challenging the Le Corbusian idea of the "Five Points of a New Architecture," especially at the Capela. The Pampulha buildings masterfully solve the conflict between local versus international references, representation versus abstraction, and industrialization versus artisan construction.

The relevance and originality of the Pampulha buildings resonated in Brazil and abroad even before the buildings were completed. In 1942, as part of the good-neighborhood policy toward South America, an exhibition was being organized at the Museum of Modern Art in New York City. The "Brazil Builds" exhibition included works by Lúcio Costa, Affonso Reidy, Rino Levi, and the young Niemeyer, who was represented by the Pampulha buildings, still under construction. The international debate of the following decade would embrace the work, with Nikolas Pevsner labeling Pampulha as subversive work, Reyner Banham discussing it as the first national style in modern architecture, and Gino Dorfles defining it as neobaroque. In this sense, Pampulha defined the conceptual foundation of what would be the best Brazilian architecture of the 20th century.

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S*ee also* **Burle Marx, Roberto (Brazil); Church of St. Francis of Assisi, Brazil; Costa, Lúcio (Brazil); Niemeyer, Oscar (Brazil)**

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PANAMA-PACIFIC INTERNATIONAL EXPOSITION, SAN FRANCISCO (1915–16)

The Panama-Pacific International Exposition, the great world's fair held in San Francisco in 1915–16 to celebrate the completion of the Panama Canal, is remembered primarily for Bernard Maybeck's Palace of Fine Arts, his majestically overscaled rotunda. As noteworthy as Maybeck's structure is, the exposition should also be remembered for its innovative site planning and its carefully considered use of color.

The completion of the Panama Canal was an event of such significance that it was considered fitting that the United States should host a world's fair in commemoration. Although New Orleans was the early favorite, influential politicians from the Pacific Coast ensured that San Francisco was eventually chosen to showcase both the canal and the city's reconstruction after the earthquake and fire of 1906. Planning for the exposition began in 1911, when the Harbor View site (now the Marina) was selected for its views of the bay and for its location at the termination of then-fashionable Van Ness Avenue. The exposition's physical layout was determined by an architectural commission that was headed by Willis Polk and then George Kelham and included prominent California architects and several eastern practitioners of national reputation, including Thomas Hastings, Henry Bacon, and the firm of McKim, Mead and White. The Board of Architects chose to develop Ernest Coxhead's so-called court scheme, as developed by Chicagoan Edward H. Bennett; this arrangement best unified the various exhibition buildings and controlled the cold winds that blew off the bay by adopting an introverted ground plan in which most facilities were surrounded by a high ornamented wall. Every structure was to be in some way subordinate to the whole. As Polk put it, "The serene goddess of harmony" was to be given her due by imposing a strict architectural unity on the exterior of the general exhibition buildings—color, texture, and landscape were to be tightly controlled.

The courts were designed around specific themes, such as "The Court of the Four Seasons" or "The Court of Abundance." The centerpiece of this circulation spine, McKim, Mead and White's Court of the Universe, focused on a pair of monumental triumphal arches and was bounded by Corinthian colonnades on an elliptical plan that was intended to recall Bernini's Piazza at St. Peter's Basilica. Despite this significant gesture to the Western classical tradition, the architectural board thought of the complex as a sprawling Islamic citadel, what Willis Polk called "an Aladin's Palace, facing the azure harbor and the mountains beyond." This aesthetic sensibility was retained by many of the exposition architects as they developed their individual projects, most of whom employed a tower or a dome in one way or another. Carrère and Hastings' signature building, the Tower of Jewels, sported Byzantine details and 50,000 glass jewels, fabricated in five colors by Austrian workshops. Louis Christian Mullgardt's Court of the Ages was modeled on Moorish prototypes such as the Alhambra, whereas the exposition halls themselves were designed largely by another local architect, William B.Faville, in a "Hispano-Moorish" style that employed

Palace of Fine Arts, Baker Street, designed by Bernard Maybeck (1915)

Roman classical motifs. Bakewell and Brown's Palace of Horticulture was reminiscent of the Blue Mosque in Constantinople with its enormous glass dome, spiky minarets, and cascading semidomes (although it sported French baroque ornament).

Color was a distinguishing hallmark of the exposition. Unlike the use of white at the Chicago, Buffalo, and St. Louis expositions, color was deemed to be an important actor in setting the exotic mood of the exposition grounds. The architectural renderer Jules Guerin was commissioned as the chief of decoration. He established a palette dominated by a warm faux travertine, a russet red, a burnt orange, and sea-foam green. Whereas some critics were concerned that the wide use of color obscured the detailed ornament of the architecture, most observers were enchanted by nightly illuminations and the shimmering fields of color encountered when viewing the site from one of San

Francisco's many hills.

The exposition's most acclaimed building was Bernard Maybeck's Palace of Fine Arts. As chairman of the architectural commission, Polk had been given the assignment to design the Palace of Fine Arts, which stood at one end of the primary axis. Because Polk was busy with his other duties, he held an in-house competition to make a preliminary design deadline. Maybeck made a quick charcoal sketch of a Roman ruin that met with immediate acclaim and won him the role as architect of the building. Maybeck chose the forms of ruined antiquity for his palace, but he freely mixed different periods and styles of classical architecture. Unfortunately, contemporary writers and critics could not take it for what it was and insisted on classifying every column, frieze, and architrave. Yet anyone who analyzed the palace from a historical perspective was missing the entire point of the building. Maybeck did not sketch a building as much as an emotion. As Maybeck explained in a pamphlet issued at the exposition, the proper attitude with which one should view art was "that of sadness modified by the feeling that beauty has a soothing influence…to make a Fine Arts composition that will fit this modified melancholy, we must use those forms in architecture and gardening that will affect the emotions in such a way as to produce this modified sadness." For Maybeck, Roman ruins, French picturesque parks, and the engravings of Piranesi all evoked the desired emotion. Although he does not use the term, he might well have been referring to notions of the sublime.

The lagoon and all the other landscape elements were an integral part of the scheme. Maybeck and John McLaren worked closely together to ensure this synthesis. The lagoon reflected the palace in the water and forced the viewer to move around it, observing the rotunda from many different angles and in many different lights. On reaching the colonnades, the viewer was then swept along their lengths, appreciating the sculpture placed in the intercolumnations and above on the capitals and looking out again toward the rotunda, where the iconographic sculptural program of the palace was best revealed. On reaching the rotunda, one paused and was drawn toward the lagoon into its space, where the murals in the distended coffers of the dome were best appreciated. At the water's edge, Maybeck designed an alter to art, adorned with Ralph Stackpole's *Venus,* which was framed by great hedges planted by McLaren.

The landscape, colonnades, and rotunda were simply window dressing for the exposition hall, which was simply a decorated shed of steel three-hinged arches lashed together inside hollow tile walls and fitted out with frame partitions and numerous skylights. Like the other buildings at the exposition, the colonnades and rotunda were constructed out of timber and staff. Maybeck seriously proposed allowing the building to rot so that children of the future might find bits of ornament and sculpture or a wondrous ruin of a previous generation. Unique among the structures of the exposition, the Palace of Fine Arts was spared the wrecker's ball, but by the 1950s the structure was decomposing. By the end of the decade, a movement to rebuild the structure in concrete was begun, and in 1960 a sponsor was found. Today, the rebuilt palace is the backdrop for numerous community activities, television commercials, and weddings.

The exposition included more than just the walled city. Numerous state and international pavilions accompanied the thematic exposition halls. The international pavilions were usually designed in a National Romantic mode or in a traditional national style, whereas the state pavilions took on Beaux-Arts classical forms or replicated a historic structure associated with the state, such as Massachusetts's replica of Bulfinch's statehouse or Virginia's faux Mount Vernon. Perhaps the most memorable state pavilion was Oregon's redwood-log temple, "reminiscent of the Parthenon in Athens." The entertainment midway, known as The Zone, contained the usual array of rides, sideshows, and ethnographic exhibits but also featured replicas of the Grand Canyon and Yellowstone Park, sponsored by the Santa Fe and Union Pacific Railroads, respectively. The most visited attraction, however, was L.E.Myers's five-acre scale model of the Panama Canal, which visitors toured from a 1200-seat moving platform.

Although the celebratory mood of the exposition was dampened by World War I, the directors and exhibitors at the exposition did their best to present an optimistic, progressive view of human social and political development. Perhaps San Francisco itself was the best object lesson in the tenacious desire of the human spirit to overcome natural and political disaster. In nine years, the City by the Bay not only reconstructed itself from the ashes of the 1906 earthquake and fire but also constructed on the rubble of the old city the evanescent city of the Panama-Pacific International Exposition, a powerful expression of the Progressive Era.

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S*ee also* **Carrère, John Mervin, and Thomas Hastings (United States); Exhibition Building; Maybeck, Bernard R. (United States); McKim, Mead and White (United States)**

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PARIS, FRANCE

In terms of their phenomenal size and scale, in the use of iron, glass, or concrete for their construction, or in the novelty of their form, many buildings of the 19th century in Paris established an outstanding tradition of architectural innovation in the city that was influential in the development of modern architecture all over the world. Architects such as Anatole de Baudot, Henri Labrouste, and Louis-Auguste Boileau were at the forefront in the use of new materials, and engineers such as Gustave Eiffel and Victor Contamin designed structures of unprecedented height and span for the international exhibition of 1889.

From the beginning of the 20th century to its end, no decade (other than the period 1940–50, of World War II and its aftermath) in Paris passed without seeing the building of major landmarks in the progress of architectural design.

One of the most densely populated cities in Europe, roughly circular and bisected from east to west by the Seine River, central Paris is today encircled by the *périphérique,* the eight-lane motorway within which live some 1.6 million people in an area of great historical importance, containing major Roman remains, great medieval buildings, and narrow medieval streets traversed by wide, 19th-century boulevards. The whole city is dominated by large-scale 17th-, 18th-, and 19th-century squares, gardens, palaces, and public buildings. It is therefore not surprising that refurbishment is one of the main 20th-century themes; re-use is another, and yet another has been the relocation of museums, libraries, and administrative offices in new buildings. New housing is a constant focus of activity.

The city began the century with a huge international exhibition for which many temporary and some permanent buildings were erected. Two large exhibition halls, built for the Exposition Universelle of 1900, were the Grand Palais by Henri-AdolpheAuguste Deglane, Louis-Albert Louvet, and Albert Thomas and the Petit Palais by Charles Girault, both still standing in what is now the Avenue Winston-Churchill. The Grand Palais as well as the adjacent Pont Alexandre III (the first bridge to cross the Seine in one span, designed by the engineers Résal and Alby) are, like the Petit Palais, flamboyant in their neobaroque style, but they are also openly expressive of the iron structure to which they owe their form.

An antihistoricist movement had already by then made its mark in Paris and was encouraged by the opening of Samuel Bing's *Maison de l'Art Nouveau* in the rue de Provence in 1895.

Using exposed ironwork, reinforced concrete, or masonry, buildings in the short-lived style known as Art Nouveau are remarkable for their curved and undulating lines; their organic, floral decoration; and their studied avoidance of motifs associated with the past. Important Art Nouveau buildings in Paris by Hector Guimard include the apartment building Castel Béranger (1894–98) and the entrances to many Métro underground railway stations (1899–1903). Some of these designs were still being carried out as late as 1914. For his own house in the avenue Mozart (1909–12) and the synagogue in the rue Pavée (1913), Guimard remained faithful to the Art Nouveau after it had fallen from general favor. The Samaritaine department store (1905) by Franz Jourdain was characteristic of the movement, in that exposed structural ironwork is combined with lavish polychrome faience decoration.

At the same time, significant buildings were being designed with little or no decoration at all. Following the pioneering systems of reinforced concrete devised by Hennebique, Coignet, and Considère, the brothers Auguste and Gustave Perret were the first architects to make extensive use of this constructional technique in all their buildings. The apartment house at 22 rue Franklin (1902–03), the garage in the rue Pontieu (1905–06, demolished ca. 1969), the Théâtre des Champs-Elysées (1910–13), and the church of Nôtre Dame, Le Raincy (1922–23), are well-known examples of buildings revealing their structure and with minimal or no decorative features. Henri Sauvage designed two influential apartment houses: the *Maison a Gradins* in the rue Vavin (1911–12) and the *Immeuble d'appartements* (1924–26) in the rue des Amiraux explore the setting back of each successive floor, with full-length balconies and the use of whitetiled facades to bring light to the apartments and to the street.

An elegant reinforced-concrete structure was designed for a cardboard factory at Lancey near Paris by the Swiss engineer Robert Maillart (1872–1940), and a pair of spectacular 300-meter-long aircraft hangars (destroyed 1939–45) at Orly in the form of 62.50-meter-high parabolic arches were commissioned by the French government in 1916 from Eugène Freysinnet (1879–1962).

The work of such architects and engineers as Perret, Maillart, and Freysinnet were among the sources of inspiration to the Swiss-born Charles-Edouard Jeanneret (Le Corbusier), who settled in Paris in 1917 and who built his first Parisian building, the Villa Ker-Ka-Re (1922–23), at Vaucresson in the western suburbs. This house, with its asymmetrical facade, had smooth, white, cement-rendered walls; horizontal and vertical strips of windows; and a flat roof. Its design reflected the close interest the artist had in Cubist painting. A studio house in the avenue Reille for the painter Amédée Ozenfant was completed in 1924. Le Corbusier was subsequently to design a number of celebrated and influential buildings in and near Paris, including the Maison Roche/Jeanneret (square du Docteur Blanche, 1923–24), the Maison Planeix (boulevard Masséna, 1924–28), the suburban villa Stein/de Monzie (Les Terrasses, 1926–28) at Garches, and the dazzling Villa Savoye (Les Heures Claires, 1928–29) at nearby Poissy.

Other important Parisian houses of this period characterized by their pure, white, cubic forms were the Maison Tzara

Samaritaine Department Store, designed by Franz Jourdain (1905)

(1925–27) by the Viennese architect Adolf Loos (although the ground floor is of coursed rubble), the Villa Seurat (1924–26), and the Maison Guggenbuhl (1927) by André Lurçat and the group known as the Cité Mallet-Stevens (1926–27) by Robert Mallet-Stevens. The unique Maison de Verre (1929–31) by Pierre Chareau has, by contrast, a sheer wall of glass as its facade.

In 1937 the Exposition des Arts et Techniques was the occasion for the erection of a number of monumental public buildings that continue to impose on the modern appearance of Paris: the Palais de Chaillot (Place du Trocadéro, by Carlus, Boileau, and Azéma) and the twin Musées d'Art Moderne (Palais de Tokyo, by Dondel, Aubert, Viard, and Dastugue) nearby on the Avenue de New York. Both are stone-clad reinforced-concrete structures epitomizing the stripped neoclassicism in vogue in the more conservative circles at the period.

Meanwhile, Le Corbusier continued to contribute buildings of fundamental importance to the Modern movement in architecture: the Asile Flottant (1929), a converted barge moored on the Quai d'Austerlitz to shelter vagrants, and the Cité de Refuge de l'Armée du Salut (1929–33) were commissioned by the Salvation Army. The Swiss Pavilion (1932) at the Cité Internationale of the Cité Universitaire is a hostel for Swiss students. This building clearly differentiates its component parts, with its ground-hugging curved lobby, its staircase tower, and its long, rectangular, curtain-walled dormitory slab raised on in situ cast stilts, *or pilotis*. In many respects, it established themes that were to be developed by Le Corbusier and countless other architects for the rest of the century.

During World War II and the Occupation, there was no significant architectural activity, and the economy took until the 1950s to recover sufficiently for serious new buildings to be financed. Le Corbusier designed the twin Maisons Jaoul (1952–56) in Neuilly, which, although of low cost and very modest in scale, were widely influential on many architects: their use of simple, shuttered concrete forms and segmental vaults resting on exposed brickwork walls heralded a new roughness and primitivism. In 1959 Le Corbusier, with Lucio Costa, designed a new pavilion for Brazilian students at the Cité Universitaire. Only 200 meters from the Swiss Pavilion and, like it, essentially consisting of a dormitory slab raised on *pilotis,* straddling the ground-floor communal spaces, the Brazilian Pavilion is by contrast rough, heavy, and vigorous in its concrete forms. An overall grid of *brise-soleil* projecting balconies and screens extends over the facade.

The Headquarters of UNESCO (1953–58) was one of the first large-scale undertakings of the period, an eight-story building, in plan a curved Y shape, by Marcel Breuer (United States), Bernard Zehrfuss (France), and Pier Luigi Nervi (Italy). It was

France Opéra de la Bastille, designed by Carlos Ott (1989)

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designed to respect the form of the Place Fontenoy, behind the École Militaire, and to fit in with one of the most complex and important axial sequences of the city. A splendid program of commissions from leading artists of many nationalities was inaugurated to embellish the interior and its exterior site.

One of the largest buildings of the complex around the Place de la Défense, which closes the axis of the avenue de la Grande Armée to the west of the Etoile, was the CNIT, Palais des Expositions (1957–58), by Camelot, de Mailly, Zehrfuss, and Esquillan. Triangular in plan and covered with a continuous fluted concrete-shell roof rising from three points on the ground, the Italian Pier Luigi Nervi was the engineer, and the veteran pioneer of metal cladding, Jean Prouvé, designed the vast elliptical curtain walls of glass and steel on each side.

With the hostility felt by General de Gaulle and his government to the Montparnasse Tower block, which rose above the southern skyline of Paris in the 1960s, skyscrapers were banned from the central area, and the Défense, which is beyond the *périphérique,* was the first area to develop a cluster of tall buildings.

A restrained but powerful, moving, and effective memorial to those who died in concentration camps is the Memorial de la Déportation (1961–62) by Henri Pingusson It is situated at the tip of the Ile de la Cité. The visitor descends a steep and narrow staircase to a small open courtyard from which nothing can be seen but the sky above and the parting of the waters of the river through a low metal grille ahead. An underground space behind has the names of the camps and a tunnel of thousands of tiny lights stretching as far as the eye can see.

With the establishment of the cultural Centre Georges Pompidou, or Beaubourg, the era of "Grands Projets" began for Paris, in which successive presidents of France committed the state to an astonishing series of monumental additions to the city. The design of a London-based Anglo-Italian architectural practice, Renzo Piano and Richard Rogers, the Pompidou Center (1970–77) is at once a realization of the ideas current in the Archigram Group in London during the 1960s and a worthy successor to the Parisian tradition of novel metal-and-glass buildings. Alongside a new square, or piazza, under which there is a parking lot, rises the rectangular steel-framed block, with open floors internally—all clear of any vertical structural supports. All services, heating, ventilation, electricity, water, and drainage are on the exterior, making an until-then-unprecedented exposure of all the technology required in a modern public building. Close by, IRCAM (1977), an institute for interdisciplinary research into music, was designed by Piano and Rogers as a network of spaces under the new Place Igor Stravinsky; in 1989, Renzo Piano added to it a 25-meter tower aboveground. Since 1970 vast areas have been developed underground in Paris. The remarkable 19th-century iron-and-glass market pavilions of the Halles Centrales (by Victor Baltard and Felix Callet in 1869) were demolished during the 1970s, and in their place, following gigantic excavations, an underground shopping area, the Forum, was designed by Penchreac'h and Manoilesco. The subterranean complex also contains a busy new RER/Métro transport interchange and, 20 meters down, an Olympic-size swimming pool, a gymnasium, and a *vidéothèque* (1985) by Paul Chemetov.

Two outstanding new museums were created in the mid-1980s, both inserted into old buildings. One, the Musée d'Orsay (1986), in the disused Gare d'Orsay (1900, Victor Laloux), was designed by the Italian architect Gae Aulenti with monumental but open galleries and towers under the vault of the giant railway station nave. The Musée Picasso (1985) was, by contrast, a transformation by Roland Simounet of a 17th-century house in the Marais district, the Hotel Salé (Hotel Aubert de Fontenay). Simounet inserted into the ancient fabric of the building a brilliant sequence of well-lit spaces and volumes while respecting, where they had survived near dereliction, details of the original architecture.

The Cité des Sciences et de l'Industrie, a very large science and technology museum, was created in a conversion of the former slaughterhouses of La Villette by Adrien Fainsilber in 1986. In 1988 the Archives Nationales were moved from the Hotel de Soubise to a new building by Stanislas Fiszer, and in 1989 the Ministère de l'Economie aet des Finances was rehoused in a building featuring a spectacular bridge over the Quai de la Rapée (P.Chemetov and B.Huidboro), having been moved to clear the Richelieu wing of the Louvre for yet another Grand Projet.

The Opéra de la Bastille (1989) by Carlos Ott was built on the site of the old Bastille station. This was the first of President Mitterand's projects, designed to bring opera to mass audiences, leaving the old Opéra of Charles Garnier to concentrate on ballet. It is a roughly triangular building in plan, with a vast backstage complex of machinery to facilitate rapid scene changes and an ambitious succession of operas throughout the year. The main entrance, at the blunt apex of the plan, is rounded to counterpoint the curved plan of the Place de la Bastille. The 1980s also saw the construction of the Institut du Monde Arabe (1987, Jean Nouvel, Pierre Soria, and G.Lezenne), with its remarkable curtain wall of 30,000 light-sensitive diaphragms that open and close irises to admit or to exclude light, a reinterpretation of the latticework screens of the *Moucharabieh*.

Perhaps the most prominently visible addition to the city-scape of the period was the Grande Arche de la Défense by the Danish architect Johann-Otto von Spreckelsen, a giant 110-meter open cube that now frames the termination, at La Défense, of the great seven-kilometer axis that begins at the Louvre and runs through the Arc de Triomphe.

These grand projects continued in the 1990s. The massive reorganization of the whole of the Louvre and its new subterranean concourses is signaled by its new entrance, the Grande Pyramide (1993). This and other major additions were by the American architect I.M. Pei. The new Bibliothèque de France (1995) by Domique Perrault, the largest building of the Mitterand era, is the enormous focus of the Seine-Rive Gauche redevelopment area, a project that will continue for the next 15 years and that will include a new university campus. The Cité de la Musique (1991–94) by Christian de Portzamparc, incorporating a museum, houses the Conservatoire National Supérieur de Musique et de la Danse, and Kenzo Tange's first European building, Le Grand Ecran, was commissioned by President Jacques Chirac for audiovisual production and projection. Its 55-meter-high open steel campanile on the Place d'Italie is transfixed by a striking Constructivist composition of giant metal cubes and beams by Thierry Vide. Jean Nouvel's Fondation Cartier pour l'Art Contemporain (1994) is partly concealed by freestanding screens of metal and glass on a monumental scale aligned with the boulevard Raspail, so that the building is hidden and revealed by a complex interplay of foliage, transparency, and reflections.

In the last decade of the 20th century, Paris has seen the creation of large new parks, among them Le Parc André Citroën (1992) by Patrick Berger and others and Le Parc de la Villette (1993) by Bernard Tschumi. Superb new sports stadiums have been built; for example, the Stade Sébastien-Charléty (1994) by Henri and Bruno Gaudin and the Stade de France (1998) at Saint-Denis by Macary, Zublena, Régembal, and Costantini. Ambitious new hospitals have been built, such as the Hôpital Robert Debré (1997) by Pierre Riboulet, a long, curved building that follows the slope of a large site in the 19th

Arrondissement.

The 1990 project of the Ministère de la Poste to build 1500 dwellings on its sites has already resulted in a number of attractive and imaginative new buildings, such as those in the Place Jeanne d'Arc (Dubus and Richez) or in the rue Oberkampf (1993, Borel).

A constant program of restoration, new housing, new facilities, and refurbished street furniture has improved the city in almost every quarter, a good example being the enormous program of improvements made to the avenue de l'Italie during 1999–2000.

The municipality of Paris set up enlightened agencies such as the RIVP (Régie Immobilière de la Ville de Paris) and the designation of areas of the city as ZACs (Zones d'Aménagement Concertées, such as those at Reuilly, 1987–97, or Bercy, 1993–36) as key elements of the continuing restructuring, repair, and embellishment of the urban fabric of this great city.

ALAN WINDSOR

S*ee also* **Art Nouveau (Jugendstil); Breuer, Marcel (United States); Corbusier, Le (Jeanneret, Charles-Édouard) (France); Grande Arche de La Défense, Paris; Horta, Victor (Belgium); Maillart, Robert (Switzerland); Maison de Verre, Paris; Mallet-Stevens, Robert (France); Metro Station, Paris; Notre Dame, Le Raincy; Nouvel, Jean (France); Pei, I.M. (United States); Perrault, Dominique (France); Perret, Auguste (France); Pompidou Center, Paris; Tschumi, Bernard (France); Villa Savoye, Poissy, France**

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PARK HOTEL, SHANGHAI

Designed by Laszlo Hudec; completed 1934 Shanghai, China

The Park Hotel (1934), also known as the Guoji Fandian (or the International Hotel), was designed by Hungarian architect Laszlo Hudec (1893–1958) in Shanghai with the aid of Chinese and European architects and assistants in his firm. Since its completion in 1934, this skyscraper hotel has been a major landmark on the horizon of this enormous city. At 284 feet, the Park Hotel stood as the tallest building in Shanghai until the 1980s. Its value to the history of architecture lies in the circumstances of its origin, as witnessed by a young I.M.Pei, who cites his exposure to the hotel's construction as the reason that he decided to become an architect. The hotel is a significant vector where the steady streams of European and American ideas and technology spreading around the world after World War I intersected with the self-conscious aspirations of certain Chinese groups to a global culture.

Shanghai before World War II was a cosmopolitan city that had seen tremendous growth since the first Europeans settled in it in the early 19th century. As one of several areas conceded to Britain in the aftermath of the Opium War in 1842, what had been a small but prosperous trading center strategically located at the mouth of the Yangtze River quickly changed through the influx of foreigners. By the 1930s, there were people of 56 different nationalities living in the city. Foreigners and Chinese alike were attracted by the city's unique opportunities for economic success afforded by the autonomous and liberal city regulations granting foreigners rights beyond those of the vast majority of Chinese inhabitants. Many Chinese living in Shanghai had fled civil strife throughout the century of Shanghai's "glory days." In this enclave of international trade within Chinese borders, Chinese of different regional groups established bonds that evolved into powerful economic, political, and social organizations.

It was from a group of successful Chinese bankers that the bank owning the Park Hotel evolved in 1923. The Joint Savings Society (JSS) was one of the ten largest modern banks in China by 1928, modeled on Western-style commerce by Chinese businessmen with an overseas education. They were from the coastal provinces of Zhejiang and Kiangsu, and some rose to a position where their advice—and their money—was sought by Chiang Kai-shek's government. This group's political and underworld associations are complex and unclear. However, as part of an elite group of financiers who believed that China's future lay in the participation of a global culture, they instituted new types of services, such as the China Travel Agency and modern banks based on Western models. The Park Hotel was operated by International Hotels Ltd., a Chinese company that also ran the new International Hotel School as part of the hotel.

The hotel rose over the racecourse, the most important social center for the international community, and participated tangibly in Shanghai's symbiotic relationship with foreign capital. It was the most visible structure on Nanking Road, a street famous for its culture of consumption. Nanking Road has been called the source of the transformation of the Chinese way of life. For many Chinese, who by a large margin held the majority in a city famous for its international composition, the street's shops, with Western goods advertised by blazing neon signs, held out hopes of status and success and symbolized impossible dreams of happiness.

At the time of its construction, local media praised the Park Hotel as a modern enterprise in every aspect that made use of modern technology to provide up-to-date services. Its Otis elevators were of the same model and speed installed in the Empire State Building only three years earlier. Publications on

Park Hotel, Shanghai, designed by Laszlo Hudec (1934)

the hotel in European, American, and Shanghai trade journals of the 1930s reveal an appreciation for the use of new technology in air conditioning, sprinklers, and steel manufacture as well as an acknowledgement of the growing trade of Western building products in China.

The hotel is evidence of the creative opportunities available to Shanghai's architects not seen elsewhere in the world. The convergence in this city at this time of practitioners and wealthy patrons from many different countries, as well as evolving or nonexistent building codes in which to experiment, meant that architectural ideas from around the world found unique expression in Shanghai. The unusual dual function of the Park as hotel and bank clearly reflected its origins in the JSS. From the second to the 19th floor, it was a hotel with all the latest modern amenities and a private suite for one of its board of directors. The bank and its vaults occupied the first floor and basement.

The Park was an apartment hotel skyscraper in a streamlined Art Deco style, a building type then popular in American cities and, when urban dwellings became fashionable for their ability to represent sophisticated and progressive ideals, in Shanghai.

Hudec traveled widely to both Europe and the United States. In 1927–28 he sketched skyscrapers and hotels in New York and California. This architect cited the work of Raymond Hood as his principal source of inspiration in the Park Hotel and suggested that, like Hood's misunderstood skyscraper designs, the Park Hotel was innovative in its solution to the problem of tall building design.

The hotel's dark, brooding appearance can be attributed to the architect's Central European heritage. The creation of regional styles, a topic under close scrutiny at the time of Hudec's Beaux-Arts training in Budapest from 1911–14 continued to be of interest to Hudec in Shanghai. Much of this architect's work, observed in close proximity to a widely diverse body of architectural styles in Shanghai, carries associations with Central or Northern European architecture, especially through surface decoration and general sensibility.

The hotel's architect, Laszlo Hudec, is acknowledged in Shanghai today as a significant contributor to the city's historic architecture. His work is virtually unknown outside Shanghai because China's 20th-century culture avoided the close scrutiny of Western scholars until the 1990s. The unusual architectural opportunities of this dynamic city provided fertile proving ground, and Hudec's own architectural office was well established by 1925, with a peak period of production between 1925 and 1934.

Like many other structures of note during the early 20th century, the Park Hotel illustrates its architect's concern with evolving an architecture that represented the dynamic developments in technology as well as a growing awareness of the meaning of architecture in society. Modern technology, American apartment hotel typology, and hybrid skyscraper design easily convey sentiments of a humanity's heroic and sophisticated presence on earth, just as other skyscrapers in the United States did. However, the message is carried to further depths with this highly visible structure on what continues to be China's symbolic street of capitalist enterprise. The human achievements acclaimed by the building of the Park Hotel were that of an elite group of Chinese who firmly believed that the attainment of a global culture was the hope for China's future. It is a message that once again finds expression in the current architectural climate of Shanghai.

LENORE HIETKAMP

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PARKING GARAGE

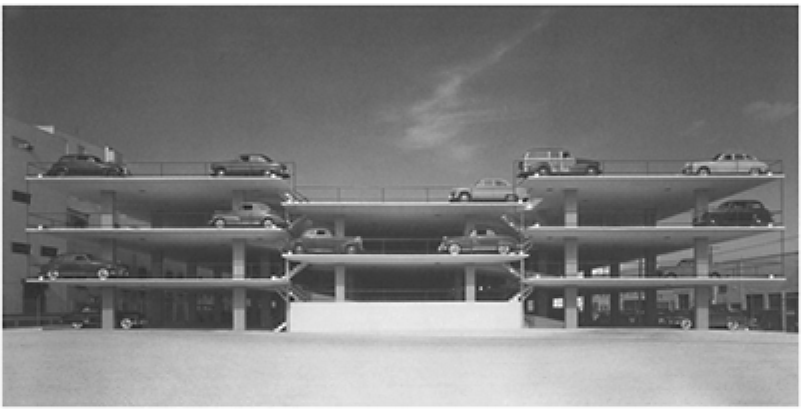
The development of the parking garage in the 20th century was a direct consequence of the automobile's unprecedented disruption of the 19th-century city. Whereas traditional urban areas had been constrained by pedestrian speed and the centralizing logic of the railroad station, the automobile's omni-directional movement, its mass availability, its high speeds, and its sheer physical size all demanded greater decentralization and dispersal. In the friction between these two paradigms of city organization, the parking garage emerged in the middle part of the century as a form of suture. Inside it, the enormously scaled automobile-oriented urbanism of the strip and the freeway would brush against that of the shopping arcade, the village green, and the office building. In one side came a driver and his heavy cloak, and out the other emerged a pedestrian.

The roots of the parking garage typology begin in the closing years of the 19th century with the invention of the motorcar. From the very beginning, it was understood that these new machines were not fit to be left outdoors. Besides simply being expensive and vulnerable to theft, most were too mechanically temperamental to be left to the vagaries of the climate. The majority of their wealthy owners simply adapted their existing coach houses to accommodate these new "horseless carriages." Those without the room and presumably without more reputable choices found space for rent in existing livery stables. Such makeshift accommodation continued into the early 1920s, by which time some underutilized warehouse facilities were also being pressed into service for automobile storage. In the relatively rare cases in which these buildings made use of their upper floors, vertical transport of the automobiles was easily handled by the preexisting freight elevators.

Unfortunately, all these patchwork adaptations and accommodations were soon overwhelmed by the enormity of the automobile's crescendoing effect. Whereas at the beginning of the century the total number of passenger cars was less than 10,000, by 1920 there were eight million autos in use. By 1930, that number had tripled to 23 million. By 1950, despite the Great Depression and the rationing of World War II, the number had nearly doubled again to 40 million. Between 1950 and 1960, two million additional cars were added each year.

Compounding the congestion generated by the sheer number of these vehicles, all requiring roadways on which to drive and spaces in which to park, was an irrefutable geometric dilemma. Whereas a person at a baseball game sat comfortably in about five square feet and an office worker was comfortable in about 50, a parked Cadillac required almost 200 square feet. This meant that in densely used areas where crowds gathered in large numbers—places such as office buildings, shopping malls, hotels, airports, or downtown department stores—there was simply no room to store all their cars. Making matters worse was the commonplace observation that no person arriving by car was willing to walk more than a few hundred yards to get where he needed to go. The only way to store that many cars that close to their final destinations was to stack them on top of one another, thereby formalizing the notion of the multitiered automobile warehouse. These new buildings, totally subservient to the spatial needs and mechanical capacities of the automobile, were nevertheless named with an exotic word of French origin: *garages*.

Given a consensus by the late 1920s on the need for some sort of formalized structure in which to store all these new cars but without strong typological or historical precedents from which to work, the early parking garages were amazingly varied, with solutions ranging from the prosaic to the utterly fantastic.



Miami parking garage, designed by Robert Law Weed (*c.* 1949)

The most straightforward garages had floor plates, which were joined by a system of ramps that the automobile would navigate under its own power. The simplest schemes, such as Victor Gruen and Krummeck Associates' Milliron's Department Store in Los Angeles (1949), continued an existing surface lot up a ramp onto the roof of a building. Slightly more complex and certainly more elegant was Paul Schneider-Esleben's use of a ramp in his freestanding Haniel Parking Garage in Düsseldorf (1953), which externally suspended two straight ramps alongside four enclosed floors of parking. In Miami architect Robert Law Weed's unnamed garage (1948) opted for an unenclosed "split-level" plan that incorporated small and discontinuous half-level ramps within it.

Other designers preferred to use curved ramps. Venice's famous Autorimessa (late 1930s) designed by Eugeio Miozzi, often called Europe's first major parking garage, could store 2500 cars arriving from the mainland on seven rectangular floor plates connected by two one-way helical (corkscrew) ramps. Toulouse's Victor Hugo Parking Garage designed by Cabinet Genard Architects (1959) also had two cylindrical ramp towers, but each of these was composed of two intertwining ramps in a double helix arrangement. Architects Albert C.Martin and Associates did away with all ramps for the May Company Department Store on Wilshire Boulevard in Los Angeles (1953), elegantly folding three parking levels so that each touched the existing grade independently. Other designers developed what is now considered the most efficient solution to the ramp-deck dichotomy and designed parking garages like the Rupert Street Multi-Story Car Park in Bristol (R.Jelinek-Karl, 1960) in which one continuously coiled floor plate is used for both ascent and parking simultaneously.

For locations in which ramped garages were not feasible, more fantastic solutions were tried. For example, in densely developed downtown cores, where aesthetic discomfort about unfamiliar parking garages dovetailed with the high value of real estate, the difficulties of subterranean parking seemed worth contemplating. San Francisco was the first city to donate the land under its Union Square Park for a privately run garage (1941), but it was copied in Los Angeles (1951), Chicago (1954), Bern (1957), and Dresden (1961) to name just a few places.

For other valued locations where even underground parking was not possible, enormous building-scaled hoisting machines were built to store automobiles in giant three-dimensional cubbyholes. By mechanizing the means of ascent and storage, these structures minimized non-parking areas, such as ramps, lanes, and even door-opening stall widths, thereby squeezing the absolute maximum storage capacity out of a parcel of land. In Chicago, for example, Thielbar and Fugard's Jewelers Building (1926) incorporated a mechanical car parking system inside the skyscraper's core, reaching 40 stories high. Two popular proprietary technologies were the "Bowser" overhead crane system (Parking Facility #1, 1955, Chicago, by Shaw, Metz, and Dolio Architects) and the totally automated, push-button "Pigeon-Hole" system (Park-O-Mat, 1951, Washington, DC). Even more fantastic schemes were studied as prototypes, including the extremely narrow "Speed-Park" forklift system (20 feet of street frontage required), a revolving "ferris-wheel garage," and the "Point-Lift System," in which a central elevator tower was surrounded by rotating floor plates.

Given that the form of the parking garage was so fluid during this midcentury period of invention, it should be no surprise that the functional program was equally in flux. Many early garages billed themselves as complete auto-service facilities and included refueling pumps, service stations, valet parking attendants, and car-washing equipment. Others incorporated restaurants and lounges. The most foresighted designers began to reconceive the links between the parking garage and its surrounding contexts. In the simplest cases, this meant a bridge or covered walkway that joined two adjacent structures (Ford Administrative Building Garage, Dearborn, Michigan, by Skidmore, Owings and Merrill). More developed schemes include Bertrand Goldberg's 1962 Marina City in Chicago. Goldberg rejected a stand-alone garage in favor of a design that integrated the necessary parking structure within the massing of the tower's adjacent planta. Taken to extremes, this tendency to combine the parking garage into a larger architectural program gave rise to a fantastic collection of hybrid buildings—a walk-up/ drive-through/parking garage bank (American National Bank, mid-1950s, Austin, Texas, by Kuehne, Brooks, and Barr, Architects), a department store in which conveyor belts linked parking spaces to retail counters (Foley's Department Store, mid-1950s, Houston, by Kenneth Franzheim, Architect), and LeRoy Warner's mythologized park-at-your-desk office building (Cafritz Building, 1954, Washington, DC).

By the end of century, most of these radical experiments in form and organization had ended, and the parking garage began to be seen as a commonplace, utilitarian, and predictable sort of building without great aesthetic or architectural significance. Probably this was in part the result of a lingering memory of the parking garage's utilitarian origins in the warehouse and livery stable. Furthermore, the maturation of the typology necessarily dimmed the exoticism and inventive wonder that had infused so many of the earlier experiments. Finally, and most significant, the parking garage remained hostage to the continuing friction between a traditional notion of the city and the rise of the automobile. As a consequence, all too often garage designers had motivations that were as much defensive as anticipatory, seeking bulwarks against the unwelcome automobile rather than new models for architectural inhabitation and use. By the mid-1960s, for every majestic and visionary project such as Paul Rudolph's Temple Street Parking Facility (1962) in New Haven, Connecticut, there were dozens of unimaginative disappointments—cheap, ugly, and banal in every respect. Sadly, no designer seemed able to realize the complex and redemptive vision imagined by Louis Kahn in his "Dock Complex" plan (1956) for Philadelphia, in which a "street becomes a building" and the parking garage assumed its rightful place as an integrated, complex, and celebrated typology in the modern city.

RONN M.DANIEL

S*ee also* **Automobile**

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PARKWAYS

Parkways played an important role in the development of the modern landscape. As the first comprehensively designed limited-access public motorways, parkways paved the way for the expressways and interstate highways that transformed the American landscape in the second half of the 20th century. As symbols of progress and modernity, parkways embodied con-temporary conceptions of modern design, efficiency, and technological progress. At the same time, their naturalistic landscaping and historical allusions suggested that modern technologies and modernist principles could be harmonized with traditional values and aesthetics.

Parkways long predated the automobile. Frederick Law Olmsted and his partner Calvert Vaux introduced the term "park-way" to describe the attractive approaches they proposed for Brooklyn's Prospect Park in 1868. The idea of connecting suburban parks with urban centers and elite residential developments by means of attractively landscaped parkways soon became a key element of American city planning. Parkways were seen as means of spreading the benefits of parks throughout the urban area, as verdant corridors that enabled pleasure seekers to escape the dangers and disruptions of ordinary city streets, and as powerful economic stimulants that enhanced property values and encouraged high-class residential development. As the connecting fabric of metropolitan park systems, parkways helped transform the focus of American city planning from isolated developments to large-scale comprehensive improvements. Olmsted and other planners, such as Horace Cleveland, Harland Bartholomew, John Nolen, George Kessler, John C.Olmsted, and Frederick Law Olmsted, Jr., went on to design notable parkway and boulevard systems for cities such as Buffalo, Boston, Chicago, Kansas City, Minneapolis, Seattle, St. Louis, and Washington, DC.

The first parkways resembled contemporary boulevards. Brooklyn's formally landscaped Eastern Parkway consisted of a central pleasure drive bordered by tree-lined park strips that were flanked by additional roadways for commercial vehicles and access to abutting properties. The series of drives and bordering parkland that Olmsted planned for Boston's Muddy River in the 1880s, now known collectively as "The Emerald Necklace," redefined the basic parkway concept from an attractively landscaped but essentially urban avenue to a winding roadway ensconced in an elongated, informal park. The project represented a middle stage in the evolution from traditional boulevard to modern limited-access parkway in circulation terms as well. Park development constrained access on the stream side of the main roadway, but turning and entering traffic from the urban side of the parkway remained a source of danger and disruption.

The proliferation of private automobiles in the first quarter of the 20th century rendered 19th-century parkway and boulevard systems obsolete, creating a demand for a new type of parkway geared toward the social, spatial, and technological demands of the automobile age.

The first public parkway designed solely for automobile use was the Bronx River

Parkway, which was completed in 1925 and stretched for 15 miles from the Bronx Zoo to the Kensico Reservoir in central Westchester County. The design team of engineer Jay Downer and landscape architects Herman Merkel and Gilmore Clarke employed all the features that would come to identify the classic mid-20th-century motor parkway. These elements included the segregation of the main parkway drive in a broad, landscaped corridor that provided ample room for broadly curving roadway alignments and aesthetic enhancements while screening out incompatible development; the elimination of access from abutting properties; a significant reduction in the number of intersecting roadways, most of which were carried over the main parkway drive on attractively designed grade separations; construction through largely undeveloped locations to minimize costs and maximize design flexibility; and a prohibition on slow, dangerous, and unsightly commercial traffic. The Bronx River Parkway included several short landscaped medians, but fully divided motorways did not make their appearance until the mid-1930s. The driveways were laid out with gentle grades, ample sight lines, and broad, sweeping, subtly banked curves. Careful attention was paid to harmonizing the roadway with the surrounding terrain to enhance the impression of gliding effortlessly through the landscape, where traditional picturesque compositions were simplified for easy appreciation at modern speeds.

The Bronx River Parkway proved tremendously successful as a scenic pleasure drive and commuter thoroughfare. Motorists, landscape architects, and planners quickly recognized that this new style of parkway was not only more attractive than conventional roadways but also safer, faster, and more efficient. The Bronx River Parkway's popularity spurred a parkway building boom that lasted through the 1930s, as planners sought to answer pressing demands for recreational amenities, transportation improvements, and suburban recreational development. Westchester County constructed numerous additional parkways, including the Saw Mill River, Hutchinson River, and Cross County. New York public works czar Robert Moses oversaw construction of the Northern and Southern State Parkways and their various offshoots to provide access to suburban homes and new state parks on Long Island. The nation's capital also embarked on an ambitious parkway-building program. Although the general outlines of the Washington parkway system antedated the Bronx River Parkway, Rock Creek and Potomac Parkway, Mount Vernon Memorial Highway, and George Washington Memorial Parkway employed similar design strategies.

By the late 1930s, rising speeds and traffic volumes made it increasingly difficult to combine efficient highway design with traditional park values. Connecticut's 1938 Merritt Parkway was popular with commuters but lacked the aesthetic sophistication and recreational amenities of earlier parkways. New York's Belt and Henry Hudson Parkways were also devoted more toward traffic movement than scenic appreciation, as was Los Angeles's Pasadena Freeway, which was conceived originally as the Arroyo Seco Parkway but was renamed before its completion in 1940. Highway engineers soon realized that they could appropriate the basic circulation features that made parkways safe and efficient without incurring the expense of elaborate landscaping and recreational development. This recognition led to the proliferation of minimally landscaped freeways, expressways, and interstate highways that came to dominate the post-World War II American landscape.

Attractive parkways continued to be constructed during the expressway era. The National Park Service (NPS) pressed on with the development of long-distance recreational parkways initiated as public works projects during the Depression. The Blue Ridge Parkway, stretching for 469 miles between Shenandoah and Great Smoky Mountains National Parks, was completed in 1987 and stands as the paragon of the parkway builder's art. The 1954 Baltimore-Washington Parkway and postwar sections of the George Washington Memorial Parkway demonstrated the appeal of independently aligned roadways separated by broad, landscaped medians. New Jersey's 1956 Garden State Parkway posed a striking contrast to the neighboring Turnpike, and New York's Taconic State Parkway (1931–63) received widespread praise as the ultimate manifestation of the modern, multiuse motor parkway. Although largely completed by the 1960s, the Natchez Trace Parkway through Tennessee, Alabama, and Mississippi remains unfinished and will extend classic parkway development into the 21st century.

The sylvan surroundings and dynamic streamlined ribbons of mid-20th-century motor parkways captured the imagination of contemporary designers, critics, and everyday motorists. Sigfried Giedion hailed parkways as supreme embodiments of the space-time ethos of modern design. Lewis Mumford proclaimed the Taconic State Parkway on par with any artistic creation of the modern age. The "magic motorways" of Norman Bel Geddes's popular Futurama exhibit at the 1939 World's Fair were predicated on parkway design principles, and Nazi engineers studied the Westchester and Washington-area parkways before designing the Autobahns, which eventually supplanted the slower-speed parkways as paradigms for modern motorway design. By the 1960s, however, the excesses of postwar expressway development prompted calls for a return to parkway-style landscape aesthetics, which have found their way into some of the more attractive late-20th-century interstate highways.

TIMOTHY DAVIS

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PARLIAMENT BUILDING, CHANDIGARH, INDIA

Designed by Le Corbusier; completed 1960

In 1963, at the inauguration ceremony for Le Corbusier's Parliament building in Chandigarh, Prime Minister Nehru described the design as "symbolic of the freedom of India, unfettered by the traditions of the past…an expression of the nation's faith in the future." Few man-made structures of any era evoke the same timeless, dignified, and otherworldly presence of Le Corbusier's Parliament. This monumental composition of abstract concrete forms draws its inspiration from solar geometry and from the physical and spiritual impact of the sun on the people of India. The end result of this approach to design is a building that is as rich in symbolism as it is in composition and texture. However, the origins of the Parliament building are terrestrial, not cosmic, and its function and existence are predicated on political rather than transcendental forces.

Following the partition of the new state of Pakistan from India in 1947, the province of Punjab was effectively split into two parts. With the primary Punjab city of Lahore now in Pakistan, there was a strong political imperative to create a new capital city for the Indian Punjab in the Ambala district north of New Delhi. This new city was to be sited between two rivers on a vast plateau at the base of the Himalayas and was to be known as Chandigarh. In 1950 a team of four architects—Le Corbusier, Maxwell Fry, Jane Drew, and Pierre Jeanneret—was commissioned to undertake the design of the city and its major public buildings. In February 1951 the team proposed that Chandigarh be founded on a modernist street grid with the commercial district at its center and with its political structures clustered together at its top (the northeast). It was these political structures, collectively known as the "Capitol," that were to occupy much of Le Corbusier's attentions until his death in 1965.

The Capitol is an almost classical composition of buildings, monuments, artificial landforms, and vast geometric piazzas, all viewed against the backdrop of the Himalayas. To the top, or the northeastern extent, of the Capitol, Le Corbusier designed the Governor's Palace (unbuilt) as a "crown" for the central public square. To the right of this square (southeast) is the High Court (1956), or Palace of Justice, and to its left, directly facing the High Court across the central square, is the Parliament, or Assembly, building. Farther to the left, beyond the Parliament, is Le Corbusier's Secretariat (1956), which houses the ministries of the government in a single nine-story building that echoes his earlier Unité d'Habitation (1953) in Marseilles.

The Parliament, which was not only the last completed building in the Capitol complex but also the cheapest, was conceived by Le Corbusier as possessing a distinctive profile. The silhouette of the Parliament is a direct result of the ingenious composition of four discrete volumes. The largest of these volumes is three stories high at the piazza level, is roughly square in plan, and in elevation is presented as a horizontal, rectilinear form. Three of the sides of this volume are lined with the blades of Le Corbusier's *brises-soleil* (sunscreens for the offices inside), whereas the fourth facade, which faces the High Court and the central piazza, is shielded by a large freestanding portico. Prominently positioned in this facade is a centrally pivoted ceremonial door. This door is covered in a brightly colored enamel collage by Le Corbusier that depicts a range of iconic signs (including traces of Le Corbusier's Modulor and solar path diagrams). The portico, which shelters both this door and the entire facade, is covered with a heavy scooped roof and is supported on eight concrete walls that are perforated with rounded holes, as if to belie their structural function. The ceremonial entrance through this portico is flanked by twin pools of water that provide reflections of the Parliament's distinctive hyperbolic and pyramid roof forms. The larger of these roof forms, a hyperbolic shell with a truncated apex, was inspired by the industrial cooling towers of Ahmedabad. The base of this form is situated within the main square volume, from which it rises through the latter's roof. The hyperbolic shell houses the assembly chamber for the Parliament at its base and a variety of special-purpose viewing galleries at upper levels. The fourth and final form is the council chamber, which is similarly located within the greater square volume and is designated with a lopsided pyramid that also protrudes above the main roof. Adjacent to this pyramid is a service tower to allow access, via a steel bridge, to the roof of the assembly chamber. Both the pyramid and the truncated hyperbolic shell contain elaborately sculptured skylights to partially illuminate the spaces below and to celebrate the relationship among the sun, the building, and the people. Within the original square volume, both chambers are surrounded by a regular grid of three-story-high concrete columns and a series of ramp and mezzanine levels. This space, which is called the Forum, is lit by clerestory windows and possesses a weight and majesty that few 20th-century buildings have been able to emulate. Both internal and external surfaces are finished in rough concrete (a necessity of construction in India at that time) and openly display a dense patina of age. Enigmatic bas-reliefs in the concrete walls serve only to amplify the curiously spiritual character of the building.

Paradoxically, it is this character of spiritual otherness that has attracted the majority of the criticisms leveled at the building. The Parliament is unashamedly overpowering in its scale, finish, and appearance. Much of this is the result of Le Corbusier's fascination with global issues: the passage of the sun, the weathering of materials, and what it means to live so closely with the environment. All these preoccupations have produced a building that is attuned more to the elements than to the government and the people of India. This is both the building's strength and its weakness.

MICHAEL J.OSTWALD

See *also* **Chandigarh, India; Corbusier, Le (Jeanneret Charles-Édouard) (France)**

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PATKAU, PATRICIA AND JOHN

Architects, Canada

The work of Patricia and John Patkau can be characterized by a very particular reference to site and by its discretely tectonic character. In developing their approach to design, this young Canadian practice has sought to search out the particular and, in doing so, avoid the generalized solutions that are so pervasive in modern architecture and especially so in North America. Patricia and John Patkau founded their practice in 1978 in Edmonton, Alberta. Their early work consisted of houses and educational buildings on the prairies. Six years later, they relocated to Vancouver, British Columbia, and during the last 16 years, working from a studio in a loft in the heart of the city, they have designed a series of private houses and public buildings for sites not only on the west coast but across Canada as well.

Their winning competition design for the Canadian Clay and Glass Gallery (1986) in Ontario marked a significant point in the development of their work. The construction of this project was delayed by a lack of funding, but when it was eventually completed in 1992, the Gallery also established an important landmark in contemporary Canadian architecture.

John Patkau studied at the University of Manitoba and graduated with a Master of Architecture degree in 1972, whereas Patricia Patkau (b. 1950) graduated from Yale University after completing her undergraduate studies at the University of Manitoba. Working together and with their colleague Michael Cunningham, they have developed one of the most significant architectural practices in Canada. The Patkaus scrutinize the site, construction, and materials in the settings in which they work so as to reveal the special characteristics of the place. This concern for the nature of place, which they have characterized as "investigations into the particular," has significantly shaped their approach to design. In 1988 they designed a new school for the Seabird Island Band—a Salish community at Agassiz in the Pacific Northwest. Organized to consider alternatives to the institutional and prefabricated school building that were customarily provided by government for remote First Nation communities, this project was developed by the Patkaus, who worked in close collaboration with the Salish people to design a new school, built by the community. The zoomorphic form of the building created some construction problems, but despite this, the new school was well constructed by its community builders in a government-sponsored scheme.

The Patkaus continue to receive private commissions; many of these have been within areas of outstanding natural beauty. In sharp contrast to the long-established and densely built landscapes of Europe, these buildings have frequently represented the first acts of settlement on a site. This first settlement on a site has fundamentally influenced the development of the residential architecture of the Patkaus. The Barnes House, for example, which was completed in 1994, is located at the edge of rocky outcrop overlooking the Straits of Georgia in British Columbia and sited in a depression in the rock, but with the main living room on the upper floor turned to focus the long view to the ocean. The house not only is embedded in the site but also serves to focus a view onto the landscape. Their designs are derived from the topography and detail of the landscape. However, they also relish the constructional detail and explore a heterogeneity in ways that are reminiscent of Alvar Aalto's work.

The design of new public buildings—a library at Newton, Strawberry Vale School on the outskirts of Victoria, new facilities for the Emily Carr College of Art and Design in Vancouver, as well as a new community school on the waterfront in Toronto—has ensured that the architecture of Patricia and John Patkau has not been isolated within private worlds or remote sites. These public buildings have been significant not only because of their complexity and public presence but also because they embody elusive and original qualities that make reference to the culture of Canada. In this respect, the work can again be viewed alongside that of Aalto, an architect whose work became an important part of the construction of a new nation. Canada can be viewed as a social democratic nation that emerged from the British Commonwealth anxious to define itself and to seek out differences that distinguish it from its expansive neighbor, the United States. In the last few years, the architecture of the Patkaus has played a role in this process.

Increasingly, the work of Patkau Architects has been seen on the international stage.

Since 1994 their work has been shown extensively in Europe and North America, and in 1999 they were selected to represent Canada in the Venice Biennale. This notice has also brought their work to the attention of the promoters of major national and international architectural competitions. Invitations to compete for several significant design projects have resulted in successful submissions for new buildings in the United States, and at present they are designing new student residences for the University of Pennsylvania in Philadelphia as well as for the Grande Bibliotheque du Québec in Montreal.

These young Canadian architects have stated that they see their work as "only at the beginning of the issues of heterogeneity that we are interested in—the variety, the difference and differentiation, the irregularity juxtaposed to regularity." As they move into the design of large civic buildings set within different urban contexts, it will be revealing to see how their declared desires for the buildings that they design—to "become more differentiated, more irregular, more various"—are made manifest.

BRIAN CARTER

S*ee also* **Aalto, Alvar (Finland)**

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PAUL, BRUNO 1874–1968

Designer and Architect, Germany

Bruno Paul was born in the village of Seifhennersdorf in rural Saxony in 1874. His father was an independent tradesman, craftsman, and dealer in building materials. When he was 12 years old, Paul left Seifhennersdorf for Dresden, where he attended the Gymnasium and entered a teacher's training school. By 1892 he was determined to pursue a career in the arts. He learned to draw while working in the office of a local architect. In 1893, he was accepted as a student at the Saxon Academy of Fine Arts.

In 1894 Paul moved to Munich, the artistic capital of Wilhelmine Germany. He enrolled at the Munich Academy as a student of the painter Paul Höcker, one of the founding members of the Munich Secession who provided Paul's introduction to the city's circle of progressive artists. In 1896 Paul left the Academy and began a career as an illustrator. He was a regular contributor to *Jugend* and, from 1897, a member of the staff of the satirical journal *Simplicissimus*. Paul's weekly contributions to *Simplicissimus* between 1897 and 1906 won him international acclaim.

In 1898 Paul began working as an applied artist. He was a leading figure in the development of Jugendstil and quickly established himself as the premier designer for the *Vereinigte Werkstätten für Kunst im Handwerk,* a maker of artistic housewares in Munich. The Jugendstil Hunter's Room he designed for the *Vereinigte Werkstätten* in 1900 received a gold medal at the Paris International Exposition and was the first of a series of prestigious commissions that won widespread professional admiration. In 1906 Paul designed a festival decoration for a barracks in Munich, his first commission on an architectural scale. His design impressed Kaiser Wilhelm II and facilitated his appointment to the vacant directorship of the School of Applied Arts in Berlin.

Paul's appointment in Berlin was integral to the program of educational reforms promoted by Hermann Muthesius and Wilhelm von Bode. Paul, who was a member of the Munich Secession and the Berlin Secession as well as being one of the 12 artists who founded the German Werkbund, proved a committed reformer. He revised the curriculum of the School of Applied Arts to promote practical craftsmanship as the basis of artistic education. He emphasized the training of designers for the applied arts industries. Only the most dedicated and talented students progressed to classes in architecture, painting, or sculpture. Paul implemented the full scope of his program of reforms in 1924, when the School of Applied Arts was merged with the Art School of the Prussian Academy. The new institution, the United State Schools for Fine and Applied Arts, provided a coherent educational program that encompassed every technical and creative aspect of artistic endeavor. Until Paul was removed from the directorship of the combined schools in 1933 for his perceived antipathy to the Nazi government, he led an institution regarded by Nikolaus Pevsner as one of the two most important in Germany—an honor shared with the Bauhaus (Pevsner, 1936). In terms of the scope of its curriculum and the number of its students, Paul's school in Berlin far surpassed its contemporary in Dessau.

As a designer, Paul provided more than 2000 furniture patterns to the *Vereinigte Werkstätten*. He also designed furniture for the *Deutsche Werkstätten* in Dresden as well as designing ship interiors for the *Norddeutscher Lloyd,* pianos for *Ibach,* and streetcars for the city of Berlin. Paul's most significant design was the *Typenmöbel* of 1908, the first example of modern, unit furniture conceived to allow an unlimited number of combinations of standardized, machine-made elements. Like much of his work, the *Typenmöbel* was widely published in contemporary professional journals.

Paul's architecture was closely related to his designs for furnishings and interiors. Before World War I, he was best known as a residential architect whose houses were simple and elegant, efficiently planned, and devoid of superfluous ornament. His favored vocabulary, an abstracted classicism, had a profound influence on the work of his students and apprentices, who included Ludwig Mies van der Rohe, Paul Thiersch, Edwin Redslob, and Adolf Meyer. In 1914 Paul designed a model house and two restaurants for the Werkbund exhibition in Cologne. His buildings reflected the prevailing tone of the exhibition and underscored the extent to which his prewar work reflected the harmonious culture advocated by the Werkbund.

After 1918 Paul's architecture reflected the changing economic and social conditions of the Weimar Republic. In 1924 he designed the *Plattenhaus Typ 1018* for the *Deutsche Werkstätten,* a prefabricated-concrete dwelling developed in response to the pressing need for affordable housing. Although the stark, prismatic volumes of the *Plattenhaus* reflected the vocabulary of the *Neue Sachlichkeit* (New Objectivity), the elegant detailing was typical of Paul's prewar designs. By the end of the decade, he was completing large commercial projects throughout Germany. In 1928 he was working on a department store for the *Sinn* company in Gelsenkirchen, the *Dischhaus* office building in Cologne, and the *Hochhaus am Kleistpark,* the first skyscraper in Berlin. All these buildings demonstrated Paul's mastery of the emerging International Style. Although Paul's projects of the 1920s were frequently innovative, their carefully considered proportions and practical detailing clearly derived from his earlier work. When Paul relinquished his directorship in 1933, he returned to private practice and continued working as an architect through the 1950s.

As a teacher, designer, and architect, Paul was one of the progenitors of the Modern movement. His work embodied one of the most significant and frequently overlooked directions in the history of progressive design in Europe: that of a pragmatic modernism attuned to the needs and desires of the middle class. Nikolaus Pevsner credited his work with effecting a fundamental change in popular taste (Pevsner, 1936, p. 200). Paul's mature designs embodied simplicity and clarity of form, stylistic abstraction, and functional elegance. By promoting these ideals through his involvement with the Werkbund, his leadership of the School of Fine and Applied Arts in Berlin, and his prolific work as a designer, Paul facilitated the popular acceptance of modernism as the characteristic style of the 20th century.

W.OWEN HARROD

S*ee also* **Mies van der Rohe, Ludwig (Germany); Pevsner, Nikolaus (England); Werkbund Exhibition, Cologne (1914)**

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PEACE MEMORIAL AND MUSEUM

Designed by Kenzo Tange; completed 1955 Hiroshima, Japan

The Hiroshima Peace Memorial and Museum not only marked the grisly ending of World War II but also skillfully expressed the challenges that Japan's architects faced in the new era.

In 1949, when Kenzo Tange's proposal took first place in a competition for the design of the Peace Park, he was already widely known for successful entries in two wartime competitions: a commemorative building (1942) for the Greater East Asia Coprosperity Sphere and the Japan-Thai Culture Center (1943). Today, most texts on Tange ignore these projects, but they demonstrate the evolution of generating ideas ultimately consummated in Hiroshima. In each, Tange's solutions subsumed individual buildings to a sweeping axial gesture that extended symbolically into the landscape. A central plaza served to unite these compositions at the scale of the site; Tange had spent much of the war researching urban design, and he embraced several models not found in Japan, including the Greek agora, the Roman forum, and Capitoline Hill by Michelangelo. These precedents also served to make the postwar design of Peace Park particularly fitting; in an era when the American occupation forces were actively promoting democracy and public assembly, the design called for a remarkable plaza, able to accommodate 50,000 people.

In the case of Tange's Peace Park, the axis extended through the ruins of the 1914 Prefectural Industrial Promotion Hall, now generally referred to as the Atomic Dome—the only competition proposal to incorporate this building, which is now a World Heritage site. In the postwar master plan for the reconstruction of Hiroshima, also by Tange, this axis continued, linking the Peace Park with zones devoted to children, sports, and culture. Although he was commissioned to design a children's library, ultimately these areas were completed without reference to Tange's master plan and without any linkage to the Peace Park.

The earlier competitions also established a direction for Tange's stylistic approach, responding to fascist ideology by explicitly welding Japan's architectural traditions to modern expression and material use. In particular, Tange referred to Ise Shrine in these projects; by the time of the Peace Park, he also drew on Katsura Imperial Villa for inspiration. When postwar propaganda efforts concentrated on shifting the perception of Japan from its *bushido* roots to the arts, Tange's work was widely acclaimed for its "Japanese" character. However, Tange was equivocal on this point. In his presentation of the Peace Park to CIAM (Congrès Internationaux d'Architecture Moderne) in 1951, he noted, "The role of tradition is that of a catalyst, which furthers a chemical reaction but is no longer detectable in the end result…. We Japanese architects, in our endeavors to resolve the problems facing modern Japan, have devoted a great deal of attention to the Japanese tradition, and have, in the end, arrived at the point which I have sought to elucidate for you. If, however, there can be detected a trace of tradition in my works or in those of my generation, then our creative powers have not been at their best, then we are still in the throes of evolving our creativity."

Tange later described the imprint of history in the Peace Park as twofold: Yayoi traditions were elegant and intellectual, and the Jomon was vigorous and creative. The delicate treatment of the louvered facade on the central Memorial Museum might be said to reveal Yayoi influences, whereas the primitive strength of the buildings and the plasticity found in the *pilotis* reflected Jomon influences. By embracing these "Jomon" characteristics, he made a virtue of one of the challenges of postwar construction: because wartime demands for steel had brought domestic building to a standstill, the labor and experience needed for refined construction were unavailable, even in the case of reinforced concrete, which was suddenly widely employed. Furthermore, despite the maturity of the design, Tange had little experience in construction supervision, as this was his first built work. Critics praised the "correct degree of roughness" found in the execution of the Peace Park's buildings.

Tange did not have complete control of the Peace Park's execution. He was ultimately responsible for only two of the three main buildings in the complex: the Memorial Museum (1952) and the Community Center (1955) to the east. A third building, an international conference center located to the west of the museum, was constructed using donations from the people of Hiroshima, and it was felt that a local architect would be more suitable. Although the building generally conformed to the master plan in both massing and the use of a module, Tange made a point of repudiating it.

At the heart of the Peace Park is a centograph that stands as a memorial to victims of the atomic bomb. In the competition proposal, it was to have been the largest structure on the site, an arch (inspired by Le Corbusier's 1931 proposal for the Palace of the Soviets) visible from the Inland Sea. Later, Tange came to the conclusion that this piece should in fact be much smaller, more a sculptural piece than an architectural one, and he invited the Japanese-American sculptor Isamu Noguchi to propose a solution. Because government officials felt that having an American involved in the project was unacceptable, in the end Noguchi was commissioned to design two bridges flanking the park to the north and south. Tange's centograph, a concrete saddle vault, was built instead; in 1985 this was replaced with a granite version as part of a complete refurbishment, begun in 1983 and supervised by Tange's office.

The results of the remodeling are unfortunate; both buildings flanking the Memorial Museum were replaced. The new buildings conform superficially to the original massing and column/ beam organization of the earlier facades, but the detailing and use of materials are contemporary and lack the power of the originals. Furthermore, the three buildings have been physically linked with a second-floor passageway, and granite cladding was added to some areas of the facade of the Memorial Museum. Tange's office is also supervising construction of a new building, the "National Hall Dedicated to Mourning Hiroshima's Atomic Bomb Fatalities," to be located east of the centograph, further altering the park.

Although it remains possible to have some sense of the original character of the complex, much has been lost. The Peace Park continues to hold symbolic importance as ground zero of the bombing of Hiroshima. In its current state, however, it can no longer be said to hold the importance that it once commanded in architectural circles.

DANA BUNTROCK

S*ee also* **Tange, Kenzo (Japan)**

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PEI, I.M. 1917–

Architect, United States

I.M.Pei is one of the last and certainly the most accomplished of the architects trained by Walter Gropius and Marcel Breuer at Harvard University's Graduate School of Design. (The best known of the others are Edward Larrabee Barnes, Philip Johnson, and Paul Rudolph.) In a career spanning more than half a century, Pei has won virtually every award of any significance in his profession, from the Gold Medal of the American Institute of Architects to the Pritzker Prize. The durability of his prominence, however, has much to do with his ability to grow as an artist as well as his skills in creating one of the most respected firms in American architectural history.

Pei's achievement is the more remarkable in light of his background. He was born in 1917 in Canton, China, the son of a prominent banker, and received his early schooling in Shanghai. He came to the United States in 1935 to study, first at the University of Pennsylvania and then at the Massachusetts Institute of Technology, where he concentrated in engineering.

After completing his degree, Pei went on to Harvard in 1940 to pursue architecture during the heady days of Gropius and Breuer, who had brought with them the avant-garde theories and practices they had developed at the Bauhaus in Germany. Pei received his Master's degree in 1946 and briefly served on the Harvard faculty.

Despite his training under European émigrés, Pei has always retained a recognizably Chinese sensitivity to nature, art, and time. (Pei's thesis under Gropius was a design for an art museum in China.) This sensitivity was developed during childhood visits to his family's villa in the ancient city of Suzhou, not far from Shanghai. There, Pei was exposed to the culture of "rock farming," the traditional practice of selecting rocks in nature and setting them aside to be eroded in lakes and rivers into ornamental elements for the gardens of scholars and the wealthy.

Following his Harvard years, Pei was obliged to subsume his design sensibilities to issues of planning and development when he went to work in 1948 for William Zeckendorf as head of the New York real estate magnate's in-house architectural team. There, Pei oversaw schemes for the redevelopment of such cities as Denver, Philadelphia, and Washington, DC, acquiring a sense of large-scale planning as well as an appreciation of finance and management.

John F.Kennedy Library, Columbia Point, Massachusetts (1979)

Photo © Mary Ann Sullivan

With the financial decline of the Zeckendorf firm, Pei set out on his own in 1955. He took with him several colleagues and went on with them to create I.M.Pei and Partners, which was to become one of the most respected architectural teams in the nation. Many of the buildings that the partners were to design were mundane, however well engineered and detailed, but many were of extremely high quality, and each partner was allowed to pursue projects in a semiautonomous fashion. The shared affinity in the office for abstract forms in concrete and glass often made it difficult to identify the lead designer for a particular project, but Pei, who has been responsible for roughly one-third of the firm's nearly 200 buildings and urban design projects, can claim most of the best.

Pei's first major achievement was the National Center for Atmospheric Research (NCAR), finished in 1967, outside Boulder, Colorado. NCAR was a boldly sculptural composition that sought to integrate the scientific needs of scientists with a form that was visually sympathetic to the Rocky Mountains that rose behind it.

The success of the Colorado building contributed heavily to Pei's selection in 1964 by Jacqueline Kennedy Onassis as architect for the John F.Kennedy Memorial Library. Originally intended for a site in Cambridge, Massachusetts, adjacent to Harvard University, the project fell prey to local politics and was eventually transferred to a site on Boston Harbor. Although the combination of crisp, abstract geometry with a large glassed-in atrium overlooking the water was characteristic of the developing Pei aesthetic, in the end the extended delays and design changes that were imposed on the original made the building a disappointment, as the architect himself has conceded publicly.

Nevertheless, the momentum created for the firm by the Kennedy commission raised I.M.Pei and Partners to national prominence. That momentum nearly stalled, however, when the windows of the John Hancock Building, a sleek office tower completed by the firm in 1976 in Boston, began to break and fall out. The designer of the building was Pei's partner, Henry Cobb, but the crisis affected the entire firm, and although the cause of the failure was eventually attributed to the manufacturer of the glass, the negative publicity slowed new commissions to a trickle.

The firm began its slow return to health largely on the strength of Pei's work in art museums, most notably the Everson Museum of Art (1968) in Syracuse, New York, and the Johnson Museum (1973) at Cornell University. These were hard-edged, late modernist geometric compositions in concrete but with interiors that were both dramatic and sensitive and judged to be superior settings for their collections.

The enthusiastic reception of these buildings led to Pei's selection as architect of the East Building of the National Gallery of Art in Washington, DC, completed in 1978. Key to the success of the building was the client, Paul Mellon, whose father had paid for the original National Gallery (1941), designed by John Russell Pope. The East Building was a full-fledged expression of Pei's enduring affection for abstract form, yet it was inflected on the interior with a skill at manipulating light to soften the effect of the hard materials, primarily marble and glass, and organizing the movement of visitors to create added visual interest.

In 1979, following the reopening of relations between the United States and China, Pei accepted an invitation to design a hotel on the outskirts of Beijing. Pei hoped to develop a modern architectural form for his native country, which had sunk into grim utilitarianism, while maintaining traditional Chinese architectural themes. Although the building enjoyed considerable critical success, it was neglected by its government owners and failed to spark the stylistic progress that Pei had contemplated.

However, the pains of Fragrant Hill, completed in 1982, were minimal compared to those of the Louvre museum in Paris, the first phase of which was completed in 1989. French President François Mitterrand asked Pei to undertake a fundamental renovation and reorganization of the museum, and Pei responded with a proposal that was as much urban planning as architecture, redistributing the collection by emptying portions of the palace formerly occupied by government agencies and creating a system of underground access. However, the attention of the public was concentrated on the glass pyramid that Pei inserted at the center of the composition. The initial reaction was outrage that a nonFrench architect would have the temerity to tamper with what is arguably the most sacred site of French culture. However, on completion of the pyramid itself, the reception changed dramatically. Pei had hoped to minimize the effect of a new structure on the existing historic architecture but ended up creating a landmark that rapidly began to compete with the Eiffel Tower as a symbol of Paris itself.

The year 1989 saw a host of other openings in addition to the Louvre Pyramid, including the Meyerson Symphony Center in Dallas and several smaller commissions. All were distinguished by a softening of Pei's austere modernist palette. The Meyerson in particular displayed an almost Romantic use of curves that modulated the architect's familiar formal rigor to powerful effect. Even the 70-story Bank of China tower in Hong Kong (his only true skyscraper design), with its irregular stepped shaft, displayed a compositional delicacy that had been absent from many of Pei's earlier works.

By no means were all of Pei's commissions of this period uniformly good. The Rock 'n' Roll Hall of Fame in Cleveland, Ohio, recalled the lifelessness of the Kennedy Library and for some of the same reasons. Pei's best work has always resulted from a close personal relationship with a wealthy and powerful client, such as Paul Mellon or François Mitterrand, and in the case of Rock 'n' Roll, the instability of the funding and disagreements among the backers aggravated Pei's understandably limited familiarity with the musical history that the building was meant to celebrate.

In 1989 Pei had already begun a gradual separation from his firm, by then named Pei, Cobb, Freed, and Partners (in recognition of his longtime collaborators Henry Cobb and James Freed), and while maintaining an office in the same building and still calling on the organization's staff, began to practice even more independently. The projects of this period included the Shinji Shumeikai bell tower (1990) for a religious organization in Shiga, Japan; the Regent (now Four Seasons) Hotel (1992), in New York City; and projects for art museums in Athens and Luxembourg.

However, what might prove to be Pei's last major work is the Miho Museum outside Kyoto, Japan, completed in 1998. Designed for the religious organization that had commissioned the Shiga bell tower, the museum was built on a remote site in a nature preserve near Kyoto. To reduce the effect of the building on the natural surroundings, the entire top of a small mountain was removed, the museum inserted, and the mountain—including many of the original trees—restored. Access was provided by an elegant suspension bridge and a tunnel, both designed by the architect, working with the structural engineer Leslie Robertson, who was the engineer on the Bank of China tower, among other Pei projects.

The museum is characterized by Pei's familiar elegant detailing in glass and steel, but its greatest success lies in the combination of crisp modernist forms with classic Japanese architectural tradition rendered in contemporary materials. In that, the Miho Museum represents a fulfillment of Pei's most fundamental affections—for nature, for elegant abstract form, and for the display of fine works of art.

CARTER WISEMAN

Biography

Born Ieoh Ming Pei in Guangzhou, China, 26 April 1917; immigrated to the United States 1935; naturalized 1948. Received bachelor's degree in architecture from the Massachusetts Institute of Technology, Cambridge 1940; master's degree in architecture from the Harvard Graduate School of Design, Cambridge 1946. Married Eileen Loo 1942:4 children. Served on the National Defense Research Committee 1943–45. Director of architecture, Webb and Knapp, New York 1948–55. Partner, I.M.Pei and Partners, New York 1955–89; firm renamed Pei, Cobb, Freed, and Partners from 1989. Instructor, later assistant professor, Harvard Graduate School of Design 1945–48; chancellor, American Academy and Institute of Arts and Letters, Washington, DC 1978–80. Member, National Council on the Humanities, Washington, DC 1966–70; member, Urban Design Council of the City of New York 1967–72; member, National Urban Policy Task Force, American Institute of Architects 1970–74; member, Corporation of the Massachusetts Institute of Technology 1972–77 and 1978–83; member, Task Force on the West Front of the United States Capitol, American Institute of Architects 1978–80; president's fellow, Rhode Island School of Design, Providence 1979. Fellow, American Institute of Architects; honorary fellow, American Society of Interior Designers; member, American Academy and Institute of Arts and Letters; member, American Academy of Arts and Sciences; member, National Academy of Design; member, American Philosophical Society; honorary member, Royal Institute of British Architects; foreign associate, Institut de France. Gold Medal, American Institute of Architects 1979; Gold Medal, French Academy of Architects 1981; Pritzker Prize 1983.

Selected Works

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Everson Museum of Art, Syracuse, New York, 1968
Herbert F.Johnson Museum of Art, Cornell University, Ithaca, New York, 1973
National Gallery of Art, East Building, Washington, DC, 1978
John Fitzgerald Kennedy Library, Boston, 1979
Fragrant Hill Hotel, Beijing, 1982
Le Grand Louvre (expansion, Phase I), Paris, 1983–89
Meyerson Symphony Center, Dallas, 1989
Bank of China, Hong Kong, 1989
Shinji Shumeikai Bell Tower, Shiga, 1990
Regent (Four Seasons) Hotel, New York, 1992
Miho Museum, near Kyoto, 1998

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PELLI, CESAR 1926

Architect, Argentina and United States

Having designed significant buildings around the world, Cesar Pelli has established himself as one of the most important architects practicing in America today, with important buildings spanning four decades. In 1991 the American Institute of Architects (AIA) selected him as one of the ten most influential living American architects, and in 1995 it awarded him the AIA Gold Medal.

Pelli has clearly articulated his views on the skyscraper as a building type. This attitude is based on a clear desire, inherited from the legacy of Louis Sullivan, to integrate solutions for the technical problems of core, structure, skin, and mechanical systems with the creation of an appropriate expression and identity for a tall building in an urban context. Pelli’s own writings on the skyscraper demonstrate clearly that, for him, the most fundamental issue is the development of clear identity and urban image for what is otherwise a large box of anonymous space.

Examples of Pelli’s investigation of the tower form can best be seen in the Bank of America Corporate Center (1992; originally the Nations Bank Corporate Center) in Charlotte, North Carolina, and the Carnegie Hall Tower (1991) in New York City. Both exemplify the designer’s careful assimilation of precedent and are less diagrammatic than earlier examples, such as the Four Leaf/Four Oaks Towers (1982) in Houston, Texas.

The Bank of America tower can be regarded as a “pure skyscraper” for two reasons: its iconic verticality, marking the historic center of a revitalized downtown, and its clear tripartite division into base, shaft, and a crowning capital that recalls Sullivan’s skyscrapers as well as 1920s and 1930s precedents. The

Zurich Tower, The Hague, the Netherlands (1999)

Carnegie Hall Tower also acknowledges history by its contextualization, making the 60-story high-rise a fitting neighbor to the historic Carnegie Hall auditorium. In both instances, Pelli's architecture is characterized by a search for an appropriate and distinctive formal expression that is at the same time responsive to history and context. In the twin 85-story Petronas Towers (1996) in Kuala Lumpur, Malaysia, this appreciation for context extends beyond purely architectural and urban matters and into broader cultural realms. The twin towers, with their sleek cladding and distinctive profiles, define a monumental urban gateway, whereas the correspondingly complex shapes of the office floor plans—two rotated and superimposed squares with small circular in-fills—were developed to relate to Islamic geometric principles.

Pelli's tenure in Eero Saarinen's office (1954–64) offered him firsthand experience of Saarinen's free interpretation of the relationship between architecture, function, and expression. This search for an architectural language for urban towers dovetails neatly with a concern that has dominated Pelli's architecture for decades, regardless of building type: the technical construction and visual expression of the building's skin.

The development of this interest in the building envelope can be charted through the 1970s and 1980s, when Pelli's work featured exquisitely detailed glass curtain walls that pushed that modernist technology to its poetic aesthetic ends, exemplified by buildings such as San Bernardino City Hall (1972); The Commons (1973) at Columbus, Indiana; and the Pacific Design Center (Phase I 1975, Phase II 1988) in Los Angeles. Midway through the 1980s and continuing through the 1990s, Pelli rediscovered the relevance of masonry construction. Instead of the sleek, homogeneous, fragile, and transparent curtain walls of glass and other lightweight panels that had become his hallmark, Pelli's interests expanded to explore the contrasting aesthetics of opacity, orchestrated pattern, and heaviness without mass.

In buildings such as Herring Hall (1984) at Rice University in Houston; the Mathematics, Computing, and Engineering Center (1991) at Trinity College in Hartford, Connecticut; and the Boyer Center for Molecular Medicine (1991, New Haven, Connecticut) at Yale, Pelli's interest focused deliberately on a reinterpretation of the traditional masonry building envelope, transforming it from its historic origins of thick, load-bearing brick and stone into thinner skins or layers of nonstructural enclosure supported off the structural frame. An increasingly bright palette of colors invites comparison to the theories of Victorian critic John Ruskin concerning "constructed polychromy" and the work of High Victorian architects in England such as William Butterfield. Pelli's design for the Hakata Bay Oriental Hotel and Resort (1995) in Japan melds together three decades of exploration regarding the building envelope, with the curved 35-story hotel tower formed of alternating bands of tautly stretched glass and brick-colored tiles rising through a four-story plinth of assertively patterned and colored tile and masonry.

Pelli's buildings span the difficult cultural transition from modernism to Postmodernism, and the tensions implicit in this major shift of attitudes, ideologies, and aesthetics are apparent in much of his work. A crucial concern expressed by Pelli when discussing his own work is the relationship between a building's image and its social and constructional reality, and the attempted resolution of this three-part equation is at the heart of Pelli's search for authentic expression.

The quality of Pelli's architecture resides not in the modernist heroics of plan form or in the witty historical allusions of Postmodern eclecticism but in a scrupulous attention to appropriateness—of siting, material, and building detail.

DAVID WALTERS

S*ee also* **Argentina; Curtain Wall System; Petronas Towers, Kuala Lumpur;**

Saarinen, Eero (Finland); Skyscraper; Sullivan, Louis (United States)

Biography

Born in Tucuman, Argentina, 12 October 1926; immigrated to the United States 1952; naturalized U.S. citizen 1964. Married: Diana Balmori 1950; 2 children, Denis and Rafael. Educated at University of Tucuman 1944–49, Diploma of Architecture 1949; University of Illinois at Urban Champaign 1952–54, Master's in Architecture 1954. Director of Design, OFEMPE (government organization for subsidized housing), Tucuman 1950–52; Associate Architect, Eero Saarinen and Associates, Bloomfield Hills, Michigan, and Hamden, Connecticut 1954–64; Director of Design, DMJM (Daniel, Mann, Johnson, and Mendenhall) Los Angeles 1964–68; Partner in charge of Design, Gruen Associates, Los Angeles 1968–77. Since 1977, Principal of Cesar Pelli and Associates, New Haven, Connecticut. Visiting Professor, University of Tucuman, 1960; Visiting professor, University of Cordoba, Argentina 1960; Charlotte Davenport Visiting Professor, 1972, and William Henry Bishop Visiting Professor, 1974, Yale University School of Architecture; Visiting professor, University of California at Los Angeles 1975, 1976; Dean of School of Architecture, Yale University 1977–84. Arnold W. Brunner Memorial Prize, National Institute of Arts and Letters 1978; Elected Fellow, American Institute of Architects 1980; Elected Academician, American Academy of Arts and Letters 1982; National Academy of Design Associate 1987; Most Outstanding Firm Award, American Institute of Architects 1989; Honorary Doctorate, Pratt Institute, New York 1990; Honorary Doctorate, University of New Haven, New Haven, Connecticut 1990; American Institute of Architects Gold Medal 1995; Honorary Doctorate, Roger Williams University, Bristol, Rhode Island 1996; Member of L'Academie d'Architecture de France 1997. Honorary Doctorate, Universidad de Belgrano, Argentina 1998; Honorary Doctorate, Universidad Empresarial Siglo 21, Argentina 1999; Honorary Doctorate, Connecticut College, New London, Connecticut 2000.

Selected Works

Four Leaf/Four Oaks Towers, Houston, Texas, 1982

Museum of Modern Art Expansion, Renovation and Residential Tower, New York, New York, 1984

Herring Hall, Rice University, Houston, Texas, 1984

World Financial Center and Winter Garden, New York, New York, 1989

Pacific Design Center Expansion, Phase II, Los Angeles, California, 1988

Boyer Center for Molecular Medicine, Yale University, Hew Haven, Connecticut, 1991

Canary Wharf Tower, Retail and Assembly Building and Docklands Light Railway Station, London, England, 1991

Bank of America (formerly NationsBank) Corporate Center and Founders Hall, Charlotte, North Carolina, 1992

Hakata Bay Oriental Hotel and Resort, Fukoka, Japan, 1995
New North Terminal, Washington National Airport, Washington, D.C., 1997
Petronas Towers, Kuala Lumpur, Malaysia, 1998
Zurich Tower, The Hague, Netherlands, 1999
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International Finance Center, Hong Kong, 2000

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PENNSYLVANIA STATION, NEW YORK

Designed by McKim, Mead and White; completed 1911
New York, New York

Pennsylvania Station (1902–11) was a landmark New York City railroad station designed by McKim, Mead and White for the Pennsylvania Railroad. A "monumental gateway" to the city, its construction was made possible by the very latest engineering technology, although its neoclassical style was reminiscent of ancient Roman baths. Recognized in its time as among the top architectural achievements of 20th-century American architecture, this famous terminal survived only half a century before it was demolished.

In 1900 New York was served by Grand Central Station, owned by the New York

Central Railroad, which controlled all railways north and east of the city and was reaching west to Chicago. The Pennsylvania Railroad, trying to gain New York traffic, had completed a right of way as far east as Jersey City, directly across the Hudson River from New York, but had not yet found a way to cross the river. Tunneling attempts in the 1870s had been disastrous, and a bridge proposal failed. By 1900, however, technological advances, such as the introduction of electric traction railways at the new Gare d'Orsay (1897–1900) in Paris and the availability of stronger electric locomotives and heavier tunneling equipment, had revived possibilities for the Hudson crossing. Pennsylvania Railroad president Alexander Cassatt visited Paris to see the new system and returned home ready to proceed, hiring the prominent firm of McKim, Mead and White.

The new Pennsylvania Railroad extension would run east over the Hackensack Meadows, tunnel beneath the Hudson, and then continue underground to a majestic new terminal at Eighth Avenue and Thirty-third Street. A newly acquired interest in the Long Island Railroad meant that the tunnels would then cross Manhattan and the East River to connect to Long Island.

Of the firm's three namesake partners, Charles Follen McKim (1847–1909) was most responsible for Pennsylvania Station's design. His work, inspired by classical and Renaissance Roman architecture, was noted for its monumentality and elegant restraint. He worked closely with Pennsylvania Railroad chief executive officer Samuel Rea and chief engineer William H.Brown. He was also assisted by two associates, William Symmes Richardson and Tenunis Van der Bent. As McKim's health gradually failed, his associates took over primary responsibility for the work, and both he and Cassatt died before the project was completed.

Design work began in 1902. Cassatt had proposed a "grand portal" that included a high-rise European-style hotel, but McKim rejected that idea. Historian Leland Roth speculates that this decision doomed the station years later, as a multipurpose structure would have been more adaptable to changing times. Construction began in 1904, and although the station opened in the fall of 1910, it was not completed until a year later.

Occupying two full city blocks, the finished Pennsylvania Station was a functional and critical success; this New York landmark was widely published and admired in the United States, England, and Europe. With its neighbor, Grand Central, Pennsylvania Station did much to establish the classical form as the standard for large train stations of the time. Even in 1924, Sir Charles Reilly praised the firm's body of work, including Pennsylvania Station, as having "that sublime quality which makes great buildings akin to the permanent works of nature."

The pink granite exterior was a restrained classical composition, with Doric-columned porticoes and pilasters delineating each of its facades. It departed from traditional train station architecture in its low primary roofline, as its trains were entirely underground and did not need the height of a train shed. The interior reflected McKim's deep admiration of Roman architecture, but its superstructure was modern steel, and the soaring spaces within were made possible by this latest engineering element. From the Seventh Avenue main entrance, one proceeded through a portico and an arcade of shops and then descended a staircase into the majestic groin-vaulted main waiting room, lined in warm buff travertine. This room, with an elaborate coffered ceiling supported by Corinthian columns and lit by thermal windows, was the centerpiece of the design, a direct reference to both the *tepidarium* of the Baths of Caracalla and the vast space of St. Peter's in the Vatican. Adjoining it was the equally dazzling concourse, with arched steel ribs and airy latticed columns supporting a groin-vaulted glass roof that echoed the great European train sheds. With its staircases cascading down to the underground platforms, the concourse provided what Richardson called a transition "from the monumental side of the station to the utilitarian."

Traffic flow within the building was carefully planned. The station covered a fan of 21 parallel tracks 45 feet underground

Pennsylvania Station, interior, designed by McKim, Mead and White (1911)

and a network of service tunnels at multiple levels. A special concourse with direct street access served commuters, whose trains ran on the three northernmost tracks, and was connected to nearby subway lines. The station's concourses could be entered at numerous points from surrounding streets, and two ramped driveways, entered from Seventh Avenue on both sides of the arcade, allowed a sheltered and efficient means to drop off and pick up both passengers and baggage by automobile or taxicab.

As time went on, the taste for monumental classicism dissipated, rail travel declined, and Pennsylvania Station aged poorly. Increasing neglect, grime, and insensitive architectural intrusions, most notably a glaring plastic shell covering a modern ticket counter, diminished the station's worth in its owners' eyes. In the early 1960s, Pennsylvania Railroad announced plans to demolish Pennsylvania Station and replace it with an entirely subterranean modern terminal above which would be a new Madison Square Garden arena and an office skyscraper. Outraged architects, historians, and critics, including Ada Louise Huxtable and Lewis Mumford, railed publicly against the proposal, even offering a counterproposal that would generate income while preserving the building; however, their efforts were in vain. Between 1963 and 1965, Pennsylvania Station was torn down, and only a few statues were saved. Its lovely stonework was dumped into New Jersey marshes as landfill. However, Pennsylvania Station's loss galvanized the historic preservation movement across the United States and led to federal, state, and local laws protecting important structures from callous demolition.

Most critics agree that the second Pennsylvania Station, designed by Charles Luckman, is grim and mediocre, even judged solely on its own merits. At present, architect David Childs plans to renovate the nearby Farley Post Office Building as a third incarnation of Pennsylvania Station.

KATHERINE LARSON FARNHAM

S*ee also* **McKim, Mead and White (United States)**

Further Reading

A more extensive bibliography can be found in the Historic American Building Survey's record of Pennsylvania Station (HABS No. NY-5471) housed in the Prints and Photographs Division of the Library of Congress, Washington, DC. This bibliography includes journal articles pertaining to its demolition. Also see Roth, page 428, for sources.

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PERKINS AND WILL

Architecture firm, United States

Perkins and Will was formed in 1935 by two Cornell University classmates, Lawrence Bradford Perkins (1907–97) and Philip Will, Jr. (1906–85). Part of a new generation of young architects innovating in the years between the world wars, these men brought new ideas and idealism to post-World War II building needs, particularly in the area of school design. Their work is marked by the study of the program that the proposed structure intends to solve by looking at the way in which people use buildings. This humanistic approach was influenced to some extent by their collaboration with Eliel and Eero Saarinen. According to Lawrence Perkins, it is one of the qualities that has set their firm's brand of modernism apart from that of the more severe International Style modernists, such as Mies van der Rohe, which was attractive to many young firms after World War II.

Specifically, Perkins and Will's practice and promotion of progressive, functional school design in the 1940s and 1950s had a tremendous influence on American architecture in the last half of the 20th century. It was natural for Lawrence Perkins to participate in the design of schools; his father, the well-known Chicago architect Dwight Perkins, designed nearly 40 schools in the early part of the 20th century and served as the Chicago Board of Education architect. After moving to Chicago in 1933, Philip Will, Jr., was responsible for the necessarily simplified, modern design of prefabricated houses for Howard Fisher's firm General Houses, Inc. He worked directly on the company's Steel House for the 1933 Chicago Century of Progress Exposition.

Soon after forming their firm in 1935, the two architects were joined by E.Todd Wheeler, and the firm was known as Perkins, Wheeler, and Will until 1946. The first significant commission that the architects received was the Crow Island School (1940) in Winnetka, Illinois. The eager young architecture firm combined with an enlightened school superintendent, Carleton Washburne, and the respected modern visionaries Eliel and Eero Saarinen, making for a highly successful and influential new school building that provided major direction to the new firm.

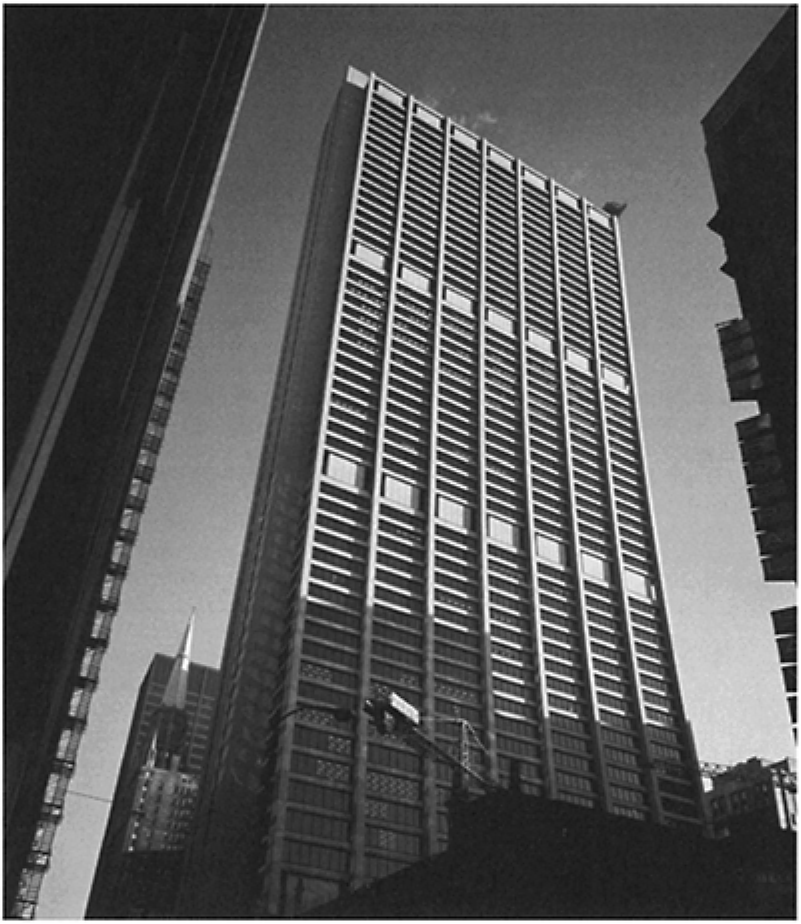
Perkins thoroughly researched and rethought the school's uses with an eye to providing a new kind of educational facility. He interviewed grade-school children, teachers, and administrators in the planning stages. As Perkins explains, "The program…said that that classroom was to be a place for a fully rounded learning and living experience at each age group; that each room was to be a colorful, flexible, child-scaled work space where the learning activity of childhood could be channeled effectively and pleasantly…color, warmth, and a place in which to work and act vigorously—these were keynotes of the earliest program" (Perkins and Cocking, 1949).

As a result, Perkins and Will, along with the Saarinens, produced a very sensitively designed school. One of the more striking aspects is the auditorium with progressively smaller moldedplywood seating toward the front so that the children would be in seats proportionate to their own sizes. The architects designed a new type of L-shaped classroom with large window walls on two sides, allowing for more and better natural light. Other innovations include individual bathrooms in each classroom, a separate activity area, and round tables instead of marching desks. In addition, the trend was toward a more healthful environment, and each class had a private courtyard, expanding the possibilities for classroom activity.

Perkins published many of the revolutionary ideas employed in Crow Island School in his book *Schools* (1949), written with school superintendent Walter Cocking. This publication served a similar function in promoting progressive design for schools, as George Nelson and Henry Wright's *Tomorrow's House* (1945) did for promoting the postwar homes. For example, Perkins and Cocking pointed out that Greek and Roman architecture were modern in their own time yet inappropriate for today's American needs. Changing philosophies regarding education, they held, meant rethinking school's functions. They argued for the functional reasons for the existence of features such as continuous banks of windows, trying to relieve the stigma associated at the time with the widespread acceptance of modern architecture. They illustrated *Schools* with contemporary schools by famous architects, such as Richard Neutra and William Lescaze, to prove the benefits of such well-considered schemes. In 1957 Perkins followed up with *Workplace for Learning,* which featured many of the success stories of the ten years since *Schools* was published. This included Perkins and Will's Heathcote School (1954) in Scarsdale, New York, which Perkins considered more successful than Crow Island because of its complete interaction with nature on the site, aided by its numerous glass corridors punctuated with lively colored panes.

Perkins and Will provided notable solutions to corporate building types, also conceived around the people who were to use them. The Scott, Foresman, and Company Headquarters (1965) in Glenview, Illinois, a campus planned for a publisher of educational materials, was undoubtedly informed by the firm's many educational buildings. Here a series of interlinked glass and concrete pavilions housing different aspects of the company were designed to give a sense of community on a 44-acre site. Trees and fountains mix with walkways between the buildings to create a flow while simultaneously reinforcing a sense of repose.

Another example of the firm's well-considered design solutions influenced later generations of architectural form givers in the urban setting. The First National Bank of Chicago (1966) was an anomaly on the Chicago skyline when it was constructed, as it eclipsed most of the Loop buildings, helping to set a precedent for the new, taller skyscrapers that became ubiquitous in American cities in the decades to follow. This building, too, was a specific and inspired design solution to a complex program. The bank had to enclose all its various activities in one building, as the State of Illinois at that time forbade branch banking. Therefore, the 60-story-tall structure flares at the base to accommodate the numerous public banking facilities, and the building



First National Bank of Chicago, designed by Perkins and Will (with C.F.Murphy Associates), 1966

tapers upward to house offices from there. Vertical steel supports gesture up, housing the curving glass wall that has been likened to "a huge ribbed sail caught in the Chicago wind" (*Architectural Record* 148 [September 1970]).

Over the decades, Perkins and Will has grown to include engineering and design services. It remains one of the largest architectural firms in the nation, with offices in Chicago, Atlanta, Charlotte, Los Angeles, Miami, Minneapolis, New York, and Paris, carrying on the work of the firm's principals. The firm continues to specialize in educational facilities and other areas in which the founding principals innovated.

JENNIFER KOMAR OLIVAREZ

Biography

Lawrence B.Perkins

Born in Evanston, Illinois, 12 February 1907; son of Prairie School architect Dwight Perkins. Attended the University of Wisconsin, Madison 1924–25; studied at Cornell University, College of Architecture, Ithaca, New York 1926–30; bachelor's degree in architecture 1930. Married 1) Margery Isabella Blair 1932 (died 1981): 4 children; married 2) Joyce Ellen Sandlerin 1982. In private practice, Chicago from 1935; founding partner, Perkins, Wheeler, and Will 1935–46; partner, Perkins and Will, later Perkins and Will Partnership, 1946–70; chairman of the board, 1970–73, director, from 1973, Perkins and Will Architects. Adjunct professor of architectural design, University of Illinois, Chicago 1974–82; visiting professor, University of Illinois, Urbana from 1982. Member, 1945–65, chairman, 1948–54 and 1963–65, Evanston Planning Commission; fellow, American Institute of Architects 1953; chairman, advisory board, Cook County Illinois Building Codes Commission 1963–66; director, Adlai Stevenson Institute of International Affairs, Chicago 1965–75, member, advisory committee, Cook County Forest Preserves from 1963. Died in Evanston in 1997.

Philip Will, Jr.

Born in Rochester, New York, 15 February 1906. Studied at Cornell University, College of Architecture, Ithaca, New York 1924–30; bachelor's degree in architecture 1930; married Caroline Elizabeth Sinclair 1933:2 children. Architectural draftsman, Gordon and Kaelber Architects, Rochester 1928–29; architectural draftsman, Shreve, Lamb, and Harmon, New York 1930-33; associate architect, General Houses Incorporated, Chicago 1933–34; associate architect, South Park Gardens, Chicago 1934. Founding partner, Perkins, Wheeler, and Will 1935–46; partner, Perkins and Will, later Perkins and Will Partnership, 1946–70; senior vice president, 1970–71, vice chairman, 1970–73, director, 1973–83, chairman, 1975–83, Perkins and Will Architects. Director, Illinois council, American Institute of Architects 1947–49; director, 1947–51, second vice president, 1951–52, president, 1952–54, American Institute of Architects, Chicago chapter; fellow, American Institute of Architects 1951; chairman, Citizens of Greater Chicago 1954; president, Alumni Council of the College of Architecture, 1954–56, trustee, 1963–73, chairman, trustee committee on buildings and grounds, 1966–73, Cornell University; second vice president, 1956–58, first vice president, 1958–60, American Institute of Architects; member, 1959–64, chairman, 1965, City of Evanston, Illinois, Planning Commission; chairman, Committee on the Performance Concept, Building Research Advisory Board, Washington, DC 1965; honorary fellow, Royal Architectural Institute of Canada; honorary fellow, Philippine Institute of Architects; honorary member, Society of Mexican Architects; honorary member, Society of Architects of Peru. Died in Venice, Florida, 22 October 1985.

Perkins and Will

Founded as Perkins, Wheeler, and Will, Chicago 1935–46 by Lawrence B.Perkins, E.Todd Wheeler, and Philip Will, Jr.; became Perkins and Will, Chicago 1946–64; renamed Perkins and Will Partnership 1964–70; renamed Perkins and Will Architects from 1970; branch offices opened in New York 1951 and Washington, DC 1962.

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PERRAULT, DOMINIQUE 1953

Architect, France

Dominique Perrault is the principal and founder of the architectural practice Perrault

Projects, established in Paris in 1981. He achieved international recognition in 1989, when at the age of 35 he was awarded the commission for perhaps the grandest of French President Mitterand's projects, the National Library of France in Paris, completed in 1995. Perrault's approach could be seen as part of a European trend, loosely defined as Supermodernism, including the work of Norman Foster, Renzo Piano, Jean Nouvel, and Rem Koolhaas. In Perrault's architecture, technological expression is tempered by a minimalist aesthetic, often making use of bold geometric forms at a monumental scale combined with subtle tectonic qualities, material textures, and lighting effects.

The practice built its early reputation on a series of large-scale industrial commissions, such as the Traffic Control Centre for the Peripherique in Paris (1984); the University for Electric Engineering, Marne-la-Vallée, Paris (1987); and the Water Purification Plant, Ivry-sur-Seine (1987, completed in 1993). Each of these projects deploys a complex range of geometric forms, but it was the monumental simplicity of the Hotel Industriel Jean-Baptiste Berlier (1990) in Paris that directed Perrault's later work. This bold glass rectangular slab containing ten stories of open-plan workspace stands out alongside a chaotic edge-city context of highways and railroad tracks. The sleek external skin contrasts with the concrete and stainless-steel interior, and the whole building displays a quiet monumentality that sets it apart from its unpromising surroundings.

The Center for Book Treatment, Bussy St. Georges, France (1995), the Olympic Velodrome and Swimming Pool, Berlin (1999), and the Media Library, Venissieux, France (2001), display a similar combination of pure geometry and smooth external surface treatment. The Olympic Velodrome and Swimming Pool project's dramatic sunken landscape setting also hints at another source of inspiration for Perrault, who has written of his interest in the work of Earthworks artists such as Walter de Maria and Richard Long. Another touchstone for this more recent preoccupation with the relationship between architecture and landscape—or as Perrault describes it, a concern with geography rather than history and a wish to create places as opposed to buildings—is the house he designed for himself and his partner on the Normandy coast in the north of France. Sunk into the ground along its northern side, the house seems little more than a wall with a large opening framing a view of the garden, and it is the desire to dissolve the building into the landscape design that characterizes two of the more substantial recent projects. His mysterious, almost evanescent installation/house project titled Kolonihavehus, Copenhagen, and designed for the Copenhagen as European Capital of Culture Exhibition (1996) sits like a minimalist cube in a quiet forested landscape.

The redevelopment of the Uni Metal planning project in Caen (1995) and the Plant APLIX (1999) in Nantes also adopt a landscape strategy comprising gridded territories to define areas for building. A more extreme case of this deference to context can be seen at the Conference Center Usinor-Salicor at Saint-Germain-en-Laye (1991), where an underground space is created beneath an existing villa and roofed with a flat glass disk sur-

National Library of France, Paris, designed by Dominique Perrault (1995)

rounding the historic structure. In addition to these and other built projects, Perrault has also undertaken a number of competitions and studies, most notably Library Kansai Khan, Kyoto (1996), the Museum of Modern Art, New York (1997), and the Cultural Center, Santiago de Compostela (1999).

In 1997 he was awarded the Mies van der Rohe Foundation prize for his National

Library, deservedly the practices' most widely regarded project, particularly for its effect at the urban scale. The building consists of four 22-story L-shaped towers containing the book storage spaces and administrative offices, sheathed in a double skin of timber shutters and an outer curtain-wall of full-height glazing. The towers sit at the four corners of a colossal elevated rectangular platform, which is covered in simple timber decking and surrounded by steps leading up from the street level. The effect of this "ziggurat," which contains the reading areas, is to create a grand ceremonial space above—somewhat isolated from everyday life—that increases the sense of ritual in approaching the building. This is reinforced by the enormous central garden into which the visitor descends toward the two main entrances, and once inside, a similarly monumental scale is maintained through the smooth surfaces and minimal detailing. The most dramatic of the interior finishes involves the use of woven metal textiles, which produce varying effects of translucency that Perrault has experimented with on other projects.

JONATHAN A.HALE

S*ee also* **Contextualism; Foster, Norman (England); Koolhaas, Rem (The Netherlands); Nouvel, Jean (France); Piano, Renzo (Italy); Supermodernism**

Biography

Born 1953 in Clermont Ferrand, France. Earned architecture degree (1978) and certificate in town planning (1979), Ecole nationale des Ponts et Chaussées; earned postgraduate degree in history (1980), Ecole des Hautes Etudes in Social Sciences. Opened Paris office, Dominique Perrault and Partners 1981; winner of the Programme for New Architecture (PAN XII) 1983; winner of Album of Young Architecture, Ministry of Culture, Paris, France 1983. Won international competition for National French Library, Paris 1989; won competition for Olympic Velodrome and Swimming Pool, Berlin 1992; opened Berlin office 1992; won competition for the Court of Justice of the European Community in Luxembourg 2000; subsequently opened third office in Luxembourg 2000. Recipient of numerous awards and prizes including Great National Prize of Architecture, France 1996; Mies van der Rohe Prize 1997; World Architecture Award, Hong Kong 2001. Chevalier of the Legion of Honour; member of German Association of Architects, British Institute of Royal Architecture; served as President, French Institute of Architects 1998–2001. Lives and works in Paris, France.

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University for Electric Engineering, Marne-la-Vallée, Paris, 1987
Hotel Industriel Jean-Baptiste Berlier, Paris, 1990
Conference Center Usinor-Salicor at Saint-Germain-en-Laye, 1991
Water Purification Plant, Ivry-sur-Seine, 1993
The Center for Book Treatment, Bussy St. Georges, France, 1995
Uni Metal (urban planning project), Caen, France, 1995

Kolonihavehus, Copenhagen (project for the Copenhagen as European Capital of Culture Exhibition), 1996
National Library of France (Bibliothèque de France), 1996
Olympic Velodrome and Swimming Pool, Berlin, 1999
Plant APLIX, Nantes, France, 1999
Media Library, Venissieux, France, 2001

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D*ominique Perrault Architect,* Basel: Birkhauser Verlag, 1999
D*ominique Perrault: progetti e architecture,* edited by Laurent Stalder, Milano: Electo, 2000

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Marcos, Javier Rodriguez and Anatxu Zabalbeascoa (editors), *Dominique Perrault: Small Scale,* Barcelona: Editorial Gustavo Gili, 1998

PERRET, AUGUSTE 1874–1954

Architect, France

Auguste Perret occupied a pivotal position in the development of the use of reinforced concrete in modern architecture, a tradition extending from Hennebique to de Baudot. Contemporary French concerns—on the one hand, an intense interest in new constructional methods, and on the other, a desire for traditional, formalist systems of proportioning and ordering—find eloquent and convincing confluence in Perret's work. Born in Brussels, Perret attended the École des Beaux-Arts, where he was influenced by rationalist theorists Gaudet and Choisy, who belonged to a tradition stemming from Viollet-le-Duc and Laugier. Perret combined Gaudet's classical compositional principles and Choisy's simple and direct structural solutions with the basics of building construction acquired with his brother Gustave in their father's firm.

The apartments in the Rue Franklin (1904) were the first to exploit the constructional possibilities of reinforced concrete to gain a greater openness of plan, which was later to influence Le Corbusier's *plan libre* (free plan), and larger windows on a restricted site.

The external framework is emphasized and covered, partly for practical reasons, by ornamental tiles that follow the structural contours. The angular effect contrasts with contemporary Parisian Art Nouveau apartments.

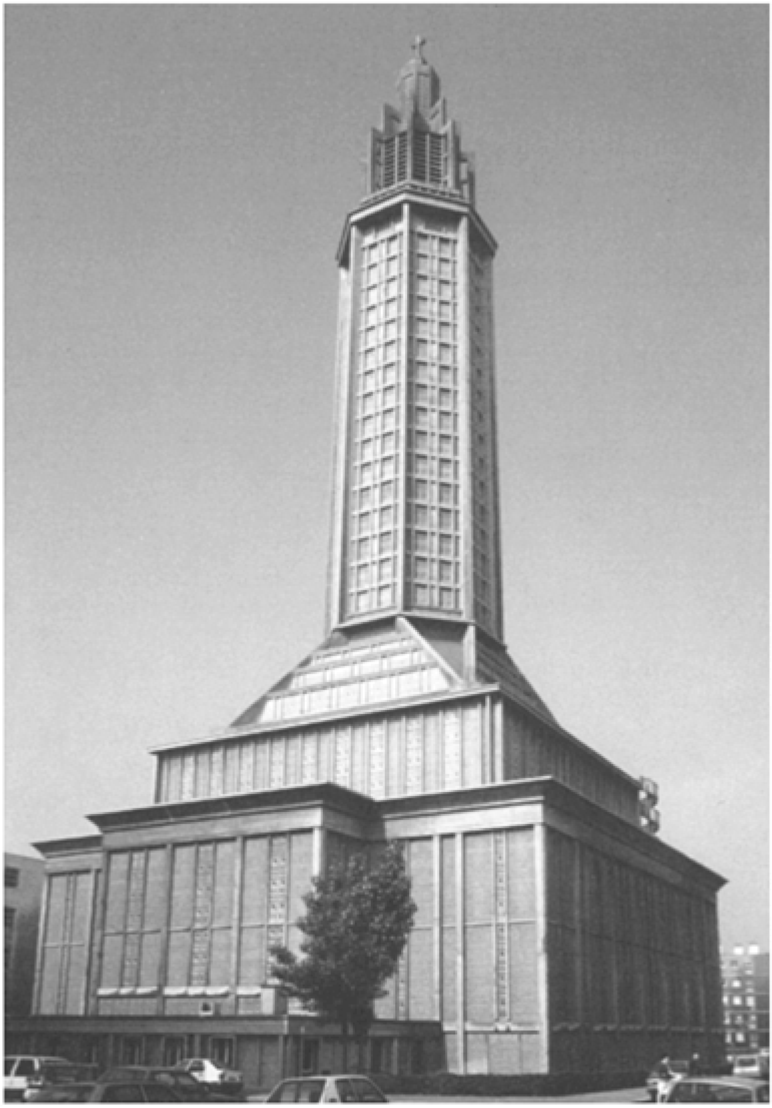
Decorative elements are eschewed in the Garage Ponthieu (1905), which Perret called “the world’s first experiment in aesthetic reinforced concrete.” The concrete frame of the interior, with its large spans and thin supports, allowed considerable flexibility in accordance with the function of the building. The formal aspects include the strongly geometric facade with classical resonances in its arrangement, the upper attic story, and the two cylindrical, nonconstructional pillar supports of the main entrance. The Théâtre des Champs-Elysées (1913) in Paris, originally planned by Henri van de Velde but carried out to Perret’s designs, shows a contrast between the ingeniously delicate framework of the building designed to allow uninterrupted views and the heavy walls, pilasters, and cornices of the facade that betray Perret’s classical sympathies.

The church of Notre Dame at Le Raincy (1923) near Paris marks a departure from, and yet a logical culmination of, Perret’s pre-World War I work. A building of high technical innovation, this memorial church established him as the leading exponent of this architectural system. The structure demonstrates the way in which a modern material such as reinforced concrete could be used to reinterpret traditional ecclesiastical typologies while maintaining a visual connection with established forms. The outer walls constructed from prefabricated components create perforated concrete screens that allow the light to filter into the interior. These combine with the nave, aisles, and slim columns carrying low-arching vaults to create a light and graceful interior. Traditional principles, both classical and Gothic, are invoked, and yet the building denies adherence to either.

After the war, Perret further pursued the neoclassical elements of simplicity and clarity exhibited so clearly in the Théâtre des Champs-Elysées. His command of the essentials of classicism is well represented in designs for the competitions for the Palace of the League of Nations (1927) in Geneva and the Palace of the Soviets (1931) in Moscow. Perhaps the best expression of Perret’s doctrine was the Hotel du Mobilier National (1934) in Paris, which addressed the problem of combining diverse practical requirements in one building and the problem of a sloping site. The Musée des Travaux Publics (1932) in Paris served as a museum for large engineering models, and so the internal columns were minimal. The tide of opinion among the international avant-garde was indifferent to the classical affinities of these buildings despite their structural novelty and ingenuity.

Special interest attaches to the apartment building (1932) built speculatively at 51–55 rue Raynouard in Paris. Perret occupied an apartment at the top, and a spiral staircase gave access to the firm’s offices on the lower level. Perret accommodated the challenges of the corner triangular site by building nine stories above the level of the rue Raynouard and 12 above the level of the rue Berton. The structure introduced a radical approach in that all the posts and beams were poured in place and the in-fills precast in bare concrete.

Perret’s most important postwar commission was the reconstruction of Le Havre (1956), destroyed during the war. With a group of disciples, he developed a master plan that serves as a model of 20th-century neoclassical town planning. Perret designed the plaza that housed the new city hall as well as the church of St. Joseph (1957). He was the first president of the Ordres des Architectes and was elected to the Institut de France.



St. Joseph's Church, Le Havre, France (1957)

Photo © Mary Ann Sullivan

After receiving numerous international distinctions, he was named president of the International Union of Architects. He died in 1954 in his rue Raynouard apartment.

HILARY J.GRAINGER

Biography

Born in Brussels, 12 February 1874; son of a stonecutter with a building business and brother of architect Gustave Perret. Studied at the École des Beaux-Arts, Paris 1891–95. Married Jeanne Cordeau 1902. Worked for father's construction firm, Paris 1897–1905; the firm became Perret et Filis 1896; by the turn of the century the firm moved into architecture and contracting. On their father's death, the Perret brothers divided the firm: A.G.Perret Architects, established 1905 by August and Gustave; Perret Freres, established 1905 and managed by third brother, Claude. Inspector-General of Public Works and National Palaces. Professor, École des Beaux-Arts, Paris. Member, French National Committee for the Reconstruction. Gold Medal, Royal Institute of British Architects 1948; Gold Medal, American Institute of Architects 1948. Died in Paris, 25 February 1954.

Selected Works

Apartments, 25 bis rue Franklin, Paris, 1904
Garage, rue Ponthieu, Paris, 1905
Théâtre des Champs-Elysées, Paris, 1913
Notre Dame, Le Raincy, near Paris, 1923
Apartment Building, 51–55 rue Raynouard, Paris, 1932
Museum of Public Works, Paris, 1932
Mobilier National Building, Paris, 1934
Le Havre Reconstruction, 1956
Church of St. Joseph, Le Havre, 1957

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Contribution à une théorie de l'architecture, 1952 *Architectes Français, 1874–1954, 1876–1952* (exhib. cat.; with G. Perret), edited by J.B.Ache, 1976

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Librairie de France, 1928
Rogers, Ernesto Nathan, *Auguste Perret,* Milan: II Balcone, 1955

PERRIAND, CHARLOTTE 1903–99

Furniture and interior designer, France

Charlotte Perriand, typically remembered as Le Corbusier's privileged assistant, remains not only one of the most significant figures of French modernism but also one of the most influential French interior designers. Her artistic activity spans over three quarters of the 20th century. Trained between 1920 and 1925 at the École Centrale des Arts Décoratifs under traditional French *décorateurs* committed to an Art Deco concept of modernity, her first exhibition as an independent professional took place at the 1926 Salon d'Automne, where she presented a *coin de salon* in a conventional French *art décoratif* manner. Her radical turn toward machine-derived furniture, however, occurred at the 1927 Salon d'Automne with a *bar sous le toit,* which brought her instant notoriety. She was almost immediately invited to join Le Corbusier and Pierre Jeanneret's office and was soon to become, at age 25, their main furniture and interior designer. In association with Le Corbusier and Pierre Jeanneret, she furnished the villa Laroche in 1928, the villa Church at Villed'Avray in 1929, the Swiss pavilion at the Cité Universitaire in 1932, and the Cité Refuge of the Salvation Army in 1932.

Her early modernist work, oriented primarily to demonstrating the viability of industrial materials and forms for elite purposes, was characterized by lightweight furniture made of bicycle tubes enhanced with leather seats and a wealth of highly reflective, chrome-plated and glazed surfaces evoking the glittery automobile wheels, windshields, fenders, and hoods that were taking over the metropolitan landscape. Early on, Perriand's interest in mechanical metaphors broadened to include movement and transformability, as her dining chairs began to rotate on ball bearings, similar to those she wore around her neck; her tables expanded or shrank along rolling, rubber surfaces.

Although adopting Le Corbusier's concept of furniture as "home equipment," Perriand's contribution both to the Le Corbusier-Jeanneret office repertoire and to Le Corbusier's own development in respect to interior design was considerable. She brought to the office a distinctly new orientation, associated with a novel sense of the *art de vivre.*

Through a more personal and expressive rendition of modernism, Perriand introduced an understanding for "total design" enhanced with lavish comfort and whimsical sophistication. Perriand's radical, comprehensive aesthetic approach to modern interiors was complemented by Le Corbusier's programmatic concept of *équipement as* opposed to *decoration.* This self-proclaimed functionalist approach to interior design dominated the first common exhibition of the Perriand-Le Corbusier-Jeanneret trio at the 1929 Salon d'Automne. The exhibits presented under Thonet's sponsorship were dedicated to the *Equipement de l'habitation: des casiers, des sièges, des tables*—all characterized by standardization and modular deployment, resulting in what became known as the Le Corbusian concept *of objet type.* A characteristic example of such type-object in

Perriand's production was her 1928 rotating dining chair—erroneously attributed to Le Corbusier—that she re-used over the years in different contexts.

Passionately involved with radical leftist groups among artists, Perriand joined in 1932 the Association des Ecrivains et Artistes Révolutionaires (AEAR), sponsored by the Communist Party, and participated in the activities of the Maison de la Culture led by Louis Aragon. She viewed this activity as a logical extension of her role in the 1930 creation of the Union des Artistes Modernes (UAM).

Informed by her social and political commitments, which included two trips to the Soviet Union and projects for the Front Populaire government, in 1936 Perriand presented at the Third Housing Exhibition of the Salon des Arts Ménagers inexpensive, mass-produced home fittings, such as her innovative *chaise pliable et empilable*. She combined with her own furniture standard Flambo metal shelving that could meet the needs of a small worker's apartment necessarily oriented toward multifunctional, transformable spaces. Along with her new interest in affordable, industrially produced house equipment, she increasingly turned to an *art brut* in which wood and natural forms replaced metal, and artisanal objects took over designs emblematic of the machine.

Consistent with a newfound essentialism, Perriand explored further through photography the aesthetic potential of "accidental" forms, whether natural or industrial. Her first, 1938 *tables en forme,* replaced furniture boasting mechanical motion with static objects shaped to fit the movement of the human body, thus providing metaphors for her new organicism.

In 1940, three months before the Nazi invasion of France, Perriand accepted Japan's invitation to assume the position formerly held by Bruno Taut as industrial design adviser to the government. Japan's efforts at modernization without jeopardizing its intricate cultural heritage met successfully with Perriand's own efforts to achieve a seamless symbiosis between the industrial and the artisanal, the fabricated and the natural. She found in the everyday life of the Japanese house some principles that she had tried to apply in her work with Le Corbusier: the influence of the environment on modes of inhabitation and the liberation of the interior space through the absorption of household equipment into the walls of the dwelling. This concept emulated the Zen Buddhist understanding of the Void as "stimulating emptiness" rather than sterile absence. Perriand reinvented for Western needs the relationship between space and motion by adapting to modern life the Japanese view that harmonious human movement is possible only within emptiness. Her exhibitions for the Takashimaya department stores played a significant role in adapting Western modern techniques to fit the Japanese traditional spirit and were just the beginning of a series of similar exhibitions held simultaneously in France and Japan after the war.

Ultimately, Perriand's contact with Japan and its distinctive classicism—recognized as germane to Western modernism at least since Frank Lloyd Wright and French *Japonisme*—helped purify her own *art brut* into a postwar sophistication reminiscent, in some respects, of her early modernist phase. Her 1950 adaptation of the chaise longue, in which bent bamboo stems replaced the metallic tubular supports, is an example of this transformation. In general, the Japanese lesson emerged in her work through the reintroduction of simple, plain wood; sliding translucent panels that open widely on natural environments; low, horizontal furniture; and transformable modular storing devices. An example of such interiors were her kitchens for Le Corbusier's Unite d'habitation in Marseille or the so-called street interiors of Air France lobbies around the world that encompassed both the exclusive and the mass produced and remain examples of the best French design of the postwar era. Never severing her cultural ties to Japan, in 1993 she designed a teahouse for UNESCO in Paris. In December 1997, at age 94, she came for the first time to the United States, where she received the Brooklyn Museum of Art's Modernism Design Award for Lifetime Achievements.

DANILO UDOVICKI-SELB

Biography

Born in Paris, 24 October 1903. Studied design at the École de l'Union Centrale des Arts Décoratifs, Paris 1920–25; attended the life-classes of Bernard Boutet de Monvel and André Lhôte, Académie de la Grande Chaumière, Paris 1924–26; pursued decorative arts studies with Paul Follot and Maurice Dufrène. Married Jacques Martin 1943:1 child. In private practice, Paris from 1927; set up a studio in the Place Saint Sulpice 1927–30 and the Boulevard de Montparnasse 1930–37; associate in charge of furniture and fittings, studio of Le Corbusier and Pierre Jeanerret, Paris 1927–37; member, editorial board, *L'architecture d'aujourd'hui* 1930–74; worked with Jean Prouvé, Pierre Jeanerret, and George Blanchon, Paris 1937–40; established office for prefabricated building research, Rue Las Cases, Paris 1940; Industrial Design Consultant to the Japanese Ministry of Commerce and Industry, Tokyo 1940–41; independent designer in Tokyo 1941–44 and Indochina 1943–46; worked in Tokyo 1953–56 and 1962–68; worked in Rio de Janeiro and Latin America 1969–76. Member, Salon des Artistes Décorateurs, Paris 1927; member, CIAM 1928; founding member, Union des Artistes Modernes, Paris 1930; member, Association des Etudiantes et Artistes Révolutionnaires, Paris 1931; consultant to the École Régionale des Beaux-Arts et des Arts Appliqués, Besançon, France 1966–68; jury president, International Office Furniture Competition, Paris 1983–84. Gold Medal, French Academy of Architecture 1978; Commandeur, Ordre National de Mérite 1978; Chevalier, Ordre des Arts et Lettres 1981; Chevalier, Légion d'Honneur 1983. Died in 1999.

Selected Works

Examples of Perriand's furnishings can be seen at the Musée des Arts Décoratifs, and the Fondation Le Corbusier in Paris.

C*oin de salon,* Salon des artistes décorateurs, 1926

Living room objects, Salon des artistes décorateurs, 1927

B*ar sous le toit,* Salon d'Automne, 1927

Dining room with mechanical table and rotating chairs, Salon des artistes décorateurs, 1928

Villa Laroche *équipement* (Le Corbusier-Jeanneret, architects), 1928

Villa Church at Ville-d'Avray (Le Corbusier-Jeanneret, architects), 1928–29

E*quipement de l'habitation,* in collaboration with Le Corbusier and

Pierre Jeanneret, at the Salon d'Automne, *Chassis porte-coussin* armchair and modular storing furniture built by Thonet, 1929

Editor's office, *La semaine a Paris,* 1930

Studies for a *Maison minimum,* 1930

C*haise longue a position variable,* Cologne International Exhibition (with Le Corbusier and Pierre Jeanneret), 1931

Interior furnishings of the public spaces of the Swiss Pavilion, Cité Universitaire, Paris (Le Corbusier-Jeanneret, architects), 1930–32

Interior furnishings of the Salvation Army's Cité Refuge (*crèche* and dormitories) (Le Corbusier-Jeanneret, architects), 1932

L*e home du jeune homme,* Brussels International Exhibition (with Le Corbusier and Pierre Jeanneret), 1935

Pavilion of the Agriculture Ministry, Paris International Exhibition, 1937

Photography with Fernand Léger and Pierre Jeanneret, exploring an *Art brut,* 1936–38

T*ables en forme,* one table made with rough pine-tree posts for the Temps Nouveaux Pavilion, office desk for Jean-Richard Bloch, editor of the daily *Ce Soir,* 1938

Hotel addition, Saint-Nicolas-de-Véroce Alpine Valley, 1939

Portable, prefabricated aluminum cabins (with Jean Prouvé and Pierre Jeanneret), 1940

"Tradition, Selection, Creation" (exhibition) for the Takashimaya department stores, Tokyo-Osaka, 1941

Furniture for a *Maison familiale minimum* (with architects P.Nelson, R.Gilbert, and Ch. Sebillote), presented at the Grand Palais international exhibition, 1947

Memorial Saint-Lô Hospital (collaboration with Paul Nelson), 1947

Design for a standardized, minimum modular storage element—the drawer, and its various accessories; patented in various materials and mass produced for the BHV department store, 1948–55

Open kitchen for Le Corbusier's *Unite d'habitation,* Marseille, 1950

Bathroom in the Japanese tradition for the Salon des Arts Ménagers, *Formes utiles* section, 1952

"Suspended" toilet bowl, 1952

Rooms for the Tunis Pavilion, Cité Universitaire, Paris (Jean Sebag, architect), 1952

Brazzaville Air France building furnishings (with Jean Prouvé), 1952

M*aison d'étudiants,* Paris (with Jean Prouvé), 1953

Interior furnishings, Hotel de France, Conakry (Lagneau and Weill, architects), 1953

Air France lobby, London (P.Bradok, architect), 1957

House in the Sahara for oil drilling workers, Salon des Arts Ménagers, 1958

Furnishings for the Brasil Pavilion, Cité Universitaire, Paris (Lucio Costa, architect), 1959

Air France lobby in Tokyo (J.Sakakura and Ren Suzuki, architects), 1959

C*halet* at Mirabel-les-Allues, Savoie, France, 1960

Apartment, Rio de Janeiro (with architect Maria Elisa Costa), 1962

Furniture for the Musée National d'Art Moderne, Paris, 1965

Residence for the Ambassador of Japan, Paris (Sakakura and Reidberger, architects), 1966

Modernization of the Geneva United Nations Headquarters (with Beaudouin and Carlu), 1959–70

Perriand apartment, Montparnasse, Paris, 1970

Interior furnishings, Station des Arcs, 18,000-bed hotel facilities in the Alps, 1967–82

Teahouse Pavilion, UNESCO, Paris, 1993

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"Monologue in a London Flat," *Architect and Building News* (October 1930)

"Habitation familiale: son développement économique et social," *L'architecture d'aujourd'hui,* 6/1 (January 1935)

"L'art d'habiter," *Techniques et architecture,* 9–10 (1950) (special issue edited by Perriand)

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Winternitz, Lonia, "Einwohnraum: von Le Corbusier in Zusammenarbeit mit Pierre Jeanneret und Charlotte Perriand," *Innen-Dekoration,* 41/6 (June 1930)

PETRONAS TOWERS, KUALA LUMPUR

Designed by Cesar Pelli; completed 1996

Kuala Lumpur, Malaysia

Claiming the title of the tallest buildings in the world at the time of their completion, the Petronas Towers were designed by Cesar Pelli and completed in 1996. Built in Kuala Lumpur City for the Petronas Company, the national petroleum company of Malaysia, the twin towers are part of an enormous commercial development that contains the headquarters of Petronas as well as a hotel and leased office space. Dominating the central part of the city, the twin towers were the first phase of a "city within the city"—an 18 million-square-foot complex located on the grounds of what was formerly a horse-racing track.

Pelli's Petronas Towers exemplify the never-ending quest to build taller structures—a quest that inspired the building of the Tower of Babel, the city of San Gimignano, Gothic cathedrals, and the modern skyscraper. The skyscraper building type emerged in the United States in the late 19th century, with Chicago and New York competing to have the tallest building in the world. Made possible by the invention of the elevator, improved fireproofing technology, and metal structural cages, skyscrapers of the Chicago School became important civic and corporate status symbols. Some of the earliest examples of this type include the Home Insurance Building (1885) by William LeBaron Jenny; Reliance Building (1894) by Burnham and Root; and Guaranty Building (1895) by Sullivan and Adler. Petronas Towers joins a list of buildings that have held the title of the tallest building in the world: Masonic Temple (1892) by Burnham and Root in Chicago; the Woolworth Building (1913) in New York City by Cass Gilbert; the Empire State Building (1931) in New York City by Shreve, Lamb and Harmon; the World Trade Center (1972–73, destroyed in 2001) in New York City by Minoru Yamasaki; and the Sears Tower (1974) in Chicago by Skidmore, Owing and Merrill. The Petronas Towers bested the Sears Tower by nine meters, standing at 452 meters to the tip of the spire. There was some controversy about which building was actually higher, since the Sears Tower has a higher occupiable floor, but Petronas reaches a higher overall height. Although Petronas Towers will someday be eclipsed as the tallest

Petronas Office Towers, designed by Cesar Pelli

in the world, it will remain the tallest concrete frame structure for many years to come.

After an international competition, the architectural commission for the towers was awarded to Cesar Pelli Associates, a firm that had executed several tall buildings noted for their rich palette of materials and elegant skyscraper profiles. The U.S. firm of Thornton-Tomasetti Engineers with their Malaysian counterpart Ranhill Bersekutu undertook the challenge of engineering the high-strength concrete frame. In addition to the technical demands of these towers, the high profile of the project, and the nationalistic nature of the program caused unusual stipulations to be placed on the design. The technology to build the towers, while developed with international expertise, had to be transferable to the Malaysians working on the project. The subcontractors were required to develop fabrication plants in Malaysia and to train local workers, both of which would have longterm benefits for the Malaysian economy.

Each of the two main towers stands 88 stories tall, with a slimmer “bustle” tower at 44 stories. The twin towers are joined with a skybridge at levels 41 and 42. The massing of the towers is relatively slender with setbacks at levels 60, 73, 82, 85, and 88, terminating in a 49-meter stainless-steel spire. The glass and stainless-steel skin of the building is faceted as a result of the complex geometry of each tower’s plan.

Petronas Office Towers, designed by Cesar Pelli

© Jeff Goldberg/ESTO. Photo courtesy of Cesar Pelli and Associates

The eight-pointed star created by two interlocked squares is one of the fundamental geometries underlying Islamic design. The basic square represents the earth and its four cardinal points, or heaven and its four rivers. The development of simple forms into complex geometry reflects the incomprehensibility of God. In the case of the Petronas Towers plan, eight small circles were superimposed at each intersection, creating a multifaceted floor plate. This result satisfied a programmatic desire for multiple corner offices, each taking advantage of the complex's park-like setting.

This geometry also dictated a structural solution that allowed the floor plates to be apparently column-free. In addition to a central concrete core, there are 16 perimeter columns, each 2.4 meters in diameter, arrayed in a 46-meter diameter circle. A ring beam, haunched to allow mechanical systems to pass underneath, connects the columns. At the setbacks, columns were engineered for a slight slope to eliminate transfer beams. Cantilevers framed in steel create the triangles and arcs that make up the points of the star.

Steel was the dominant structural material for tall buildings for most of the 20th century, and the decision to depart from this norm was made early in the Petronas Towers design process. High-strength concrete became the preferred material partially because of its compressive strength and partially because of the government's incentive to use materials that could be fabricated domestically. Another advantage is that the concrete's mass stabilizes the towers so that movement is not a significant problem.

The site chosen for the towers, however, posed significant challenges. The nature of the soil was extremely unpredictable, and in fact an underground cliff was discovered. Master-plan changes had to be made to accommodate found conditions, and the excavation for each "barrette pile" (concrete friction element) had to be surveyed to an average depth of 80 meters.

The steel-framed connecting skybridge that attached to the towers at their midpoint was another major technical challenge. A clear space between the towers was very important in the design and massing of the building, and therefore the connector piece had to be light and relatively transparent. The connector bridge was braced against each tower with a pair of split "V" legs, each slender element containing a tuned mass damper. Each set of legs was attached to its tower with a fully rotating ball joint that allowed for movement up to 500 millimeters. The connector was prefabricated by a Korean manufacturer and was raised over several days after a ceremonial celebration.

RENÉE CHENG

S*ee also* **Chicago School; Empire State Building, New York; Pelli, Cesar (Argentina and United States); Sears Tower, Chicago; Skyscraper; Woolworth Building, New York; World Trade Center, New York**

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PEVSNER, SIR NIKOLAUS 1902–83

Architecture historian and critic, England

Nikolaus Pevsner transformed the discipline of architectural history in Britain. More than any other single individual, architect, or critic, he molded the taste of English architects throughout the 1940s and 1950s and developed public awareness and appreciation of architecture in Britain for an even longer period. He was a naturally gifted teacher, an indefatigable researcher, and a highly opinionated critic. Before he arrived in Britain as a refugee from Nazi Germany in 1933, architectural history and criticism in Britain was very largely a dilettante activity taken up by gentleman architects and university professors. By the time he died, 50 years later, British scholarship in the fields of architectural theory and history was second to none: vigorously disciplined, genuinely enlightening and innovative, and securely based in higher academic institutions.

This transformation was not effected by Pevsner alone, of course. His fellow countryman Sir Ernst Gombrich, the noted art theorist and historian, achieved as much in academic circles. However, among architects, architectural students, and the general public in Britain, Pevsner's achievements and influence stand head and shoulders above any other. He achieved this status through his prolific writings, which were scholarly yet popular; through his editorship (1942–45) and long association with the *Architectural Review,* Britain's most prestigious monthly architectural journal; and through his many years of teaching architectural history (as professor of history of art at Birkbeck College, University of London, 1942–69, and as Slade Professor of Fine Art at the University of Cambridge, 1949–55, and at the University of Oxford, 1968–69). Many generations of architectural students have grappled with the question he asked in the introduction to his book, *An Outline of European Architecture* (1942), "What is architecture?" and disputed his answer, "A bicycle shed is a building; Lincoln Cathedral is a piece of architecture." In the late 1930s and throughout the 1940s, they were convinced by him of the intellectual validity and inevitable victory of the Modern movement in architecture through reading his *Pioneers of the Modern Movement from William Morris to Walter Gropius* (1936).

Modest and unassuming in manner, Pevsner had an iron will and determination. He persuaded Sir Allen Lane, founder of Penguin Books, to embark on Penguin's most ambitious, extensive, and financially uncertain project: the publication in 46 volumes, eventually, of a series, The Buildings of England. This was to consist of a series of scholarly and entertaining catalogs of the most important, and the more interesting, buildings, archaeological sites, urban neighborhoods and ensembles, towns, and villages—historic, traditional-vernacular, and modern—country by country. The early volumes were entirely researched and written by him. In later volumes, he was more dependent, both in research and in the actual writing, on the assistance of others—many his former students at Birkbeck College. However, when the series was finally completed in 1974, the series was unmistakably his—his vigorous scholarship, acute observation, and idiosyncratic likes and dislikes were evident in every volume—and, not content with England, he persuaded Penguin to commission volumes on the countries of Wales and Scotland.

The Buildings of England series made Pevsner a household name in Britain. Few families would embark on a motor tour or a provincial holiday in England without packing the appropriate volumes of The Buildings of England to take with them. As the volume and extent of heritage tourism grew in Britain throughout the 1960s, 1970s, and 1980s, so did sales of these particular books. He was a popular broadcaster as well, delivering the Reith Lectures of 1955 on BBC radio on the subject "The Englishness of English Art."

Pevsner's intellectual formation was rigorously academic. Born in Leipzig, Germany, he was educated in Leipzig, Munich, Berlin, and Frankfurt and was destined for a career in art history. He joined the staff of the Dresden Gallery in 1924 while engaged in research for his doctorate. His doctoral dissertation was published, as Leipziger Barock, in 1929. In the same year, he joined the staff of Göttingen University. He visited England in 1930, developed an interest in English 19th-century design, and emigrated to England in 1933.

During the 1930s, as an "enemy alien" in World War II, life in England was not easy for Pevsner but, rather, was precarious and insecure. It was not until after the war, under a progressive government and with a tenured teaching appointment at London University, that he could feel secure. In 1946 he became a naturalized British citizen. He acquired a house, in Hampstead Garden Suburb, in which to bring up his family.

Responsibilities and honors were showered on Pevsner: the responsibilities he welcomed and bore diligently, whereas the honors sat highly on his slightly bowed shoulders. He was appointed to the Royal Fine Arts Commission, the Historic Buildings Council, and similar organizations and was chairman of the Victorian Society, which he was largely instrumental in founding, from 1958 to 1976. He was made a Commander of the British Empire (CBE) in 1953 and a Fellow of the British Academy (FBA) in 1965 and was awarded the Royal Institute of British Architects (RIBA) Royal Gold Medal in 1967 and knighted in 1969. In the same year, his native land honored him with the award of the Grand Cross of the Order of Merit of the Federal Republic of Germany.

Pevsner was a prolific writer and published many books and articles in learned journals. For Sir Allen Lane, he edited the series King Penguins from 1941 and persuaded his patron to publish the Pelican History of Art series, which was launched in 1953 with *Painting in Britain 1530 to 1790* by Ellis Waterhouse and *The Art and Architecture of India* by Benjamin Rowland. Among his later books are *Sources of Modern Architecture and Design* (1968), *Some Architectural Writers of the Nineteenth Century* (1972), and *A*

History of Building Types (1976). He remained intellectually active until the end of his life, although the onset of Parkinson's disease in the early 1970s limited his mobility and caused him and his many friends and colleagues considerable distress. He died in 1983.

ANTHONY D.C.HYLAND

Biography

Born in Leipzig, 30 January 1902. Studied at the University of Leipzig, Munich, Berlin, and Frankfurt am Main. Art historian, the Gemäldegalerie, Dresden; editor, *Architectural Review,* London 1942–45. Lecturer in art and architectural history, University of Göttingen 1929–35; lecturer 1942–69, chair 1959–69, Birkbeck College, University of London; lecturer, University of Cambridge 1949–55; lecturer, University of Oxford 1968–69. Member, later chair and president, Victorian Society from 1958. Royal Gold Medal, Royal Institute of British Architects 1967; knighted 1969. Died in London, 18 August 1983.

Selected Publications

Pevsner was a prolific writer. He contributed regularly to learned journals in English, German, and French and was widely translated into Spanish and Italian. Several of his more popular books ran to several editions and were published in both Britain and the United States. The select Pevsner bibliography included in *Concerning Architecture,* edited by John Summerson (1968; see listing under "Further Reading"), contains almost 300 entries up to the end of 1967 and does not claim to be comprehensive. The list below contains only his more important books and a few key journal articles.

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PHILADELPHIA, PENNSYLVANIA

Philadelphia began the 20th century as the third-largest city in the United States, after New York and Chicago. It was an economically prosperous manufacturing center and a significant port that attracted many immigrants from the poorer areas of Eastern Europe, southern Italy, and the southern United States. Although it had lost its position as America's political, financial, and cultural capital to Washington, DC, and New York, Philadelphia was a thriving industrial metropolis at the turn of the 20th century.

The epitome of Philadelphia's confidence at this time can be seen in its City Hall (1871–1901), designed by John McArthur, Jr., and Thomas Ustick Walter in an ornately decorative Second Empire style with sculptures by Alexander Calder. This imposing and monumental structure fills a massive square block broken only by pedestrian passages that continue Philadelphia's axes of Broad and Market Streets into its center courtyard. In addition, City Hall's tower, with clock and sculpture of founder William Penn, prominently stands out from all parts of the city. This was especially so before Helmut Jahn's Liberty Place (1987), when there was an unwritten "gentleman's agreement" not to build higher than City Hall's tower.

During the 20th century, Philadelphia gradually moved away from its 19th-century manufacturing history and developed into a service economy with the building of office buildings, hotels, department stores, apartment buildings, banks, and cultural buildings.

Daniel Burnham's Land Title Buildings (1897 and 1902) introduced to Philadelphia the practice of downsizing the presence of a building's steel frame behind external ornament and a curtain wall. (City Hall is constructed with load-bearing stone approximately 22 feet thick at its base.) This practice continued into the 20th century, most notably with the Art Deco-style East Penn Square (1930) by Ritter and Shay. The first Philadelphia building to break away from this tradition was George Howe and William Lescaze's Philadelphia Savings Fund Society (PSFS) Building (1932), one of the first International Style skyscrapers in the United States and a daring architectural statement by a conservative institution such as a bank.

The convention of expressing a tall building's steel frame continued as modernism flourished in the decades after World War II. The Penn Center development (1953–82), proposed by Edmund Bacon and Vincent Kling, was made possible by the construction of Suburban Station (1924–29) and 30th Street Station (1927–34), both by Graham, Anderson, Probst and White, and the 1953 demolition of Broad Street Station (1892–93) and its elevated railroad tracks. Penn Center is worthy of mention if only because of its integration of transportation, retail, and office facilities. Other notable buildings in this area west of City Hall include the pyramid-topped Mellon Bank Center (1990) by Kohn Pederson Fox and the electric-razor-like Bell Atlantic Tower (1991) by the Kling-Lindquist Partnership.

Befitting a city with money to spend, Philadelphia produced a considerable amount of large department stores and retail centers in the 20th century. The Lit Brothers Store (1891–1907), Strawbridge and Clothier Department Store (1890s-1920s), and Gimbel's Department Store (1890s-1900, demolished 1980) were all major retail outlets around the vicinity of Eighth and Market Streets composed of assorted buildings that were built or converted as was needed. In contrast, Burnham's John Wanamaker Department Store (1902–11), a blocky Renaissance *palazzo* on the outside with an impressive atrium on the inside, was purposely built to be a self-contained shopping experience.

Philadelphia's last big foray into retail in the 20th century came between 1974 and 1983 with the development known as "The Gallery" by Bower and Fradley (phase 1) and Bower Lewis Thrower (phase 2). Basically an urban shopping mall, The Gallery can be commended for its integration with the street grid

View of the city looking towards the Philadelphia Museum of Art, ca. 1933 of Philadelphia and also with the underground Market East Train Station (1985). The Gallery cannot be commended, however, for its typical and banal shopping mall appearance and for the way it stole the street life away from nearby Chestnut Street, which had been pedestrianized in 1973.

Prominent bank buildings in 20th-century Philadelphia include the Girard Trust Company (1905–08), a brilliantly white Ionic temple by McKim, Mead and White. The Federal Reserve Bank (1931–35) by Paul Phillipe Cret is a bit more stripped down in its classicism. The previously mentioned PSFS Building was internally innovative in the way its banking hall was located on an upper floor of its sleek polished-granite base, with street level given over to retail.

The major cultural project of the early 20th century was the creation of the Benjamin Franklin Parkway (1907–41), a spacious boulevard modeled after Paris's Champs-Elysées, which cuts through Philadelphia's street grid to connect City Hall with Fairmount Park. The idea for the Parkway was first inspired by the World's Columbian Exhibition of 1893 in Chicago, which promoted broad avenues with gleamingly white neoclassical buildings under the guise of the City Beautiful Movement.

The Parkway itself was officially designed and planned by Jacques Grabér and Paul Philippe Cret, but its crowning glory is the Philadelphia Museum of Art (1916–28) by Horace Trumbauer, especially in the way it mediates Fairmount Park and the city. Along the Parkway are other neoclassical civic buildings, such as the Rodin Museum (1927–29), also by Grabér and Cret; the Franklin Institute Science Museum (1932–34) by John Windrim; and the Philadelphia Free Library (1917–27) by Trumbauer and its near twin, the Philadelphia County Courthouse (1938–41), based on a design by Windrim.

The second half of the 20th century produced two stars of the international architectural scene from Philadelphia: Louis Kahn and Robert Venturi. Kahn's Philadelphia masterpieces include the Margaret Esherick House (1960) in Chestnut Hill, a private residence that beautifully makes use of natural light to enhance the interior, and the University of Pennsylvania's Richards Medical Research Laboratory (1957–61) whose "served" and "service" spaces influenced a generation of architects. Venturi was born in Philadelphia and briefly worked for Kahn before establishing his own practice with John Rauch in 1964 and Denise Scott Brown in 1967. His Philadelphia masterpieces include the Vanna Venturi House (1962), a private residence for his mother, and the Guild House (1960–63), an apartment house for the elderly both of which have been mistakenly credited as the foundation of Postmodernist architecture.

After World War II, the character of Philadelphia began to change. Beginning in 1948, under the good intentions of creating space around Independence Hall (the location of the signing of the Declaration of Independence and the writing of the Constitution), many buildings were cleared to form empty strips of land called Independence Mall and Independence Park. For the United States' bicentennial celebrations in 1976, all this space began to make sense, especially coupled with the Liberty Bell Pavilion (1976) by Mitchell/Giurgola, a glass box that displays the icon of Philadelphia tourism. After the bicentennial, however, these areas became an empty wasteland. In brilliant opposition to the fakeness of Independence Mall, Robert Venturi designed his Franklin Court (1976) as a tubular steel outline of Benjamin Franklin's former house, putting the actual exhibits underground.

The tourist-world of Independence Mall is in the process of being reconstructed to include an Independence Visitor Center and a National Constitution Center. In addition, a new home for the Liberty Bell, designed by Bohlin Cywinski Jackson, that allows views of Independence Hall without a background of skyscrapers will open in 2003. The view of the city as a museum piece was especially reinforced after the construction of the Pennsylvania Convention Center (1994) by Thompson, Ventulett, Stainback, and Associates, which converted the Reading Terminal train shed (1891–93) for part of its facilities after its redundancy following the construction of the Market East Train Station. With the anticipation of thousands of different visitors every week, hotel speculation went rampant, with many office buildings converted into hotels, including the seminal PSFS Building. Along with the hotels also came the tourist-traps that could be located anywhere and not necessarily particular to Philadelphia—namely a Hard Rock Café and a planned Disney Quest "family entertainment center." Conversely, the Kimmel Center for the Performing Arts (2001) by Rafael Viñoly Architects, part of a planned arts district on South Broad Street, rises above the anonymity of the subsequent Convention Center development and sets a good example for future development like a proposed entertainment complex with tram across the Delaware River and a new downtown baseball stadium.

CHRISTOPHER WILSON

S*ee also* **Burnham, Daniel H. (United States); City Beautiful Movement; Cret, Paul Philippe (United States); Graham, Anderson, Probst, and White (United States); Howe, George, and William Lescaze (United States); International Style; Jahn, Helmut (United States); Kahn, Louis (United States); Kohn Pederson Fox (United States); McKim, Mead and White (United States); Office Building; Vanna Venturi House, Philadelphia; Venturi, Robert (United States); Wanamaker Store, Philadelphia**

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PHOENIX CENTRAL LIBRARY

Designed by Will Bruder (bruderDWLarchitects); completed 1995
Phoenix, Arizona

The Phoenix Central Library was the first major commission for Will Bruder (1946–), an artist and self-trained architect who lives and works in New River, Arizona, in the desert north of Phoenix. Opened in 1995, the building has earned critical acclaim from the architectural profession for its poetic and economical integration of everyday materials, natural lighting, and environmental technologies as well as for its local and regional specificity, achieved without recourse to historical pastiche. Planned in close collaboration with the library's professional staff, the building also received in 1997 an Award of Excellence in a library building award program cosponsored by the American Institute of Architects and the American Library Association.

The campaign for a new central library in Phoenix began in the early 1980s, but the project began in earnest only in 1988, when the city passed a $1.2 billion bond issue to finance the construction of several new cultural institutions. In the summer of 1989, the city issued a request for proposals for the library, and by the end of the year a selection committee had picked Bruder's firm (known as bruderDWLarchitects) from a pool of five finalists that also included Antoine Predock and Ricardo Legorreta. In the first half of 1990, the design team (led by Bruder and Wendell Burnette) refined the building program by conducting interviews with the entire library staff (including city librarian Ralph Edwards, central library director Rosemary Nelson, and president of the library board of trustees Elinor Green Hunter) and by holding 28 citizen meetings. The basic design concepts were in place by November 1990. Despite some resistance to the initial design (fueled in part by Bruder's description of the building as a "kinetically energized arrival pavilion"), the city council approved the plan in early January 1991.

As a library, the Phoenix building owes a great deal to postwar developments of the building type and particularly to the concept of the modular library. Using a planning module based on the standard dimensions and spacing of bookshelves, this system allowed bookshelves to be placed anywhere in the library and facilitated the integration of reading and book storage areas. Such buildings typically had large, square (or nearly square) footprints; uniform ceiling heights; and flat ceilings to conceal the requisite air-handling equipment and artificial lighting. At the Phoenix Central Library, a skeleton of concrete columns in the main body of the building rises from a planning module 32 feet, 8 inches square, creating a nearly square footprint approximately an acre in area at the upper floors. On the first four floors, these columns carry a precast T ceiling system that houses the east-west chases for lighting fixtures, air ducts, and power and data lines; concealed behind slightly concave aluminum panels, these chases are in turn served by aluminum-covered soffits, called "power bellies," which run north-south just inside the main body of the building. Flexibility—the watchword of postwar library planning—is here enhanced by housing ancillary and service functions in "saddlebags" (the architects' term for the curved, copper-clad elements that flank the main body of the building along its east and west sides) and extended to computer terminals that can be located anywhere in the library.

Phoenix Central Library (1995), grand staircase leading to Reading Room

© Bill Timmerman. Photo courtesy William P.Bruder Architects

While the Phoenix Central Library updates the technology of the modular library, it also moves beyond the monotonous interiors that characterized libraries in the postwar period. In part, this is achieved by glazing the north and south walls and providing natural lighting and dramatic views of the city and surrounding mountains. Computer-controlled mechanical louvers on the building's south side adjust continuously to block the strong desert sun, and on the north side Teflon-covered sails prevent glare. Natural lighting is also brought into the core of the building through the "crystal canyon," a five-story skylit atrium surrounded on three sides by glass and on the fourth by glass-encased elevators.

The Phoenix Central Library also updates the postwar type with the reintroduction of a monumental public reading room. In this case, the room is on the fifth floor, where it can take advantage of substantially taller ceiling heights and dramatic views; mechanical systems at this level are laid beneath a raised floor deck. Dominated by 30-foot-tall columns that taper from two feet at the base to ten inches at the top, this room has been compared to the great reading room in Henri Labrouste's Bibliothèque Nationale (1858–68) in Paris and to hypostyle halls of ancient Egyptian temples. Above each column is a skylight of laminated glass seven feet in diameter; in each, a hole in the blue interlayer provides clear glass opening four inches in diameter, calculated to allow the sunlight of the summer solstice to "light" the candlestick columns. (The library sponsors

Phoenix Central Library (1995), South elevation

a solstice event each year, which has brought as many as 1500 people to witness the effect.)

These skylights also call attention to the fact that the columns stop short of the ceiling, which seems to float overhead. The ceiling is, in fact, supported by a "tensegrity" structure developed by Michael Ishler, an engineer with Ove Arup and Partners. Anchored to the steel caps bolted to the top of the columns, steel cables support vertical struts that in turn support the north-south purlins of the galvanized-steel roof deck. The roof deck also stops short of the walls on the east and west sides of the room, allowing daylight to wash down their concrete surfaces.

The Phoenix Central Library is noteworthy also for its regional character. Bruder, for example, drew on a number of regional metaphors in the process of refining the initial design concept. In addition to the crystal canyon and the saddlebags mentioned previously, Bruder has compared the building itself to a man-made mesa, its scaleless mass rising abruptly from the desert floor. The building also acknowledges its locale through its attention to the power of the desert sun. The 12-inch concrete walls, which separate the main body of the building from the saddlebags to the east and west, insulate those facades and allow the air conditioning to function smoothly. The experience of the main reading room—where the glazing of the north and south walls is most apparent and where sunlight washes the east and west walls—is particularly affected by the time of day and the time of year.

The library's regional specificity is also evident in the choice of materials: copper used to clad the steel-frame saddlebags is one of Arizona's most important natural resources (although copper sheets of the size needed here could be found at a competitive price only in Germany). Striations in the copper are the result of roll forming, a technique normally used to construct metal grain silos. Its use here is both expressive (in that it links the library to the industrialized agribusiness that sustains the state) and practical: because of the rigidity of the corrugation that it achieves, the technique allowed the use of an exceptionally thin gauge copper that cost only $1 more per square foot than the stucco often used in the Southwest to imitate adobe. In the end, the library cost less than $100 per square foot, demonstrating Bruder's commitment to an architecture in which "both pragmatism and poetry are served with equal passion" (Bruder, quoted in Ojeda, 1999).

ABIGAIL A.VAN SLYCK

S*ee also* **Arup, Ove (England); Historicism; Library**

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PIANO, RENZO 1937

Architect, Italy

Renzo Piano, born in 1937 in the Mediterranean harbor city of Genoa, has been one of the most influential architectural personalities since the 1980s. He was strongly influenced by Franco Albini and Ernesto Rogers, who were his professors at the Polytechnical University in Milan. Jean Prouvé, Pierluigi Nervi, and the work of Buckminster Fuller also exerted a strong influence on the architect.

After Piano ended his academic career at the Polytechnical University, he founded Studio Piano, his first architectural office (1964–70). During this period, Piano also worked with Louis I.Kahn in Philadelphia and Z.S.Makowsky in London. He first gained international recognition when he went into partnership with English architect Richard Rogers from 1971 to 1977, emphasizing technology in architecture. From 1977 to 1981, he partnered with engineer and humanist Peter Rice (1935–92), who influenced Piano's work significantly with his focus on structural systems. After the death of Rice, Piano founded the Renzo Piano Building Workshop. The innovative and experimental character of Piano's work is based on team workshops that are filled with young talent from around the world. Like only a handful of architects, Piano has planned and realized a broad range of projects on a worldwide basis.

For Piano architecture is a creative process of communication and participation in which architectural solutions follow a process of diagnosis, design, realization, and documentation. This procedure was developed during the UNESCO-Workshop in Otranto, Italy (1978). A mobile display and communication box covered with a tent structure offered a central public forum. Piano created an environment allowing direct verbal confrontation and active participation of the community in the search for respectful restoration methods.

Piano and Rogers's Georges Pompidou Center (1978) is located in a sensitive urban environment in downtown Paris. Against considerable public and political resistance, Piano and Rogers designed a cultural forum in the form of a highly visible machine. Approximately 25,000 visitors participate daily in all sorts of cultural events on the inside as well as on the rectangular plaza in front of the Pompidou Center. Visitors enter the building through a transparent escalator that is attached to the external structural framework, which opens to a multilevel, open spatial layout. The floor plan is flexible and non-load bearing.

In 1982 Piano produced the space of the Palazzo a Vela in Turin, Italy, for the exhibition of the works of Alexander Calder. He put a stage installation together that incorporated the play of light, space, and temperature. Piano was able to create an open environment that liberated the boundaries of materiality. The dark and cool space offers a dimension where the mobile structures of Calder have a maximal effect on their observer.

Piano's work often experiments with the use of materials, which was especially evident in the IBM Traveling Pavilion (1986). The 48-meter-long tube was designed to display new forms of communication technology. The modular and transparent exhibition space is remarkable in its unusual combination of old and new materials and their connecting techniques.

In Turin Piano was engaged with the reorganization of a historical industrial monument, the Lingotto (1995). In the 1920s, engineer Matté Trucco designed a 500-meter-long and five-story-high industrial complex for the car manufacturer Fiat. At its time, the structure followed the requirements of functionalism. Piano transformed this highly visible sign of the industrial revolution into a "multifunctional service and research center." He placed a large auditorium space for cultural events into the existing structure. An inner courtyard was transformed into a public garden that reflected the Mediterranean character of Turin, and a rooftop, bubble-formed conference room located close to a helicopter platform became a new symbol of innovation for the city.

For the 500-year anniversary of Columbus's discovery of America, Piano completed in 1992 his first large-scale urban project. His hometown, Genoa, commissioned Piano to permanently reorganize the old harbor to revitalize the abandoned maritime area. Piano was confronted with the difficult task of linking the industrial harbor with the historic town structure by overcoming a division marked by an elevated major arterial road. Piano demolished no buildings but, rather, carefully implemented new functions in restored historical buildings or added new ones. His gentle revitalization concept helped to develop the old harbor into a vital cultural and recreational center of Genoa.

Piano and Rice built the San Nicola sports stadium (1990) in Bari, Italy, for the soccer world championship. The project requirements demanded that 60,000 people could enjoy the game and that standards for security not be ignored. They focused on optimal visibility, modular separation of fan masses, and an unusually high number of exit systems. Staircases between the seating sections also enhanced the vertical and horizontal cross ventilation. Piano and Rice created an elliptical floral-like stadium, expressing the plasticity of reinforced concrete in the manner of Pier Luigi Nervi.

The 220 low-income apartments (1991) in the Rue de Meaux in Paris were Piano's first housing complexes in which he proved that architectural and spatial quality do not always depend on large budgets. The facade demonstrates Piano's passion to reinvent the application of traditional and new materials. Glass, terra-cotta, and fiber-reinforced concrete exude Piano's interpretation of Le Corbusian rationality.

Piano's final project with Rice was the design and construction of the Kansai International Airport (1994) in Osaka, Japan; a steel building of simple geometry in which most internal structural elements were left visible. A physical site literally did not exist, as the proposed location of the airport was in the oceanic bay of Osaka. An artificial island on stilts first had to be built under extreme engineering demands. Piano envisioned a 1.7-kilometer-long building whose form derived from precise mathematical calculations following the laws of aerodynamics.

Piano unifies science and architecture in his work. Punta Nave, the Renzo Piano Building Workshop in Genoa-Vesima (1991), also serves as a UNESCO laboratory for climate and the use of natural light in architecture. The transparent building is located on a significant slope, accessible only by cable car. The workshop building is organized in sections that step topographically down hills, providing most workspaces with a view to the Mediterranean Sea. The glass roof is partially covered with solar-controlled louvers that interact automatically with changing daylight conditions. With this rather small project, Piano was able to create a productive team space in which architects and scientists are able to explore architectural solutions in tune with their environment. Among others, this building exemplifies Piano's methods and ideas pertaining to sustainable architecture.

In Switzerland, Piano realized the Fondation Beyler Museum (1997) in Riehen/Basel. Similar to the Menil Collection, his most important building material was the natural light that he physically enclosed with sandstone, steel, and glass. The strict and rectangular building is covered by a glass roof and opens on three sides to a park. Like few other architects, Piano understands how to dissolve the barriers between inside and outside. One is reminded of Mies van der Rohe's Barcelona Pavilion in the way that Piano connects exhibition space on the inside and water ponds on the outside. The museum is extended into a space continuum that finds a symbiosis between art and architecture.

At the very end of the 20th century, Piano's most significant project was the new multifunctional development of the Potsdamer Platz (1999) in Berlin. The Potsdamer Platz was one of Europe's most important centers of cultural life in the 1920s. For Piano it meant that he had to redevelop what years ago was either destroyed by World War II or erased by postwar city planners. Under the leadership of Piano, internationally renowned architects, such as Arata Isozaki, Hans Kohlhoff, Lauber and Wöhr, Rafael Moneo, and Richard Rogers, have transferred the Postdamer Platz from a deserted empty historical space back into a lively part of downtown Berlin. New architectural developments range from shopping centers, theater, cinemas, restaurants, offices, and corporate headquarters to apartment houses. Surrounded by the water of the nearby Spree River, Piano designed eight of the 19 buildings of the Postdamer Platz. His buildings have the double-layered terra-cotta facade to formally unify the large area as a whole. As the core project, he created a new piazza between Potsdamer Strasse and Kulturforum as a metaphoric intersection between the former East and West German cultures.

Piano's projects are difficult to place in a particular category, but he is certainly one of the most exceptional architects of the 20th century. He constantly tries to liberate his design intentions from formal constricting preoccupations as he unifies art and technique. For Piano, the design process is not a linear progression to the final product. Piano's architecture develops out of a circular process in which presolutions are constantly reevaluated. For that reason, the team workshops develop a countless number of models on an extraordinary high level of craftsmanship. His architecture often applies the latest technology but is never dominated by it. As a result, most of his buildings appear rich in details but often seem so light as to lift up in the wind. Stability is achieved by their flexibility—an intelligent relationship to dominant cultural, historical, and environmental facts.

RICHARD KÖCK

S*ee also* **Cultural Centre Jean Marie Tjibaro-Noumia, New Caledonia; Fiat Works, Turin; Kahn, Louis (United States); Kansai International Airport Terminal, Osaka; Menil Collection, Houston, Texas; Pompidou Center, Paris; Rogers, Richard (England)**

Biography

Born in Genoa, Italy, 14 September 1937, son of a builder. Studied at Milan Polytechnic School of Architecture with Ernesto Rogers, Jean Prouvé, and Franco Albini (1959–64). Studied two years at the University in Florence. Married first wife Magda Arduino in Milan; 3 children: Carlo, Matteo, and Lia. Opened first architectural office (1964–70) in Milan, with additional work with Louis Kahn in Philadelphia and Z.S. Makowky in London. First major commission in 1969, the Italian Industry Pavilion at Expo 1970 in

Osaka, Japan. In partnership with Richard Rogers (Piano & Rogers, 1971–77). Later worked with Peter Rice in partnership (Atelier Piano & Peter Rice, 1977–81). Established Renzo Building Workshop with offices in Genoa and Paris, with about 100 employees (1980). Since 1992, married to E. Rossato. Awarded numerous international prizes: International Union of Architects Prize, Mexico City (1978), Honorary Fellow American Institute of Architects (1981), Honorary Fellow Royal Institute of British Architects (1985), Royal Gold Medal for Architecture/Royal Institute of British Architects (1989), Honorary Doctorate Stuttgart University, Germany (1990), Honorary Doctorate University of Delft, the Netherlands (1991), Goodwill Ambassador for Architecture, UNESCO (1994), Pritzker Architecture Prize (1998).

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Office building for B&B, Como, Italy, 1973
Pompidou Center, Paris, France, 1977
IRCAM, institute for acoustic research, Paris, France, 1977
Rehabilitation project for historical centers, Otranto, Italy, 1979
VSS experimental vehicle for FIAT, Turin, Italy, 1980
Calder retrospective exhibition, Turin, Italy, 1982
Musical space for Prometeo opera by L. Nono, Venice, Italy, 1984
Office building for Lowara factory, Vicenza, Italy, 1985
IBM Travelling Exhibition in Europe, 1986
Museum for the Menil Collection, Houston, Texas, 1986
San Nicola football stadium, Bari, Italy, 1990
Housing for the City of Paris, Paris, France, 1991
Renzo Piano Building Workshop, Punta Nave, Italy, 1991
Columbus International Festival, Aquarium and Congress Hall, Genoa, Italy, 1992
Reorganization Lingotto for Fiat, Turin, Italy, 1994
Kansai International Airport, Osaka, Japan, 1994
Cité Internationale, Lyon, France, 1995
Museum of Science and Technology, Amsterdam, Netherlands, 1996
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PIETILÄ, REIMA (1923–93) AND RAILI (1926-)

Architects, Finland

In the 1960s, Reima and Raili Pietilä became the leading architects of Finland by proposing an organic architecture as opposed to the uniform, prefabricated architecture of that time, an approach that related their work to that of Alvar Aalto. The roots of Pietiläs' architecture lie partly in the tradition of European Expressionism of the 1920s; partly in the theoretical influence of Aulis Blomstedt, the founder of the study group Le Carré Bleu; and partly in the awareness of the genius loci. They created a theory of imitating nature with architecture, and their design approach can be described as being natural and intellectual at the same time.

Although Reima and Raili Pietilä adressed issues such as language, literature, philosophy, and art on the theoretical level, the formal approach of their architecture is often directly related to the landscape and to the natural conditions of the building site. Lasting until 1969, their most creative period began in 1958, when Reima won the competition for the Finnish Pavilion at the Brussel's World's Fair.

After graduating in architecture from the Helsinki Institute of Technology, Reima Pietilä was first employed by the Master Planning Department of Helsinki City. In 1957 he set up his own private practice, having won the 1956 competition for the Finnish Pavilion, a monument to the Finnish sawmill industry. The wooden modular structuralism of the exhibition building was based on a symbiosis of local features and a strictly abstract composition, much in the spirit of the Le Carré Bleu group aesthetics. In 1960 he was joined in his practice by his wife, Raili, who had also graduated from the Helsinki Institute of Technology the year before and who had worked for a while at Aalto's office. The Kaleva church in Tampere, sited on an open hill, was their first project together. The competition was won in 1959 and the building completed in 1966.

The floor plan is composed of U-shaped concrete curves that mark the outline of a Christian fish symbol. The section is very simple, with a flat roof: the plan was extruded to derive the interior space, a high volume with long, vertical window slits. The sculptural monumentality of the interior with its mystical light choreography was intended to recall organ music and was much indebted to the sculptural space concept of Umberto Boccioni.

The Pietiläs' Dipoli student and conference center (1966) at Otaniemi is reminiscent of Aalto's habit of opposing a geometric form with an organic shape. The site where Dipoli was built was given character by its large, exposed, granite shield originating from the glacial era. The roofline is a simulation of the microgeography of the site while also being a reptilian metaphoric image. The idea was to work against any tradition and preconceived styles but to let the building become part of the forest. More than any other project of the Pietiläs, it is not architecture in the traditional sense but, rather, part of the environment.

The modular strategy appears again in the Suvikumpu Housing Project (1969), a mixed development of 162 apartment units sited on a steep, wooded hillside in Espoo that was planned in 1962 with some additions made in 1983. To avoid the monotony of massing, the apartments are connected along a line, following the form of the central hill. The landscape is reflected in the varying vertical and horizontal masses of the building. The facades are composed of white plaster and dark wooden surfaces that invoke the region's bright sunlight and respond to the changing patterns of light and textures of the surrounding woods.

After this project was realized, the Pietiläs did not receive any important commissions in Finland, except for two minor projects, until 1975. This period certainly had a negative effect, as their later work did not achieve the strength of the earlier projects. Reima Pietilä was nominated a professor of arts, and from 1973 to 1979 he taught at the University of Oulu, initiating the Oulu School—an architectural trend rich in form—and applying regional and international features. In 1973 the Pietiläs received the commission for building the offices of the Ministry of Foreign Affairs (1982) at the Sief Palace in Kuwait, and in 1975 they won the competition for the Hervanta Congregational, Leisure, and Shopping Center (1979) in a suburb of Tampere. In 1978 they won the competition for the Tampere Main Library ("Metso"), which was finished in 1986. In these projects, the Pietiläs moved toward an early kind of Postmodernism. In the Sief Palace, they combined environmental elements, such as sun baffles, with local cultural traditions and metaphorical statements, such as fountains in the shape of coral flowers of the reef below the building. For the Hervanta shopping center, the formal influence of railway stations and the turn-of-thecentury mall in Tampere was most important. However, the architects make references to the ruins of the Forum Romanum, and the adjacent congregational center of Hervanta suggests a forest fable. The Tampere Main library grew out of two images: a male wood grouse and a mollusk shell. This representational approach seems to follow the tradition of organic-shaped library buildings that Aalto had established. Indeed, the curved roof of the Metso recalls typical Aalto designs.

In their late works, the Pietiläs returned to the design concepts of Dipoli: to create a "naturalized" building. There is no longer any ambition to imitate natural forms but, rather, one to set up a dialogue with nature. In the Finnish Embassy (1985) in New Delhi, the roof patterns viewed from above simulate the geomorphology of Finland, with its parallel furrows and hills, strip lakes, and islands. From the side, the eaves are shaped like snow sculptured by the wind. The chimneys on the roof of Mäntyniemi (1987), the residence of the Finnish president in Helsinki, resemble a burnt forest, as a simulation of a possible or fictional Stone Age scenery, and the elevations take their cue from the landscape as well.

DÖRTE KUHLMANN

S*ee also* **Aalto, Alvar (Finland); Finland; Helsinki, Finland**

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PILGRIMAGE CHURCH AT NEVIGES

Designed by Gottfried Böhm; completed 1968 Neviges, Germany

After World War I, the Catholic Church began to change its position concerning restraints between worship and the physical architecture of the church. By the end of World War II, the evenly proportioned synagogue-style or basilica plan of the past, where the programmatic and visual thrust of the church centered on the sanctuary, was being replaced by spaces conceived from individual congregational requirements. The technological development of steel girders and concrete combined with relaxed church regulations moved church building away from traditional ecclesiastical architecture.

Mary, Queen of Peace, the Pilgrimage Church (1968) at Neviges, Germany, that is today a quarter of the city of Velbert, is the oldest pilgrimage church north of the Alps associated with the “Immaculata.” Built by Gottfried Böhm, it was a response to the increased number of pilgrims of the 1950s.

The object of the pilgrimages is a 17th-century etching of the Virgin owned by the monks at Dorsten, Germany. Mary is reported to have spoken through the picture directly to one of the Franciscan clerics, instructing him in the art of healing. In 1680 the engraving was moved for protection to the fortified, baroque church of Neviges. This building housed the artwork until 1968, when it was moved to Böhm's new pilgrimage church.

Böhm, a third-generation architect and the son of the respected builder of Roman Catholic churches, Dominikus Böhm, had designed a variety of buildings ranging from museums to public housing when he was commissioned. Before the Neviges project, Böhm had built an important church in Kassel, Germany, an assignment that introduced many of the problems and solutions that he successfully integrated later at the Pilgrimage Church.

Interior, Pilgrimage Church at Neviges, Germany (1968)

An estimated 10,000 pilgrims make the annual visit to view the miraculous engraving of

Mary and the expressionistic church that houses it. They arrive by train, bus, or automobile. All modes of transportation set the pilgrim on his or her journey at the Elberfelder road. From here, the pinnacles of Böhm's Pilgrimage Church can be glimpsed from time to time as the traveler makes his way through the historic village of Neviges. Böhm intended that the tantalizing glimpses of the church should be gained as the pilgrim processes through the halftimbered, slate-roofed town. Eventually, the old baroque church is reached, as is the monastery. Then time and architecture take a great leap forward as the initial stages of the goal are reached. Böhm presents a gentle-stepped polychromed stairway organically hugging the natural contours of the site. Workstations as well as modular units of the pilgrim's house containing welfare services and sleeping cells are on the left; temporary tent-like coverings can be stretched over the slight steps to accommodate outdoor activities. Then, as one passes beyond the last pod of the pilgrim's house, the church thrusts upward like a prism reflecting the steep pitched roofs of Neviges and the evergreen clad mountains in the background.

The Pilgrimage Church roof is constructed of a concrete skin 25 centimeters thick. Therefore, the interior is a negative of the exterior; the form of the building is plastic and boundless. The church is impossible to accurately measure, although approximate dimensions are listed as 37 meters wide by 50 meters in

Exterior, Pilgrimage Church at Neviges (1968)

© Inge and Arvid von der Ropp

length. The exterior walls measure between ten and 20 meters, with the apex of the uppermost creased plane computed at 34 meters. No right angles exist, and the form is totally asymmetrical. The floor is a multicolored design extrapolation of the outside steps and sweeps the visitor into the structure, past loggias that are reminiscent of the cellular administration pods directly outside. Quite simply, Böhm brings the pilgrim to the village, the village to the administration buildings, and the administration buildings to the Pilgrimage Church. Only in the sanctuary is the processional stopped.

The altar, unlike the synagogue-style church, is not fixed; it is movable, dependent only on the function of the changing activity of the church. The chairs are likewise not secured to one specific place. Like the village macrocosm Böhm's structure imitates, the pilgrim is at liberty to move about, to explore the ecclesiastical environment and reflect on the architecture, the world, and the spirit.

Massive, vertical stained glass windows touch the muted concrete interior with pink and burgundy light. The glass is designed with the traditional symbols associated with Mary; however, the execution is anything but conventional. The outsized scale is sometimes overwhelming. A single crimson rose burns in a window, the symbol of the Virgin's sacrifice; an emerald interlace evoking Hiberno-Saxon manuscripts uncoils along the steps.

The Pilgrimage Church (Mary, Queen of Peace) is important in that it breaks completely with the symmetrical designs of ecclesiastical architecture. It redefines the concept of pilgrimage church and brings it into contemporary existence as conference center, hostel, and spiritual focus.

ALLISON HOUSTON SAULS

S*ee also* **Böhm, Gottfried (Germany); Church**

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PLAN OF CANBERRA, AUSTRALIA

Designed by Walter Burley Griffin; completed 1911

The plan of Australia's capital city of Canberra, as designed in 1911 by the Chicago architect Walter Burley Griffin (1876– 1937), is one of the major examples of a 20th-century planned capital and the only one whose design was selected in competition. The 12 sheets of drawings, as rendered by Marion Mahony Griffin (1871–1961) and her assistants and presently housed in the National Archives of Australia, record one of the most significant chapters in the history of modern urban planning.

The need for an Australian national capital arose when the six separate British colonial states on the continent were federated in 1901 to provide a mechanism for dealing with one another and with the outside world. From the Australian perspective, this need for a new capital city was not great; the competition for its creation was announced only a decade later. The decision to locate the new Australian Capital Territory between Melbourne in Victoria and Sydney in New South Wales—the capitals of the two most populous states and notorious rivals—was more political than practical and produced the only major inland Australian city.

The competition for a capital city with an initial population of 25,000 was announced on 30 April 1911 with a closing date of 31 January 1912. By that time (or at least by early March, when the actual judging began), the Department of Home Affairs had received 137 submissions. Although these included designs from around the world, British and Australian architects had boycotted the competition because of the makeup of the adjudicating committee as well as the Australian government's position that the winning design would not necessarily be implemented.

On 23 May 1912, the committee unveiled the winning designs and, in the presence of reporters, ceremoniously cut open the envelopes, revealing the identities of the winners. Walter Burley Griffin of Chicago was awarded first prize; second prize went to Eliel Saarinen of Helsinki, Finland; and third prize was given to Alf Agache of Paris.

The selection of Griffin, a youthful 35 years of age, came as a complete surprise to nearly everyone. Raised in Chicago's western suburbs, Griffin studied architecture at the University of Illinois (1895–99); drafted for Dwight Perkins and Robert Spencer, two members of the emerging Prairie School; and between 1901 and 1906, worked for Frank Lloyd Wright as landscape designer, office manager, and site superintendent. Between 1906 and 1914, Griffin practiced independently in Chicago before resettling in Australia to supervise the construction of Canberra. His experience as federal capital director was fraught with difficulties, and he resigned in 1920. Although Canberra was officially dedicated in 1927 and has subsequently grown to a population of more than 300,000, it bears only a general resemblance to Griffin's original design.

Griffin's career encompassed the three separate disciplines of architecture, landscape architecture, and urban planning. Many of his most satisfying projects, like Canberra, combine all three. Because nothing remains of his reputed plan for enlarging Shanghai, China (ca. 1905–06), his earliest surviving urban scheme appears to be the small town of Idalia, Florida, designed around February to March 1911, only a few months before the official announcement of the Canberra competition. Griffin later recalled, however, that he had known of the impending need for an Australian capital city for many years and was eager to contribute to its success. As he explained in 1913 to King O'Malley, head of the competition committee, "I…entered this Australian event to be my first and last competition, solely because I have for many years greatly admired the bold radical steps in politics and economics which your country has dared to take…yours is the greatest opportunity the world has afforded for the expression of the great civic ideal." As James Weirick has explained, Canberra "was intended to express in its physical form, the true nature of the democratic experience" (Weirick, 1998).

The site was composed of a rolling valley surrounded by hills and bisected by the wide streambed of the intermittent Molonglo River. Griffin created a design whose basic format was determined by this landscape. The axis defined by the crown of the nearest high hill, Mount Ainslie north of the river (and just outside the city limits), to the most prominent point in town, Kurrajong to the south, became the generating line of the entire plan. Griffin termed this the Land Axis. At the point where this line crossed the Molonglo, Griffin defined a perpendicular Water Axis, to be given expression by damming the river to create a series of lakes, the central three of which would be formal and geometric and the outer two left irregular and "natural."

Griffin ordered the landscape by separating areas according to use: civic, cultural, political, economic, and residential. He divided the city into hexagonal, octagonal, and circular subcenters, connected by major boulevards that radiated from the subcenters. The scheme was subtly configured to the changing topography while remaining part of a clearly defined geometric diagram originating from Kurrajong.

Although the competition guidelines had called only for the general placement of some 38 public buildings, most entries included perspective renderings that attempted to give a corresponding architectural image to the proposed city. Although Mahony's perspectives at first glance suggest that this was also the case with Griffin's entry, in fact Griffin went beyond this, making complete designs for the group. By combining the footprints on the plans with the elevations and section that appear on the various axial drawings, it is possible to re-create the individual buildings. Griffin added another structure not listed in the competition precis: atop Kurrajong Hill, he placed a design labeled as the Capitol building, a stepped ziggurat that was to serve as a kind of national focal point, what Griffin called "the figurative embodiment of the spirit of the Commonwealth" (Griffin, 1923, quoted in Weirick, 1989).

Griffin intended his plan to provide a legible cipher of the interrelationships among the political, economic, cultural, and spiritual forces at work in a progressive, democratic nation. The very placement of the public buildings in the great triangle descending from the Capitol to the central lake revealed the relative positions of the branches of government.

The sources for Canberra are wide and varied. Griffin drew on such city plans as Christopher Wren's 1666 scheme for rebuilding London; Pierre L'Enfant's plan for Washington, DC (1790), and its reintroduction as the Senate Park Commission's plan of 1901; the City Beautiful movement, especially Daniel Burnham and Edward Bennett's Plan of Chicago (1906–09); and the English Garden City movement. There is no real precedent, however, for the hierarchies of building placement, the configurations to subtle changes in topography, and the unity of landscape to urban design found in the plan of Canberra.

PAUL KRUTY

S*ee also* **Griffin, Walter Burley, and Marion Mahony Griffin (United States)**

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PLAN OF CHICAGO

The Plan of Chicago, developed mainly by architect Daniel H. Burnham (1846–1912) and his assistant Edward H. Bennett (1874–1954), was the first master plan for an American city and its region in the 20th century. Burnham developed ideas for the plan from 1894 on, though his consistent work on the project for Chicago's Commercial Club began in late 1906. The plan was published as a book in 1909 with renderings by Jules Guérin (1866–1946), when its drawings were exhibited at The Art Institute of Chicago. Although the city's form was discussed for decades after the Great Chicago Fire of 1871, the plan was largely motivated by success of the World's Columbian Exposition of 1893 in Chicago, for which Burnham had served as chief of construction and that had posited a neoclassical model for urban design that integrated public buildings and parks. The Plan of Chicago also owed much to Burnham's work as head of the MacMillan Commission, charged by the U.S. Congress with the planning of central Washington, DC, in 1901–02, and to his plans for Cleveland (1903), San Francisco (1905), and Manila (1905). The Plan of Chicago was also based on Burnham's systematic consultation with local experts and citizens, a process that helped to ensure its acceptance and partial implementation.

Burnham's earlier urban plans featured a central focal group of neoclassical public buildings linked to each other and to the surrounding city with broad, tree-lined avenues. This idea was central to the Plan of Chicago, which featured large new railroad passenger terminals and a cultural and civic center on the city's near West Side, dominated by a tall, domed city hall. Architecturally, the plan included recommendations for common cornice heights for buildings and generous street widths, aiming to create a visually unified cityscape on the model of Second Empire Paris. Burnham requested plans of pre- and post-Haussmann Paris, along with information on over 20 American and 30 European cities. As Burnham wrote: "the city has a dignity to be maintained; and good order is essential to material advancement. Consequently, the plan provides for impressive groupings of public buildings and reciprocal relations among such groups." Burnham saw his city some 70 years after its founding in 1833 as

Plan of Chicago

having reached a stage of development that called for permanent monumentality in civic buildings and landscapes.

The Plan of Chicago was to both enable and present an image of ordered economic growth. In this it went further than many essays in the City Beautiful Movement by proposing to consolidate Chicago's extensive and varied rail traffic network, including tracks of common width, and a shared system for handling freight. Presented in the same year that the Model T Ford was introduced, the Plan of Chicago featured a regional highway system for automobiles, including both radial arteries and circumferential ring roads within a 60-mile radius of the city's center to connect it with its suburbs and to link suburbs to each other. The future city was to be an efficient transportation network for the facilitation of commerce, with extensions of an ordered plan out into the surrounding region. As Burnham wrote: "The plan frankly takes into consideration that fact that the American city, and Chicago pre-eminently, is a center of industry and traffic. Therefore attention is given to the betterment of commercial facilities; to methods of transportation for persons and for goods; to removing the obstacles which prevent or obstruct circulation; and to the increase of convenience." Toward this end, the plan proposed routing different types of motor traffic on double-decker streets connected by ramps, with pleasure vehicles above freight trucks. Water transport was to be improved by straightening the Chicago River and by building windbreaks stretching a mile into Lake Michigan to protect new harbor facilities.

The plan included an inland park system that vastly extended Chicago's earlier parks with connecting carriage boulevards designed by Horace Cleveland and Frederick Law Olmsted. Perhaps most important for the city's future development, the plan proposed a comprehensive treatment of 23 miles of lakefront parks for public recreation, including lagoons for rowing, and numerous playgrounds, especially for the city's poorer classes who had little access to green space inland. As Burnham wrote, "When a citizen is made to feel the beauty of nature, when he is lifted up by her to any degree above the usual life of his thoughts and feelings, the state of which he is a part is benefited thereby." The plan's aim was to promote good citizenship at a time when 1.3 of Chicago's 1.7 million residents were foreign born and when the deplorable working and living conditions of the city's poor were as described in Upton Sinclair's *The Jungle* (1906). The plan aimed to create an ideal built environment that would educate citizens' tastes and shape social norms according to bourgeois models and in the service of capitalist interests. Burnham wrote: "It is realized, also, that good workmanship requires a large degree of comfort on the part of the workers in their homes and their surroundings, and ample opportunity for that rest and recreation without which all work becomes drudgery." Although aimed at improving the quality of life for all, the plan included no provisions for publicly funded housing.

The Plan of Chicago directly influenced the subsequent development of the city from the mayor's appointment of an official planning commission in late 1909 through the financial crash of 1929. Major improvements of these 20 years based on the plan included the widening and enhancement of Michigan Avenue north of the Chicago River, the landfills and development of Grant Park on the central lakefront and lakefront parks to the north and south, and the construction of Wacker Drive along the Chicago River. The Plan of Chicago had rapid influence beyond the city, first in inspiring the German Kaiser to appoint a commission in 1912 to replan the capital of Berlin. The Plan of Chicago was also a point of reference for developing the Regional Plan of New York City and its environs of 1929.

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S*ee also* **Burnham, Daniel H. (United States); Chicago (IL), United States; City Beautiful Movement**

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PLAN OF NEW DELHI

At an imperial durbar in 1911 hosted outside the walled city of Shahjahanabad (later called Old Delhi), King George V announced plans to transfer the seat of the government of India from Calcutta to a new imperial capital to be built in the vicinity of that very spot. It was to become the "New" Delhi. The aim was to present the British Raj as the legitimate successor of the Mughal Empire precisely at a time when British rule was being challenged by Indian nationalists. Near Shahjahan's old capital, amid the ruins of a score of erstwhile capital cities and far from the tumultuous nationalist politics of Calcutta, a new imperial British capital was hoped to capture the fiction of peaceful and benevolent domination of an alien people. The historic importance of the site of Delhi was to be revived after a century of neglect to serve as a necessary counterpoint to the demonstration of British power.

By early 1912, a Delhi Town Planning Committee was organized, comprising Edwin L.Lutyens, an architect then known mostly for his design of country houses; John A.Brodie, city engineer of Liverpool; and George S.C.Swinton, chairman-elect of the London County Council. Henry V.Lanchester, who had a well-established architectural practice in London, was appointed as an external consultant. Among them, only Swinton had any previous firsthand knowledge of India. The committee's responsibility was to suggest a suitable site for the new capital and to formulate a general plan for the city. From the very beginning, two assumptions were made clear. First, the new capital would be used only as the government's winter residence, with the customary annual migration to Shimla during the summer months. Second, the centerpiece of this plan would be the Government House (later called the Viceroy's Palace, presently the Rashtrapati Bhavan), the residence of the head of the British administration, the viceroy. Designed as the center of government and not a commercial city, the imperial capital was to physically represent the administrative and power hierarchy of the British Raj, complete with its class and racial stratification.

At the initial stages, two different sites and two types of plans were proposed. One of the sites was to the north of Shahjahanabad near the British Civil Lines and Durbar Grounds; the other was to the south of the existing city between Raisina Hills and

Green spaces around the Jami Masjid, New Delhi

the Jamuna River. The Town Planning Committee favored the spacious southern site as more suitable for their exaggerated monumental vision of the city and the ease with which one could make visual reference to the historic monuments that were located on the southern and eastern limits. The principal feature of the committee's early plan was a ceremonial avenue with closely packed government buildings terminating at the Government House and opening up a vista to the Jami Masjid, the largest Mughal mosque in the existing city; the rest of the new capital was conceived on a rectangular matrix of roads. The monotony of the plan raised questions, and Lanchester attempted to improve on the committee's scheme by suggesting replacing the rectangular pattern with a series of radial streets. At the crossing of the ceremonial avenue and these radial arteries, he proposed a plaza around which to arrange the Secretariat buildings. When the committee was again asked to reconsider the northern site, their revised plan took some hint from Lanchester's layout. They proposed a more tightly knit ensemble of government institutions headed by the monumental place of the Government House and deviated from the rectangular pattern by making the peripheral roads adjust to the topography.

When officially "opened" in 1930, the city was planned for a maximum population of 65,000, covering an area of 3200 acres. The final plan, which underwent many subsequent adjustments, was based on a revised treatment of the southern site that retained several ideas from the preceding plans. The Government House, or Viceroy's Palace, was still the focal point. It was perched on Raisina Hills and connected by straight avenues to the Purana Qila on the west, to the railway station on the northwest, and to Safdarjung's tomb on the south. The scheme borrowed from the principles of Beaux-Arts planning as well as from new notions of the garden city but ultimately conformed to the hierarchical planning pattern of British cantonments in India. By the time the final plan was reached, Herbert Baker, an architect who had acquired a reputation for his work in South Africa, was brought into the team and the specific architectural treatment of the monuments were being prepared. Lutyens was awarded the design of the Viceroy's Palace and Herbert Baker the Secretariat and Council House. It was the monumental classical architectural vocabulary, which Lutyens had rehearsed long before he was given the building commission, that gave specific meaning to the plan that ultimately developed. The appliqué of Indian decorative elements on this imperial classicism at a later stage only enhanced the symbolic logic of the plan, which was meant to unambiguously subordinate the "old" city and the Indian population to the new capital and its British denizens.

A long, processional 440-feet east-west parkway, named King's Way (presently Rajpath) and a cross-avenue named Queen's Way (presently Janpath) formed the central armature of a multinode hexagonal plan. Traveling along King's Way from the Purana Qila, the visitor encountered a series of monuments along the Central Vista—a wide expanse of green space accentuated by water channels. Anchored by the monumental canopy that once housed the statue of King George V and, on the west, the War Memorial, the parkway led to the "cultural" node, which was meant to house four colonial institutions at the four corners of the crossing of King's Way and Queen's Way—the Imperial Museum, the Oriental Institute, the Imperial Library, and the Imperial Record Office (presently the National Archives, the only building constructed before Indian independence). Then a dense arrangement of imperial symbols prepared the visitor for the principal focus of the plan—the Secretariat Blocks on raised platforms on either side framing the centrally located Viceroy's Palace, which dipped from view as one approached the Secretariat Plaza, only to emerge later in its full regalia once one reached the top of the plaza. This vanishing vista was the result of a controversial miscalculation of the street gradient. The Viceregal Estate, the entry to which was guarded by a series of Britannia lions and anchored with the Jaipur column, covered approximately two-thirds of a square mile and housed, in addition to the main palace and integral council chamber, the symmetrically arrayed staff quarters and the elaborate "Mughal" garden. The rotund Council House (included in the plan in 1919, presently the Parliament Building) played a subsidiary role in the imperial administration and was located off the main axis to the north of the Secretariat Blocks. Radial avenues from the Council House and War Memorial, as well as Queen's Way, converged on Connaught Place—the principal commercial node—before leading to the railway station. Residential space was allocated according to a strict sociospatial taxonomy based on site elevation, proximity to the Viceroy's Palace, dwelling and plot size, and most important, segregation along occupational and racial lines. The houses of the members of the Executive Council were located closest to the seat of power, whereas gazetted officers were allocated space to the south of the Central Vista near the lavish and exclusive green recreational space of racecourse and parks. Indian princes were encouraged to purchase land to the east, whereas European clerks were assigned space to the north. Indian and Anglo-Indian clerks and "menial" staff were situated on the periphery of the new city in separate enclaves. The separation between the new and the old city was physically completed with a surrounding wall (demolished in 1950) and a 100-yard-wide and mile-and-a-half-long green space around the old city.

Obsessed with the demonstration of imperial power, the planners created an infrastructure of inequity that would pose both physical and ideological problems when, at midcentury, the city became the capital of a new democracy. Defined on the basis of unequal access to resources and glaring population differentials between the old city and the new, it was neither amenable to public transportation nor anticipatory of a significant population increase and its attendant need for schools, shopping, and housing.

SWATI CHATTOPADHYAY

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PLASTICS

At no time in history has a material developed so rapidly and became interwoven in the fabric of our daily lives as have plastics. In fact, today's styles of living would be unimaginable without their existence. Less than 200 years old, these materials have become part of almost every facet of our daily lives. Plastics have played a variety of roles in the building and construction industry, but especially so in the 20th century.

Although the invention of many forms of plastic has origins in the 19th century, their practical application for consumer products and other industrial uses came about in the 20th century. For example, a major milestone was achieved in the evolution of plastics when John Wesley Hyatt, an American, invented Celluloid in 1866 by adding camphor (a derivative of the laurel tree) to nitrated cellulose. This was the first thermoplastic in the sense that it could be molded under heat and pressure to form a shape and that it would retain that shape after the heat and pressure were removed. In 1891 Louis Marie Hilaire was trying to produce man-made silk in Paris when he modified nitrated cellulose to form rayon. In 1907 Leo Baekeland, a New York chemist, discovered the first completely synthetic man-made substance, which he called Bakelite. This liquid resin is considered the first thermoset plastic ever produced because once it hardened, it would never change. Later, in 1913, Dr. Jacques Edwin Brandenberger, a Swiss textile engineer, produced viscose (now known also as rayon), which led to his invention of cellophane, the first true waterproof wrapping material. After the use of cellophane spread worldwide, DuPont's laboratories, under Wallace H.Carothers, developed Fiber 66, which was later named nylon. This fiber replaced animal hair in toothbrushes and silk stockings. In fact, nylon stockings enjoyed great public acceptance when unveiled in 1939, and reinforced nylon fabrics were being used in air-supported structures. At B.F.Goodrich, Waldo Semon, an organic chemist, developed an inexpensive, fire-resistant, and easily formable substance named polyvinyl chloride (PVC), or vinyl, which became the base material for thousands of household products, from garden hoses to records. Meanwhile, in Germany, H.Staudinger discovered the molecular structure of plastics, and Carothers, in turn, realized that by adding and replacing elements into the chainlike molecules of plastics, one could produce many types of new compounds. This particular discovery gave the plastics industry its prolific nature vis-à-vis the many useful polymers introduced since then, such as nylon, acrylics, neoprene, SBR (Styrene Butadiene Rubbers), saran, polyethylene, Velcro, Teflon, Spandex, Nomex, and Kevlar, all of which replaced, at one time or another, materials typically supplied by nature. The most widely utilized polymer, however, has been polyethylene, a thermoplastic first discovered in 1933 by Fawcett and Gibson. At present, polyethylene is the largest-volume plastic in the world, with such uses as milk jugs, soda bottles, grocery and dry-cleaning bags, food storage containers, packaging, and in the construction industry as a reliable source of water proofing.

After World War II, plastic products were everywhere. Inventors were continuously filing patents for new plastics, and the American public's view of the image of such products became increasingly negative. In reality, polymers had two main disadvantages. First, they had relatively low stiffness, and as such they were rendered nonviable where structural integrity was required. Second, they degraded rapidly when exposed to heat and ultraviolet (UV) radiation. Consequendy, plastic products were thought of as cheap, nonenduring, fake, and environmentally unfriendly. The U.S. military, however, noted the desirable characteristics of polymers. As such, it was military applications in the mid-1950s and 1960s that carried the torch for the plastics industry. In aerospace applications, higher rigidity and lighter weight led to a landmark development in the evolution of plastics, and fiber-reinforced polymers were born. By combining the relative flexibility of some thermosetting plastics, such as epoxies, and the high rigidity of fibrous materials, such as graphite, aramid, and boron, new and far superior materials were created and dubbed advanced composites. The notion that embedding fibers, short or long, in a binding medium to create a new and improved plastic manifested itself in different forms and led to the creation of such materials as ceramic/metal composites and braided Kevlar. These superior plastics were used in applications ranging from armored personnel suits and gear to intercontinental ballistic missiles and the space shuttle.

Plastics and the Construction Industry

All the desirable qualities of 1950s plastics did not escape the watchful eyes of the construction industry, which has always been on the lookout for more competitive building materials to replace existing ones. Plastics appeared as vinyl siding and as foam insulation in homes and buildings, making them much more energy efficient and comfortable for their occupants. Plastics were also used in underground storage tanks and in pipe systems. There were even a few adventurous attempts by individuals and companies to construct all-plastic houses intended as showcases only and not for mass production. A primary early example was the Monsanto House of the Future (1957–68) at Disneyland in Anaheim, California. This structure was envisioned at the Massachusetts Institute of Technology and assembled for Disneyland in 1957 using structural fiberglass-reinforced polyester elements. Other attempts during the 1950s to build houses out of plastics were made, but they never quite presented the construction industry with any serious alternatives. The only notable effort to mass-produce affordable plastic housing was made by Ionel Schein when he presented his *Maison Plastique* (Plastic House) in a housing exhibition in 1956. The Bucharest-born designer used 15 different plastics and three colors—yellow, red, or blue—in all 70 prototypes he produced. In 1974 the higher prices of raw materials, resulting from the oil embargo and more competitive concrete and steel industries, put an end to Schein's production of plastic houses.

In the late 1970s and in response to the stabilization of oil prices as well as emerging environmental concerns for conserving natural resources, most manufacturing industries made serious and successful attempts at incorporating plastics into their design and materials selection processes. Once again, plastics were gaining an excellent reputation for superior and cost-effective performance in applications where their beneficial characteristics can be best employed. The construction industry was not immune to this movement. Plastics were recyclable, and as such they reduced construction waste; their use in construction is environmentally responsible, conserves natural resources, and is consistent with the concept of sustainability; in addition, their ease of fabrication, transportation, and erection resulted in a relatively lower life-cycle cost. As a result, they started appearing in many applications, such as glass-reinforced plastic (GRP) moldings to replace cast-iron work, as cladding and roofing materials in multistory buildings, as corrugated translucent sheeting (e.g. indoor swimming pools), as replacement of metals for electrical insulation purposes (e.g. ladders, man lifts, light and telephone poles, special hospital structures, CB radio antennas, radar and military facilities, airport control towers, transmission and electrical power towers, and power plant structures), as structural and nonstructural elements in water/wastewater treatment and desalination plants, as agricultural and irrigation equipment and structures (e.g. manure filters, weirs, barn structures, and watergate guides), as cooling towers (e.g. housing units), as industrial chimneys, and as waterfront and offshore structures (e.g. oil rigs and marine risers).

Architecturally, plastics presented the designer with the advantage of controlling the texture, color, and the shape of any designed element. This inherent quality of manufacturing plastics allowed for greater design flexibility in such issues as shading, form flow, and patterns repetition, all the while maintaining lower costs and faster erection time than other conventional materials. Examples of such cases include but are not limited to cladding panels for the Olivetti Training Centre (1972) in Haslemere, Surrey, England; 50-meter-diameter roofing domes at the Sharjah International Airport (1977) in the United Arab Emirates; and the access ramps to Terminal 2 (1978) at Heathrow Airport in London. A more widespread use of FRPs (Fiber-Reinforeed Plastics) in construction was hindered for three main reasons. First, there was still a prevalent lack of knowledge in the general design philosophy, behavior, and limitations of such materials, including their relative low stiffness and heat- and UV-light-resistive capabilities. Second, there existed other competitive, long-established, and more familiar construction methods and materials. Third, building and design codes dealing with the design specifications and testing methods of plastics did not exist at the time. All these reasons made it difficult for designers and builders to shift into unknown and untested building materials. As such, during the 1970s and early 1980s, the usage of FRPs remained limited to specific applications in which they were the only choice for the conditions under which a specific structure existed.

Since the mid-1980s, the world has witnessed an unprecedented reliance on and use of plastics in construction. The integration of plastics into the building industry proliferated so rap-idly that in 1998 more than 20 percent of all plastic resin sales in North America were used for fixed construction. In fact, about two-thirds of all thermosetting polymers (mainly polyesters and vinylesters) produced today are consumed by the building and construction industry. There were six main reasons for that remarkable growth: environmental concerns increased regarding the sustainability, conservation, and recycling of used materials; the prices of raw materials for producing plastics had dropped significantly while costs of lumber soared; with much improved fire retardancy and heat and UV resistance, FRPs had proven by then, through research and actual field-performance track records, that they were solid substitutes for typical construction materials; there were significant advances in the technology of producing polymers, in improving their qualities, and in manufacturing their fiber-reinforced components; the end of the Cold War allowed for a tremendous amount of information and expertise about high-performance plastics (i.e. advanced composites) to migrate from the military and aerospace industry into the construction world; and finally, a worldwide deterioration of some infrastructures (i.e. bridges and highways) demanded the immediate attention of governments worldwide and forced them to look for alternative construction materials. As a testament to the energy-absorption capabilities and strength of fiberreinforced plastics, the California Department of Transportation approved, after the 1994 Northridge earthquake, the use of plastics for seismic retrofitting of reinforced-concrete highway decking and column systems. In addition, the versatility of improved polymers allowed inventors to come up with such structural elements as glue-laminated timber members (glu-lams) and fiber-reinforced glu-lams. These elements allow for larger loadcarrying and spanning capabilities, less natural wood to be used, and lower cost when compared with lumber members. In addition, polymers were being used to produce plastic lumber and polymer concretes, which, when reinforced with glass fibers, produced members with exceptional strength and rigidity and of lighter weight and smaller dimensions.

As confidence and knowledge about plastics in the world of construction increased, designers and contractors found themselves routinely adding them to their repertoire of available options for building materials. Plastics have been successfully used in such projects as the FRP Turret Sun Bank Building (1988) in Orlando, Florida; the Nations Bank Tower (1989) in Atlanta, Georgia; and as window/door lintels (1993) at Pennsylvania State University in University Park, Pennsylvania. Realizing the potential of plastics in construction, government agencies supported collaborative academic and industrial research efforts to further the understanding of the nature and characteristics of fiber-reinforced plastics. A landmark result of such efforts was the plastic industrial building constructed at Weston, West Virginia, in November 1995. This 12.31-meter-long, 6.45-meterwide, 4.31-meter-high structure was the result of a joint research-and-development effort between the U.S. National Science Foundation, the West Virginia Department of Transportation, and the Constructed Facilities Center at West Virginia University headed by Professor Hota GangaRao. Perhaps the most salient structural building achievement for plastics to date is the Eyecatcher (1999). This is the first five-story residential/ office building constructed completely out of fiber-reinforced plastic (glass and polyester) pultruded structural profiles. Fiberline Composites of Denmark unveiled the Eyecatcher Project during the Swissbau ’99 Fair in Basel, Switzerland. After the exhibition, the ten-meter-wide, twelve-meter-long, fifteen-meter-high building was disassembled and brought to its new and permanent location at Münchensteinerstrasse 210, Basel. The Eyecatcher, which opened in 1999 as an office building, will require absolute minimal maintenance over the next 50 years and will have a life expectancy of 100 years.

The Future

Today, with more than six billion human beings living and building on this planet, environmental consciousness is at its peak, and the efforts of aggressive recycling programs and conservation of our natural resources are at an all-time high. Plastics are playing a major role in these conservational endeavors in the building industry, where plastics are competing in the main arena of conventional construction materials and in structurally demanding applications. Given their remarkably short history, the prolific nature of their industrial evolution during the 20th century, and the inherent likelihood of accidental discoveries in their field, one could only conclude that the use of plastics in general, and in the building and construction industry in particular, will experience an even larger proliferation in the new millennium. As such, the 20th century will always be remembered as the dawn of the plastics age.

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PLATE GLASS

Glass is an unusual material created from the basic components of earth-sand, soda, and lime. In buildings, glass can be the source of both intriguing delight and distress. Used as fenestration in building envelopes, it creates the well-balanced and skillful face of a building, the facade. Glass allows light to enter, warms interior spaces in the winter, and is capable of establishing a flowing relationship to the outside. Glass can contribute like no other building material to the enjoyment of architecture; it encloses, protects from the environment, and visually connects at the same time.

The origins of glass and glassmaking can be traced back to Phoenician times, around

5000 B.C.Sailors, lacking stones on which to place their cooking pots, used as an alternative the soda carried as cargo by their ships. As the fire's heat increased, the sand and soda turned into molten glass. The public baths in ancient Pompeii were among the first usages of plate glass; records indicate that a single sheet of glass measuring 3 by 4 feet (800 by 1100 millimeters) was used as a window, an extraordinary achievement at the time.

Between the 10th and 15th centuries, the small island of Murano near Venice was the unchallenged center of glassmaking, although the technology quickly spread via France to Germany, Belgium, and England. Other techniques to produce high-quality building glass included the blowing of glass cylinders that were then split, reheated, allowed to flatten, and then rolled on a flat surface.

In the early 18th century, larger and relatively inexpensive pieces of glass increasingly entered the building trade in Europe. It cannot be denied that the quality of the product had much improved from the humble beginnings of Venetian glass manufacturing, yet one area remained where the glass quality was insufficient: the making of mirrors. Mirrors, more than regular glass panes, required a much higher surface quality, free of distortion. The goal to create a high-quality glass material to be used in mirrors led to the invention of plate glass. The casting of mirrors was developed in France by Abraham Thevart around 1688 and led to the founding of the St. Gobain glassworks, which was at the time the major glass-producing center in the world.

Because of milestone inventions of the industrial age at the end of the 19th century, such as steam machines and electricity, plate glass and thus mirrors became commonplace. Water-power, steam engines, and electrical machines made the polishing and grinding of the glass plate material easier and faster: plate glass became affordable. At the end of the 19th century, storefronts and the facades of commercial buildings in the metropolitan centers of the Western world used vast quantities of plate glass.

Because plate glass has a rough surface, as opposed to sheet glass (the Libbey Owens Glass Company developed continuous sheet glass production in the United States in 1905 in Charleston, West Virginia), which is transparent as it is formed, it needs to be manually ground flat and then polished with coarse, sand-based abrasives. Through manual grinding and polishing, one surface was first treated, followed by the reverse side. The result of this time-consuming process was a glass with almost perfect optical quality, nearly free of distortion (depending on the quality of the mixture of base materials), and of an unprecedented size.

After being monopolized in France, Belgium, and Germany, in 1895 the Pittsburgh Plate Glass Company (PPG) became the first successful manufacturer of plate glass in the United States. The company was founded in 1883, with the first glass production plant in Creighton, Pennsylvania, near Pittsburgh. The company produced plate glass in varying thickness, generally between one-quarter and one-and-one-quarter inches. The beginning of the 20th century brought further development in the area of glass production, mainly because of improved polishing and grinding techniques. In 1925 the company of Pilkington Brothers in Doncaster, England, developed the technology of continuous grinding and polishing. By 1937 the plate of glass was horizontally moved through a double roller and then ground and polished in the same line of production—with both sides handled simultaneously (twin grinding).

Large panes of polished plate glass allowed the initial floors of commercial buildings to be opened up to the eager and curious eyes of "window shoppers," a term that described a significant change in the behavior of consumers to view and select merchandise without crossing the threshold of the respective enterprise. The first four floors of the 14-story Reliance building were designed in this manner in 1890 by Charles B.Atwood of Daniel Burnham's office and the structural engineer E.C.Shankland: all perimeter bay windows were filled with plate glass.

Between 1930 and 1940, glass products moved forward in importance as new uses of glass were suggested. The all-glass door appeared and was soon widely favored. The glass door, without structural elements obstructing the view to the inside of stores, reduces the visual barrier that formerly prevented potential customers from entering. Advertisements by the glass in-

Plaza and PPG Place Skyscraper (formerly Pittsburgh Plate Glass Company, PPG Industries, Inc.), Philip Johnson and John Burgee (1979–84)

dustry in architectural magazines of the time noted, “Today store fronts of large plate glass try to make sure that passers-by won’t pass them by!” (Pittsburgh Plate Glass advertisement in *Progressive Architecture,* 1946). Large display windows made of structural plate glass successfully competed with other, more traditional materials.

Designs for large stores by the architect Morris Lapidus in the 1950s turned storefronts into eye-catching, gigantic, and glittering display cases made of plate glass.

Not only in the area of storefront design did plate glass try to establish new records. In 1950 the UN Board of Design Consultants, under the directorship of Wallace K.Harrison and the contracting firm of Fuller-Turner-Walsh-Slattery Inc., designed and built on the island of Manhattan in New York “the world’s largest window,” a window wall made of heat-absorbing plate glass with dimensions of 280 by 500 feet. The UN Headquarters also boasts 5400 individual plate-glass windows and large numbers of opaque spandrel glass elements.

In 1961 Libbey-Owens-Ford developed new testing methods for large plate-glass elements with a thickness of a quarter inch. Tests indicated that thickness rather than the ratio of width to length is the important factor governing the strength of plate glass for larger panes.

Plate glass also became more and more favored in residential design in the 1950s and 1960s. The Case Study Houses, commissioned by John Entenza and published in his influential magazine *Arts and Architecture,* formed the cutting edge of design in America and abroad in the postwar period. In these designs for progressive residences by Richard Neutra, Pierre Koenig, Rudolph R.M.Schindler, and others, plate-glass walls extend from floor to ceiling, creating a tall interior space, with the transparent walls allowing a spatial flow between the interior and exterior. The crisp, pure geometry of these house designs, using large panes of polished plate glass and the interweaving of interior and exterior spaces, became hallmarks of the International Style in residential architecture. The horizontal roof planes of these Californian residences, which were largely copied in other parts of the world, seem to float without gravity on large surfaces of vertical plate glass.

Plate glass was also used in school designs of the time to add a feeling of spaciousness; designers also selected plate glass because of its ease of maintenance. With glass being widely used, it was more than natural that issues of solar heat gain, glare, and safety of the material became more necessary to consider than any other building material issue. Tinting of plate glass to reduce the large heat gain of uninterrupted glass walls was developed in the early 1950s; the trade names Solargrey, Solarbronze, and Solex, for example, described the color in which the surface of plate glass was treated to reduce thermal conductivity. Safety issues were addressed by the development of tempered plate glass, mainly used for doors. An excellent late example of the use of green-tinted plate glass is the Lever House in New York by architect Gordon Bunshaft of Skidmore, Owings and Merrill.

In the United States and most other industrialized nations, plate glass is no longer produced. It was superceded by float glass, the most recent advancement in glass manufacturing.

RALPH E.HAMMANN

S*ee also* **Bunshaft, Gordon (United States); Burnham, Daniel H. (United States); Glass; Harrison, Wallace K., and Max Abramovitz (United States); Lever House, New York; Neutra, Richard (Austria); Schindler, Rudolph M. (Austria and United States); Skidmore, Owings and Merrill (United States); Skyscraper**

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PLATT, CHARLES ADAMS 1861–1933

Architect, United States

Charles Adams Platt was one of the leading American domestic architects and landscape architects of the early 20th century. He was born in 1861 in New York City, where he eventually established his practice as an architect and landscape designer. His father was a corporate lawyer and his mother a member of the Cheney family, important silk-mill owners from Manchester, Connecticut. He began his artistic education during summer vacations in Manchester, where two uncles were artists. While still in his teens, he became an early member of the Etching Revival, learning to etch from the Philadelphia artist Stephen Parrish. Platt trained briefly in painting at the National Academy of Design and the Art Students League before going to Paris in 1882 for further study at the Académie Julian. While in Paris, he met architecture students at the École des Beaux-Arts and discussed with them his emerging interest in this art. In 1886 he married a New Yorker, Annie C.Hoe, while in Europe; she died the following year, losing twin daughters in childbirth. While slowly recovering from this tragedy, Platt continued to paint and spent the summer of 1890 with artist friends in Cor-nish, New Hampshire. He would continue to summer in the Cornish art colony, where the quality of the landscape and the collegiality of sympathetic friends remained an important force throughout his life.

In 1892 Platt invited his brother William, then an apprentice in the landscape architect office of Frederick Law Olmsted, to accompany him on a tour of the gardens of Italy. Charles Platt used the sketches and photographs they made of approximately 25 gardens from throughout the Italian peninsula to illustrate two articles for *Harper's* magazine in 1893. He expanded these articles into a book, *Italian Gardens,* published in 1894. This modest volume was one of the first illustrated publications in English depicting the gardens of Renaissance Italy, and it heavily influenced the emergence of a formal garden style in America.

Platt turned from this book to a career as a designer of gardens and then as an architect, both without any academic training or apprenticeship. He had begun to experiment with architecture in his own summerhouse and garden at Cornish in 1890. He expanded and refined the gardens for his house, following the lessons learned from his travels in Italy. In the summer of 1893, he married Eleanor Hardy Bunker, the widow of his Paris friend and fellow painter Dennis Miller Bunker.

Throughout the 1890s, Platt's Cornish neighbors commissioned him to design informal residences and geometric gardens, all influenced by what he had seen in Italy. Among these early clients was the architectural critic Herbert Croly, who became an important promoter of Platt's architectural and landscape architectural talents in his articles for *The Architectural Record.* By the late 1890s, he was executing significant commissions as a garden designer for patrons beyond Cornish. Most important among these early designs were his plans for Faulkner Farm, the Charles F.Sprague estate (1897–98), and for Weld, the Larz Anderson estate (1901), both in Brookline, Massachusetts. These projects illustrate Platt's adaptation of the Renaissance villa garden to American conditions. By the turn of the century, he had established himself as an architect, producing mainly designs for country houses and gardens. He relied in these early days on the advice of a wide circle of artistic friends in New York City and in Cornish, including the architect Stanford White. Platt's associates at the Century Association, the private club for professionals and amateurs in literature and the arts, proved invaluable as advisers and clients. Having no formal training in horticulture or engineering, he often worked in collaboration with other landscape architects, including the Olmsted Brothers, Warren Manning (1860–1938), and Ellen Biddle Shipman (1869–1950), his Cornish neighbor and most frequent collaborator. He developed a small office in New York from which he executed commissions throughout the country, relying on the professional expertise of younger men and carefully controlling the design solutions of the firm. By 1904, when Herbert Croly published a review article on Platt's work for *The Architectural Record,* he had established a recognized style in planning and design of domestic architecture. Commissions for "Platt houses" and their landscapes annually grew in number and scale.

Among the most influential of Platt's designs for country houses and gardens were those for Maxwell Court, the Francis T.Maxwell House (1903) in Rockville, Connecticut; Gwinn (1908), the William G.Mather place near Cleveland, Ohio; the Manor House

(1911), the John T.Pratt estate in Glen Cove, New York; and Villa Turicum (1918), the immense country estate of Harold and Edith Rockefeller McCormick in Wake Forest, Illinois. Platt's work was frequently illustrated and discussed in architectural and landscape magazines, including *The Architectural Record* and *Country Life in America.* In 1913 he became the subject of the first commercially produced monograph on a living American architect or landscape architect. In addition to his work on country houses, he designed a series of elegant tall office buildings and apartment houses in New York City throughout his career. Institutional designs monopolized much of his time in the 1910s and 1920s. He became recognized as a leading architect for art museums, which included the Freer Gallery of Art (1923) on the Mall in Washington, DC, and an unrealized proposal for a National Gallery of Art (1924). He also gained national recognition as an architect and planner for schools and colleges, especially the master plans he prepared for Phillips Academy in Andover, Massachusetts, between 1922 and 1930 and the plans for the University of Illinois, Urbana, that he prepared between 1921 and 1933. He designed numerous buildings for both campuses and other schools and universities throughout the country.

Platt was a careful student of history and applied the lessons he learned to the needs of contemporary buildings, pleasure gardens, and public spaces. In all his work, Platt emphasized careful planning, evident in the meticulous axial relationships of rooms or the integration of exterior and interior space through the use of architectonic garden components and strong vistas. Although he almost never wrote about his own work, his designs were frequently published and exerted a strong influence on his generation.

KEITH N.MORGAN

Biography

Born in New York, 16 October 1861. Attended the National Academy of Design, New York and the Art Students League, New York 1878–82; studied painting independently 1882–83 and under Jules Lefèvre at the Académie Julian, Paris 1883–87; Julian toured Italy 1892. Married Annie C.Hoe, 1886; she died 1887. Married Eleanor Hardy Bunker (widow of painter Dennis Miller Bunker) 1893:4 children. Designed and built a studio in Cornish, New Hampshire 1890. In private practice, New York from 1898. Died in Cornish, 12 September 1933.

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Platt House and Studio, Cornish, New Hampshire, 1890

Gardens, Faulkner Farm, Chades F.Sprague estate, Brookline, Massachusetts, 1898

Gardens, Larz Anderson estate, Brookline, 1901

Gardens, Francis T.Maxwell House, Rockville, Connecticut, 1903

Herbert Croly House and Garden, Cornish, 1904

Studio Building, New York City, 1906

William G.Mather House and Garden, Cleveland, Ohio, 1909

John T.Pratt House and Garden, Glen Cove, New York, 1913

Villa Turicum, estate of Harold and Edith Rockefeller McCormick, Wake Forest, Illinois, 1918

Freer Gallery, Washington, DC, 1923

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PLAZA

The term *plaza* is a Spanish word for an open space in the city. It is cognate with the French and English *place,* which are ultimately derived from the Greek word *plateia,* meaning "broad street." The Italian-word equivalent is *piazza*. The contemporary American term is *square,* although the terms *park* and *green* are also utilized. In all cases, the terms mean an urban space (which might be paved or landscaped) surrounded by streets and defined by buildings on one or more sides. They vary highly in both size and geometric configuration. A plaza is inextricably related to the architectural frame that defines it, as it is the functions in these buildings and their density that directly influence its use and design.

Plazas are the public open spaces in a city whose primary purpose is to provide a gathering place for the people to foster the creation of community. They are sometimes called urban living rooms, places of formal and informal socialization. They are also places of spatial focus providing orientation, repose, and historical continuity.

Plazas can also accommodate specific activities, such as markets, performances, celebrations, protests, and recreation. The traditional use of public spaces for political activity waned in the 20th century in democratic countries but remains alive in socialist countries, as evidenced by the recent incidents at Wenceslas Square in Prague and Tiananmen Square in Beijing. The use for markets also waned during this century in the industrialized cities of the world. The other uses remain current.

Virtually all Western historical cities, planned and unplanned, were formed around one or more urban plazas. The vast majority of these cities throughout the world were founded before the 20th century. Thus, the primary design activity of this century has been preservation with only modest changes. Many cities have renovated their primary plazas. This is most evident in Savannah, Georgia, with its integrated pattern of historical squares.

In cities where there has been dramatic change in density and transportation, the plazas have changed in design. This occurred in the 20th century primarily in the United States, Canada, and Australia. The most common response has been to build a parking garage beneath the plaza and concomitantly redesign it. This occurred first at Union Square in San Francisco in 1942.

Existing plazas in some cities needed to be redesigned in the 20th century to correct design deficiencies. Bryant Park behind the New York Public Library at Fifth Avenue and 42nd Street had become the turf of drug dealers because of its physical and visual separation from the surrounding streets. Landscape architects Hanna/Olin produced a highly acclaimed scheme that took out the perimeter hedge and widened the entry points. They also provided abundant seating and luxuriant plantings.

In other cities, the plaza had to be redesigned because of a changed context. This is the case with Boston’s Copley Square, which has been the subject of periodic design competitions since 1893. The 1966 design treated the square as a terraced Italian piazza, windswept and inhospitable and lacking pedestrian amenities. The battle to preserve its scale was essentially lost with the construction of the 60-story John Hancock Building on a corner of the square. It overwhelms the two masterpieces of historical architecture on the square: Trinity Church and the Boston Public Library. Another design competition in 1984 resulted in a scheme based on a village green. Now, increased pedestrian traffic from surrounding development threatens the survival of the soft landscape in this small but precious public place.

In Barcelona, Spain, more than 150 open spaces have been rebuilt in an effort to revitalize the city after the neglect during the Spanish civil war. These range from neighborhood parks to urban plazas, many featuring large sculptural works. All are designed as multiuse gathering spaces. Their designs are a dialectic between formal and informal geometries taking advantage of circumstantial opportunities. The Mediterranean tradition of paved places has been continued with judicious use of trees and planting. For the 1992 Olympics, the port was reconstructed as an urban plaza defined by shops and restaurants featuring twin high-rise towers.

In Italy there is a great urban tradition of the piazza as the social and spatial focus of a town. Some of these have been artistically redesigned to foster new vitality. Redesigned piazzas in Cormans, Vilanova, Pirano, and Santa Severina are abstract minimalist compositions of paving geometry and urban elements that create new perceptions of these places as they relate to the historic buildings that define them.

Some cities have had to create plazas where none existed. This occurred in Portland, Oregon, because of the need for a true central civic place. A design competition in 1980 resulted in a highly contextual scheme created by a design team led by architect Willard Martin. The resulting Pioneer Square is almost completely paved in brick, an unusual condition in the United States, which favors green, open spaces. To ensure the successful use of this square, a private association programs 300 events throughout the year, including dinners, dances, concerts, exhibits, and fairs. This draws 2.5 million people annually to a city whose population is only 500,000.

New squares in Boston and Toronto were created in conjunction with new city halls. The Boston City Hall Plaza (1962–

Avenue de los Presidentes, El Vedado, Havana, Cuba

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68) is a large, tiered, brick-paved space reminiscent of the Campo in Siena, Italy. Nathan Phillips Square in Toronto is formed around a large pool and fountain that becomes an ice-skating rink in winter.

Most new plazas designed and built in the 20th century in the United States, Canada, and Australia have been in conjunction with real estate developments. The modern era of the developer plaza begins with the design and construction of Rockefeller Center (1931–39) on three blocks in Manhattan. John D.Rockefeller, Jr., wanted to create an appealing complex of buildings around an urban space to make his development succeed during the 1930s Depression era. The team of architects created a design that brought pedestrians through a garden from Fifth Avenue to a sunken plaza in the middle of the complex. The sunken urban space connected the street-level shops to an extensive underground concourse system, creating pedestrian links between all the buildings. The plaza reflects the change of seasons, being an ice-skating rink in winter and an outdoor cafe with a fountain in summer. What started as a real estate venture has developed into one of the best social spaces in New York City.

Corporations have often built plazas in conjunction with new urban headquarters. One of the first of this type was the Seagram Building (1958) on Park Avenue in Manhattan designed by Ludwig Mies van der Rohe. This flat, elevated, granite-paved plaza was intended to showcase the modern office tower that was set back from the street. The only features are two shallow pools of water, surrounded by ledges that separate the plaza from the side streets. Inadvertently, this plaza has become one of high pedestrian use because of its direct physical and visual connection to Park Avenue.

There are now dozens of corporate plazas in Manhattan alone, including Union Carbide, Chase Manhattan Bank, and Marine Midland Bank. Perhaps the bleakest is at the World Trade Center: five acres of paving with an overscaled fountain to match the overscaled 110-story buildings. Chicago has the Sears Tower, San Francisco the Bank of America, and Los Angeles the Wells Fargo Bank, each with its own plaza. Every large American city has its share of corporate plazas. Usually, these are windswept expanses of paving with token landscaping and few if any pedestrian amenities. Many have been created through zoning bonuses that allow taller and/or bigger buildings if plazas are provided. The research of William H.Whyte has been instrumental in making these plazas more pedestrian friendly.

There is an extensive legacy of urban open spaces in the cities of the world. In some countries, these are still utilized for traditional purposes. In other countries, they are languishing in use because of changing cultural norms and dispersal of the population. The suburban shopping mall has become the most ubiquitous substitute for the urban plaza. The primary question for the 21st century will be whether historic urban places can be preserved, redesigned, and utilized.

MICHAEL J.BEDNAR

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PLEČNIK, JOŽE 1872–1957

Architect, Yugoslavia

An old modest house, located at No. 4 Karunova Street in the Trnovo district to the northeast of Ljubljana's core, has remained as Jože Plečnik's modest legacy; he was undoubtedly one of the most significant 20th-century Slovenian architects and a prominent pioneer of modern architecture in Central Europe.

Plečnik's house is characterized by frugality and an elegant, albeit monastic, ambience. The search for an identity for Slovenian architecture; the fascination with folk traditions; craftsmanship; the interest in the classical world, particularly the Renaissance and Mannerist periods; and a devotion to the sacred are among the themes that characterize Plečnik's oeuvre.

His architectural career unfolds from the last quarter of the 19th century to the mid-20th century. Vienna, Prague, and Ljubljana became the geographic areas of the architect's activities, each one coloring a phase of his production. In 1891 Plečnik's father passed away, a circumstance that contributed to Plečnik's decision to move to Vienna as opposed to returning to Ljubljana to take over his father's woodworking workshop.

The following year, with assistance from the architect Leopold Theyer, who procured him employment with the firm K.K.Hof-Bau und Kunsttischelerei J.W.Müller, Plečnik finally moved to Vienna. His arrival in the capital of the Austro-Hungarian Empire was timely as it coincided with the transformation of the imperial city into one of the centers of world architecture. The architectural and urban efforts of Otto Wagner and several of his followers were decisive contributions to the transformation of this city's infrastructure and physiognomy. In 1894 Plečnik met Wagner, who accepted him as a student at the Academy of Fine Arts. This was a definitive period in the formation of the future architect, who became a devoted adherent of Wagner's ideals. Wagner gave primacy to technique over form and to innovation over tradition and emphasized a positive Rationalist position, thus anticipating many of the critical themes developed later as part of the Modern movement.

In 1898 Plečnik graduated third in his class after Josef Hoffman and Jan Kotera. His efforts earned him a bursary that allowed him, from 1898 to 1899, to travel to Italy with short incursions into France and Spain. Although the death of his mother prompted the young architect to put an abrupt end to this Grand Tour, the rich extant correspondence and drawings from the period show Plečnik as a very sensitive and keen observer of architecture and art.

Plečnik's Viennese period, marked by an initial devotion to Wagner's rational aesthetic, also reflects the architect's involvement with the Vienna Secession movement, founded in 1897 by architects Joseph Hoffman and Joseph Maria Olbrich and painter Gustav Klimt. Plečnik worked on projects for the Secession, which included designs for contemporary furniture and household furnishings. His first important commission, the

Zacherl House (1903–05) in central Vienna, dates from this epoch. Undoubtedly the architect's early masterpiece, the Zacherl House is innovative in the use of concrete technology for the structural support.

Plečnik's interest in sacred art, a theme that would pervasively appear throughout the architect's career, also emerged during the early years of the 20th century. His Church of the Holy Spirit in Ottakring (1910–13), the first reinforced-concrete church in Vienna, is an excellent example of the expressive use of materials.

The second period of Plečnik's professional career began in Prague in 1911. With the help of his friend Jan Kotera, he was appointed to a teaching position at the Prague School of Applied Arts. Plečnik's stay in the Czech city, which included many visits to Vienna until the outbreak of World War I, permitted him to distance himself from the strong German nationalism then emerging in Vienna and to concentrate on the study of Slavic art, a theme that would shape his later work.

The search for Wagner's replacement as a director of the Academy of Fine Arts in Vienna during the early 1910s gave Plečnik the hope for a return to the city that he considered his home. Although Plečnik was the faculty's choice for the post, the students protested the appointment, and after two years the position was given to Léopold Bauer instead. Disillusioned by this turn of events, Plečnik discarded any plans to return to Vienna.

The second decade of the century saw Plečnik actively involved in teaching in Prague. This phase was distinguished by a lack of built production that was nonetheless counteracted by a return to a preoccupation with craft—particularly metalworking—through his teaching activities. During this period, the architect often traveled to Slovenia, beginning a process of reacquaintance with his family and native land that greatly contributed to his desire to return to Ljubljana.

In the early 1920s, Plečnik concluded his academic activities at the Prague School of Applied Arts and returned to Slovenia, where he began teaching activities at the Polytechnic School of Ljubljana. However, before his departure for Slovenia, he received the offer from the newly elected president of the Czech republic, Tomás Masaryk, to become the architect of the Prague Castle. This important commission, through which Masaryk intended to transform Prague's highly visible historical royal compound into the architectural symbol of the new democracy, became Plečnik's obsession throughout a great part of this period. He returned to Prague each year until 1935—the year Masaryk abdicated—to supervise the work. Other significant buildings from this period include his restoration of the Presi-dent's summer residence in Lány (1921–23) and the Sacred Heart Church in Prague (1928–32).

Ljubljana marks the last, and undoubtedly most productive, period in the architect's career. After the return to his homeland, Plečnik devoted himself to an architectural and cultural campaign that produced significant buildings raging from sacred architecture to institutional projects and urban interventions, transforming the architectural fabric of that city. The buildings from this phase clearly express the architect's search for a national Slovenian language, idiosyncratic nonetheless, but craftily executed and based on Mediterranean rather than Nordic precedence. This period includes the Church of Saint Francis of Assisi, Siska (1925–31); Saint Michael's Church, Barje (1937–38); and the renovation of the Chamber of Commerce, Craft, and Industry (1925–27), the

Headquarters of the Vzanjemna Insurance Company (1928–30), the National University Library (1936–41), and the Central Funerary complex at the Zale Cemetery (1938) in Ljubljana. The Ljubljana oeuvre epitomizes the syncretic amalgam of themes and motives, influenced by classic, neoclassic, and vernacular imagery that persistently nourished the production of Plečnik—without doubt one of the significant, yet overlooked, figures of modern architecture.

RICARDO CASTRO

Biography

Born in Lujbljana, 23 January 1872, third of four children, son of a woodworker; studied woodworking, Technical School in Graz 1888–92; while there met architect Leopold Theyer, his first mentor. Met Otto Wagner (1894), with whom he studied at the Academy of Fine Arts, Vienna 1895–98; graduated in 1898. Traveled on scholarship to Italy, France, and Spain 1898–99. Returned to Vienna and began to work in Wagner's studio 1899–1900. Moved to Prague in 1911; appointed to faculty of Prague School of Applied Arts; taught at the trade school in Prague 1911–20; designed alterations at Prague Castle. Settled in Ljubljana (1920), where he taught at Ljubljana University until his death in Trnovo, Ljubljana, 7 October 1957.

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Villa Weidmann, Vienna, 1901
Loos Residence, Vienna, 1901
Zacherl House, Vienna, 1905
Church of the Holy Spirit, Ottakring, Vienna, 1913
National Gallery of Art, Ljubljana, 1913
Headquarters for Vzanjemna Insurance Company, Ljubljana, 1930
Church of Saint Francis of Assisi, Siska, Ljubljana, 1931
Sacred Heart Church, Prague, 1932
Central Funerary complex, Zale Cemetery, Ljubljana, 1938
St. Michael's Church, Barje, Ljubljana, 1938
National University Library, Ljubljana, 1941

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POELZIG, HANS 1869–1936

Architect, Germany

Hans Poelzig was an important exponent of German Expressionism. Together with Walter Gropius, Adolf Meyer, and Peter Behrens, he was one of the most important German architects before 1914.

From 1889 to 1894, Poelzig studied architecture with the renowned Gothic Revivalist Karl Schäfer at the Technical University (Technische Hochschule) in Berlin-Charlottenburg. From 1899 to 1916, he taught at the Academy of Fine and Applied Arts (Akademie für Kunst und Kunstgewerbe) in Breslau (now Wroclaw), first as professor of style (Fach Stilkunde) and after 1903 as director of the academy. From 1916 to 1920 he also served as city architect (Stadtbaurat) in Dresden and visiting lecturer at the Dresden Technical University. In 1920, he moved to Berlin, where he had a master workshop at the Prussian Academy of Arts. In 1923 he was appointed professor at the Berlin Technical University. In 1933 he succeeded Bruno Paul as director of the U.S. School for Free and Applied Arts in Berlin, only to be stripped of all his academic offices shortly thereafter by the National Socialists. In 1936 he accepted a professorship in Ankara, Turkey; however, he died before being able to begin work in this émigré position. Poelzig was a member of the "Novembergruppe" and the Workers' and Soldiers' Council for Art, the presiding officer of the German Werkbund (1919–21), and a member of the governing council of the League of German Architects (Bund Deutscher Architekten, 1926–33).

Poelzig was passionate about the arts generally, and he also created large-format paintings. His contemporaries considered him to be an unpredictable, temperamental creative force. In addition to being an innovative architect, Poelzig was an influential teacher whose concepts and ideas reached a large audience. Especially during his tenure in Breslau, he promoted a program of cooperative effort between handicrafts and art, and thus—years before the Bauhaus program was formulated—he represented a similar, pathbreaking position.

Unlike many of his contemporaries, Poelzig was less rooted in Jugendstil and more inspired by new concepts of living and house design, such as those formulated by Alfred Lichtwark and Hermann Muthesius. He was also significantly influenced by rationalist ideas about style based on an honest use of building materials. Fundamental traits such as these are apparent even in early works, such as his own house near Breslau/Wroclaw (1906), the Zwirners house in Löwenberg/Lwówek Slaski (1909–10), and the house for the Breslau Art and Crafts Exhibition (1904). Ever more pronounced, Poelzig had a strong interest in deriving plastic architectonic forms from the chosen building materials, a practice that he had given theoretical form in his 1899 study *Materialstillehre* (Lessons in Materialist Style). Alongside his designs for country houses, his industrial designs bear this trademark. The first such work of importance was the water tower

(Oberschlesienturm) in Posen/Poznan (1911, partially destroyed) with its crystalline features, which was built as an exhibition pavilion in conjunction with a mining exhibit. The exterior featured an exposed iron skeleton open to the elements into which he placed brick niches that were clearly meant only to fill in the gaps in the exposed frame.

Poelzig also used building materials symbolically. Rather than rely on ornament borrowed from historicist or Jugendstil models, he allowed the special character of the building materials to determine the decorative shape of a building's interior and exterior. In this way, he composed visual confrontations based on the innate qualities of the materials. In his design for the Werdermühle in Breslau (1906–08), facade portions in glass contrast with massive brick walls. Similarly, in an office building (1912) on Breslau's Junkernstrasse, he juxtaposed steel-framed concrete construction reminiscent of half timbering with horizontal bands of windows running unbroken around the rounded corners of the building. In this way, even before World War I, he created a design motif that was frequently used by the rationalistic architecture of the 1920s and 1930s and that for him was suggested by the plastic potential of glass, steel, and brick.

Poelzig successfully combined diverse elements into harmonious architectural designs. In many projects, he wanted to decrease the monotony of large industrial complexes and administrative buildings. Into such designs, he incorporated a variety of architectural forms to artistically balance large-scale architectural masses and expressive construction. A good example of his use of these principles is found in the avant-garde, pseudo-objectivist buildings for a chemical factory (1911–12) in Luban. There, Cubist forms blended into each other. Round-arched windows set flush with the masonry contrast sharply with rectangular windows. To show off the design's engineering, rectangular windows were specifically chosen for the parts where load-bearing steel beams visible in the facade made such windows possible. Occasionally, he punctuated such rationalist, material-derived effects with purely decorative elements; for example, Gothicinspired stepped gables.

Poelzig's work after World War I was rooted in the Expressionist movement, particularly his practice of overplastering plastic architectonic elements to heighten their effect. He began a series of crystalline structures, including his design for the House of Friendship (1916) in Istanbul, the plans for a Town Hall (1917) in Dresden, and the Festival Hall (1920) in Salzburg. These projects show how he moved toward an ever more individualistic treatment of design elements and materials. He combined new architectural concepts with an extremely personal interpretation of formal traditions.

These developments culminated and were most demonstratively realized in his best-known building, the Grosses Schauspielhaus (1918–19), a transformation of the Schumann Circus in Berlin undertaken for Max Reinhardt as an experimental theater. In the theater's vaulted auditorium, he created a famous cavelike effect by covering the domed ceiling with a sheath of stalactite forms. The room's organic appearance was in part the result of his use of a post-and-lintel system. Poelzig's use of light as an aesthetic element in giving form to the space was innovative, creating a total spatial effect based on an elaborate conception of color—his "light architecture," or *Lichtarchitektur*. The theater's exterior was flat, with little surface decoration, although decidedly monumental in appearance. Together with the simply delineated and sparsely decorated structure of the I.G.Farben administrative building (1930) in Frankfurt am Main, the exterior of the

Grosses Schauspielhaus pointed the way to the International Style of the 1930s.

The Radio House in Berlin (Haus des Rundfunks, 1929–30) likewise stands in this path of development. It was the first German broadcasting building to be built. Based on a triangular floor plan, Poelzig articulated a brick-masonry facade with colored ceramic plates, creating a fenestration of high plasticity that, in pillar fashion, emphasizes the perpendiculars of the three wings of the building, each of which reaches over 150 meters.

Simple yet striking articulation of the volumes typifies Poelzig's subsequent sketches, designs, and buildings. These include the Capitol Cinema (1925) in Berlin, the Mosaic Fountain (1926) in Dresden, the competition designs for the expansion of the Reichstag (1929) in Berlin, the new plan for the Luxemburg Platz (1929), proposed designs for numerous gas stations (1927), and Poelzig's participation in the competition for the new Reichs Bank building (1932). Poelzig's late work shows increasing neoclassical tendencies; for example, in his contest entries for a theater (1935) in Dessau. In addition to his activity as an architect, Poelzig designed scenery for the theater and films, notably for *The Golem* (1920) and other films by P.Wegener.

STEPHAN BRAKENSIEK

Biography

Born in Berlin, 30 April 1869. Studied under Karl Schäfer at the Technische Hochschule, Berlin 1889–94. City architect, Dresden 1916–20. Professor of style 1899–1903, director 1903–16, Akademie für Kunst und Kunstgewerbe, Breslau; visiting lecturer, Technische Hochschule, Dresden 1916–20; master workshop, Prussian Academy of Arts, Berlin from 1920; professor, Technische Hochschule, Berlin from 1923; director, U.S. School for Free and Applied Arts, Berlin from 1933; stripped of academic offices by National Socialists 1934; accepted position as professor in Ankara, Turkey, but died before starting. Member, Novembergruppe; member, Workers' and Soldiers' Council for Art; president, German Werkbund 1919–21; member of governing council, Bund Deutscher Architekten 1926–33. Died in Berlin, 14 June 1936.

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Werdermühle, Breslau, 1908
Zwirners House, Löwenberg, Germany, 1910
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Office Building, Junkernstrasse, Breslau, 1912
Milch Chemical Factory, Luban, Germany, 1912
House of Friendship (competition project), Istanbul, 1916
Town Hall, Dresden, 1917
Grosses Schauspielhaus, Berlin, 1919
Festival Hall, Salzburg, 1920

Capitol Cinema, Berlin, 1925
Mosaic Fountain, Dresden, 1926
Reichstag Expansion (competition; unexecuted), 1929
I.G.Farben Headquarters, Frankfurt am Main, 1930
Radio House, Berlin, 1930

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POLSHEK, JAMES STEWART 1930

Architect, United States

James Stewart Polshek has restored to late-20th-century practice one of the most admirable legacies of modernism—its belief that architecture is wedded to ethics, that the primary concern is not the creation of personal monuments but of functional and structurally sound buildings that answer the evolving programmatic and economic needs of the time. By extending that notion to embrace the vital importance of context as a key ingredient of such responsibility, Polshek mediates the dogmatic utopian oversimplifications that often flawed modernist practice. Thus, his works are not isolated icons of style but rather buildings that defer to both the site and the people who inhabit them.

Born in 1930 in Akron, Ohio, Polshek entered the premedical program at Case Western Reserve University in Cleveland, but an introductory course in architectural history led to a dramatic change in plans. He transferred to the School of Architecture for his fourth and final year and in 1951 entered Yale University's graduate program, receiving a master of architecture degree with honors in 1955. After a brief stint under I.M.Pei at Webb and Knapp developers in New York City, in January 1956 he accepted a Fulbright scholarship in Copenhagen that allowed him to observe firsthand the making of sound and economically viable buildings in a socially progressive country while permitting him to travel to see the work of such early heroes as Le Corbusier and Alvar Aalto.

On returning to New York City in 1957, Polshek accepted a position in the office of the Harvard-trained Ulrich Franzen, but in 1962 he embarked on a remarkable odyssey for a young man: the commission for two major buildings in Japan for the Teijin Textile Company. He lived in Japan until 1964, absorbing the lessons not only of modern masters such as Kenzo Tange and Kunio Maekawa but also of traditional Japanese architecture. The two concrete behemoths for Teijin, in the Brutalist idiom then current, received awards in Japan and the United States, and Polshek's career was launched. One measure of his growing visibility was the invitation in 1968 to design the Quinco Mental Health Center in that town of trophy works by leading architects, Columbus, Indiana. Set in a wooded area, Quinco's *béton brut* planes create a "bridge" over an existing creek, incorporating the structure into its natural surroundings.

Subsequently, Polshek received a broad range of commissions to include master plans for cities, campuses, colleges, and cathedrals, designs for public housing, corporate headquarters, sewage treatment plans, embassies, theaters, convention centers, museums, libraries, and apartment houses. Polshek undertook domestic commissions (such as private homes for individuals) as well, although his preference for community architecture prevailed, including projects involving preservation, restoration, and adaptive re-use. Especially noteworthy are the reconstructions of such landmarks as Carnegie Hall (1978–87), Cass Gilbert's U.S. Customs House, the American Museum of Natural History, and the Cooper-Hewitt Museum of Design, all in Manhattan, and Delano and Aldrich's Sage Hall, Smith College, in Northampton, Massachusetts.

A particular triumph of what Polshek terms "reinforcement" is 500 Park Tower in New York City (1980): the sleek aluminum, glass, and stone surfaces of the 40-story residential and commercial tower, the massing of which is inspired by the PSFS building in Philadelphia, form a bold but empathetic backdrop to the former Pepsi-Cola headquarters of 1959 by Gordon Bunshaft, which Polshek has restored. His "Cinderella wand" has endowed even modest relics with new lives as stunning images and functional ensembles: at the Seamen's Church Institute in New York's South Street Seaport (1991), which houses as many different kinds of spaces as an ocean liner—offices, a navigation training laboratory, dining services, an art gallery, and a chapel, among others—a nautical note is struck by the upper floors, clad in white enameled steel, which rise dramatically but compatibly from the base of the resurrected 18th-century brick facade. Such opportunities profoundly influenced Polshek's architectural vocabulary no less than his design philosophy. Asked to insert a new building into an existing configuration or to expand or alter structures from various stylistic periods, he responds with a nuanced sensitivity while avoiding historical pastiche. Through the devices of abstraction and the selection of materials, he transforms references to traditional details into contemporary solutions.

Polshek relishes commissions for entirely new buildings, which he handles with a similar gusto for resolving complex programs that must be embodied symbolically as well as served practically. Whether starting from scratch or renewing, a number of favorite motifs appear repeatedly, in particular the figure of the square, which he learned to appreciate in Japan. It is a means of both proportioning spaces and organizing planes: square tiles articulate brick walls, and gridded windows and screens shield

Inventure Place, Inventors Hall of Fame, Akron, Ohio, designed by James S.Polshek, James G.Garrison, Joseph L.Fleischer, D.B.Middleton, Don Weinreich, Jihyon Kim, Joanne Sliker, and Gaston Silva (1995)

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interior volumes. Characteristic as well are metallic structures and surfaces: steel, zinc, chromium, bronze, copper, and corrugated aluminum (often painted in bright colors) are cherished for their elegance and brio alongside the more familiar masonry, wood, and stucco materials. Reminiscences of admired exemplars from earlier avant-garde movements, such as De Stijl and Constructivism, and of works by architects such as Louis Kahn, Frank Lloyd Wright, George Howe, and Pierre Chareau are skillfully assimilated to leave a delicate but intriguing residue.

The inspired Rose Center for Earth and Space at the New York Museum of Natural History, which Polshek began renovating and expanding in 1995, opened to great acclaim in February 2000. A pure sphere encased in a meticulously detailed glass box, the design brings together the modernist geometry that Polshek loves—the Phileban solids employed by late-18th-century precursors like Claude-Nicholas Ledoux and Etienne Boullee—with the current search for symbolic meaning in architecture, for the sphere embodies the universe as it discloses its secrets. The year 2000 as well saw Polshek embarking on the commission for the William Clinton Presidential Library in Little Rock, Arkansas.

The way in which Polshek has organized his successive partnerships is key to his philosophy. He understands that collaboration is the essence of architectural achievement. The client is an indispensable member of the design team along with the members of his office, whose various contributions Polshek encourages and scrupulously credits. The size of the office has varied from 30 to more than 100 over the years and represents at once a model of the American large architectural practice and an exception in the camaraderie and collegial interchange among participants.

In 1972 Polshek became dean of the Graduate School of Architecture, Planning, and Preservation at Columbia University where he served for 15 years, assembling an unprecedented diverse faculty and shaping the curriculum to respond to the complex needs of the last quarter of the 20th century. He also transmitted his vision of the professional architect as urbanist, who must cope with the megascale of complexes that engage entire portions of cities no less than the individual building, and as preservationist, who must patiently repair the rifts in the urban fabric. By example, he continues to teach that architects should not aim for the instantly identifiable individual statements of dubious practical utility that tend to be glorified by the media and that they can responsibly fulfill their social and professional responsibilities while making works that communicate and bring sensual pleasure and intellectual delight to their viewers.

HELEN SEARING

S*ee also* **Aalto, Alvar (Finland); Adaptive Re-Use; Bunshaft, Gordon (United States); Chareau, Pierre (France); Corbusier, Le (Jeanneret, Charles-Édouard) (France); Howe, George, and William Lescaze (United States); Kahn, Louis (United States); Wright, Frank Lloyd (United States)**

Biography

Born in Akron, Ohio, 1930. Undergraduate at Case Western Reserve University, Cleveland, B.S., 1951. Master of Architecture. Yale University 1955. Fulbright Fellow, Royal Academy of Fine Arts, Copenhagen, Denmark 1956–57. Worked for Webb and Knapp (under I.M.Pei) 1955, Ulrich Franzen 1957–60, and Westerman and Miller 1960–61. Practiced in Japan 1962–63. Independent practice 1963–70. Founder, James Stewart Polshek and Associates 1970–79; James Stewart Polshek and Partners 1980–93, Polshek and Partners 1994–98, and the Polshek Partnership 1999. Taught at Cooper Union, New York City 1965–66, and Yale University Graduate School of Architecture 1966–68. Dean, Graduate School of Architecture, Planning and Preservation, Columbia University 1972–87. Elected Fellow of the American Institute of Architects 1972. Numerous design awards from the American Institute of Architects, national, state, and local chapters (including the Medal of Honor from the New York Chapter in 1986), the Institute for

Urban Design, the National Endowment for the Arts, the Art Commission of the City of New York, the New York Landmarks Conservancy, The City Club of New York, National Trust for Historic Preservation, among others. AIA Firm of the Year Award 1992.

Selected Works

Oster House, Stony Point, New York (with L. Schniewind), 1959

Teijin Central Research Institute, Tokyo, Japan, 1963

New York State Bar Center, Albany, New York City (restoration and addition), 1968

Quinco Mental Health Center, Columbus, Indiana, 1969

Twin Parks East Housing, New York City, 1969

Physical Education Building, State University of New York, Old Westbury campus, 1975

Rochester Riverside Convention Center, Rochester, New York, 1980

500 Park Avenue (renovation) and 500 Park Tower, New York City, 1980

Liberty House, Battery Park City, New York, 1982

Stroh River Place Master Plan, Detroit, Michigan, 1983

Washington Court Apartments and Shops, New York City, 1984

Bard College Student Residence, Annandale-on-Hudson, New York, 1985

Barnard College Student Residence, New York City, 1985

Schenectady Downtown Plan, 1986

Residential Condominium, Battery Park City, New York, 1986

Brooklyn Museum of Art Expansion plan (with Arata Isozaki), 1986

Carnegie Hall, New York (renovation/reconstruction of the auditorium; cafe, museum, reception room expansions), 1987

U.S. Embassy Chancery, Muscat, Oman, 1989

Seamen's Church Institute, New York City, 1991

Center for the Arts Theater, Yerba Buena Gardens, San Francisco, California, 1993

Skirball Institute of Biomolecular Medicine and Residence Tower, New York University Medical Center, New York City, 1993

Inventure Place, National Inventors Hall of Fame, Akron, Ohio, 1995

T*he New York Times* Printing Plant, Queens, New York, 1996

Jerome L.Green Hall, Columbia University Law School, New York City (renovation and addition), 1996

Santa Fe Opera Theater, Santa Fe, New Mexico, 1998

Queens Borough Public Library, Flushing, New York, 1998

Mashantucket Pequot Museum and Research Center, Mashantucket, Connecticut, 1998

Iris and B.Gerald Cantor Center for Visual Arts, Stanford University Museum of Art, Stanford, California, 1999

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POMPIDOU CENTER

Designed by Renzo Piano and Richard Rogers; completed 1977

Paris, France

From the moment the results of the open international competition for a new cultural center in Paris were announced in 1971, the Pompidou Center attracted both strong praise and fierce criticism. Designed by architects Renzo Piano and Richard Rogers together with structural engineers Ted Happold and Peter Rice of Ove Arup and Partners, the winning scheme was conceived as an antimonumental democratic palace of culture. Since opening in 1977, the Pompidou Center—also known simply as Beaubourg, the name of the site where it is located—has proved to be immensely successful in fulfilling the ambition of its designers, becoming both a focus of the contemporary visual arts in France and one of the most popular tourist destinations in Europe.

The competition, initiated by French President Georges Pompidou, attracted 681 entries. The nine-person jury included four architects of international distinction: Jean Prouvé (president of the jury), Philip Johnson, Oscar Niemeyer, and Jørn Utzon. In the event, Utzon was ill and unable to participate in the selection process. The winning scheme, selected in the first round of deliberations by a vote of 8 to 1, caused controversy when it was discovered that the designers were young and relatively unknown and that they were not French.

The building offered a bold vision of a new kind of monument that, instead of being pompous and elitist, would be populist and fun. Its thinking reflected a number of influences: Le Corbusier's principles of *pilotis* (Stilts), the free plan, and the occupiable roof; the provocative avant-garde visions of Archigram and Cedric Price; and ideas about prefabricated systems buildings as advanced by architects including Jean Prouvé and Ezra Ehrencrantz. The architects organized the building as a disarmingly simple rectangular volume overlooking an enormous new public square. Pushing structure, services, and circulation to the exterior created vast open floors—each providing 7500 square meters of column-free space—that fulfilled the internal flexibility required by the competition brief. The envelope itself, inspired by a famous unbuilt scheme for the Maison de la Publicité (1935) on the Champs Élysées by the German architect Oscar Nitzchke, was to be an information machine animated by changing images and text.

The completed building, built under political pressure and to an extremely fast timetable, is remarkably faithful to the com-petition scheme. It is one of the outstanding achievements of the century and of the movement that subsequently would be called High Tech. A fastidious attention to detail that far surpassed conventional building technology of the time complements the building's formal simplicity, setting new standards for both the architectural profession and the building industry.

Like the Eiffel Tower built a century earlier, the Pompidou Center uses technology to capture the spirit of the time. Happold and Rice were determined to use cast steel for the structure of the building. Although cast iron had been widely used in the 19th century, it had been supplanted by steel alloys that were less brittle and by rolling processes that were more efficient. Marrying 19th-century techniques with 20th-century knowledge of fracture mechanics, Rice was particularly interested in using cast steel as a way of reintroducing the human imprint of craft into techniques of industrial mass production.

A single row of columns along the east and west facades carries enormous castings called gerberettes, named in honor of Heinrich Gerber, a 19th-century German bridge engineer who developed the cantilever principle that defines the structural concept of the building. The gerberettes, connected to the columns with giant steel pins, are rotating arms with the inboard end shaped to carry 44.8-meter clear spanning steel trusses on seated connections without welds or bolts. To counterbalance these loads, "sputnik" bosses at the outer ends of the gerberettes are tied to the foundations with a series of tension rods. The gerberettes are shaped to reflect structural forces and, appropriately in view of Rice's intentions, also have been described as strongly anthropomorphic.

The 95,000-square-meter building—which includes a mix of art galleries, design centers, libraries, theaters, cinemas, and restaurants—was constructed in just four-and-one-half years. To compress the construction program, the steel superstructure, like many of the building components, was prefabricated during the 26-month period when the cast-in-place concrete foundations, mechanical plant rooms, and parking floors were built below grade. Following a diplomatic intrigue, the steel contract controversially was awarded to the German firm Krupp. The steel was brought to Paris by rail and, because of its enormous scale, transported to site at night on specially designed trucks. The contractors assembled the superstructure in vertical slices without scaf-folding. With an astounding 1500 tons of steel erected per month, it took just eight months to complete both frame and floors. Like the primary structure, the enclosure and secondary systems of the building were all designed as prefabricated kits of parts.

In the public imagination, the Pompidou Center is embodied in the color-coded vertical services risers and mechanical plant

Pompidou Center, Paris

Designed by Renzo Piano and Richard Rogers (1977)

Pompidou Center, aerial view from a distance

that define the east facade and the public escalators that are hung in clear plexiglass and steel tubes along the west facade. Viewed from the narrow medieval streets that surround the site, the services—characterized as irreverent, strident, and playful—express the radical spirit of the building. Although the envelope was not realized as an information machine, the escalators and public circulation galleries animate the west facade, making it an extension of the square. The public promenade rises far above the rooftops of the surrounding historic quarter to reveal spectacular panoramic views of Paris.

Following the completion of the Pompidou Center and an adjacent building for the Institute for Research and Coordination of Acoustics and Music (IRCAM) in 1977, the partnership of Piano and Rogers ended. Propelled to international prominence by the success of the Pompidou Center, each went on to achieve a distinguished reputation in his own right. Their subsequent individual collaborations with Peter Rice, ended by Rice's untimely death in 1992, produced a number of distinguished buildings noted for both the advancement and humanization of technology.

ANNETTE W.LECUYER

S*ee also* **Plano, Renzo (Italy); Rogers, Richard (England)**

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PONTI, GIO 1891–1979

Architect and designer, Italy

One of the most accomplished and prolific Italian architects of the 20th century, Gio (Giovanni) Ponti was not only an architect but also a poet, painter, ceramist, graphic artist, and designer of exhibitions, theater costumes, glassware, tableware, furniture, lighting fixtures, and ocean-liner interiors.

Ponti graduated with a degree in architecture from the Milan Polytechnic in 1921. That same year, he set up a studio with architects Mino Fiocchi and Emilio Lancia. Later, he went into partnership with Lancia—forming Studio Ponti-Lancia (1926–33)—and then with engineers Antonio Fornaroli and Eugenio Soncini—forming Studio Ponti-Fornaroli-Sancini (1933–45). This became Studio Ponti-Fornaroli-Rosselli in 1952, when Alberto

Rosselli became a partner. After Rosselli's death in 1976, Ponti continued work with Fornaroli.

Ponti's early works, such as the house he designed for himself and his wife (née Giulia Vimercati) at no. 9, Via Randaccio (1925), in Milan; Villa Bouilhet, Garches (1926), in Paris; and the furnishing for Palazzo Contini-Bonacossi (1931), in Florence reflect the *Novecento Italiano's* neoclassic revivalism that was prevalent at the time.

The creation of the *Movimento Italiano per l'Architettura Razionale* (Italian Movement for Rational Architecture) in 1927 presented Italian architects with the opportunity to discard their reliance on the classical effects of arches and columns for a new approach to architecture, one that took into account new developments in building technology. Through his architectural work, his writings in *Domus* magazine (which he founded in 1928), and his involvement with the Triennial Exhibitions of Milan, Ponti promoted a renewal of Italian architecture and decorative arts and transformed the "classic" language into a rationalist vocabulary. In his articles and books, such as *La Casa all'Italiana* (1933; House Italian Style), he imparted his conviction that architecture must always preserve some national characteristics.

In the 1930s, Ponti produced the *Domuses,* or "typical houses" (1931–36) in Milan; the Universal Exhibition of the Catholic Press (1936) in Vatican City; and the first Montecatini Building (1936) in Milan. In these projects, he gradually abandoned the neoclassical conventions and replaced them with a rationalist system of aesthetics. The first Montecatini building also marks his first integrated project. Here he designed not only the building but also the fittings, appliances, and furniture.

During the 1940s, Ponti's efforts were dedicated to writing, painting, and industrial design, but during the 1950s, Ponti was very productive architecturally. He traveled to Brazil, Mexico, Venezuela, the United States, and the Middle East. He carried out a series of projects in some of these countries, such as Villa Planchart (1955) and Villa Arreaza (1956) in Caracas, an auditorium on the eighth floor of the Time and Life Building (1959) in New York, and a building for government offices (1958) in Baghdad.

It is during this decade that Ponti produced his most renowned building: the Pirelli Skyscraper (1955–58) in Milan. An office block of over 30 stories, it was at one time the tallest building in Europe and still is one of the world's most refined and elegant tall buildings. Lessons inherent in the design of this building have been absorbed all over the world. Pier Luigi Nervi, acting as structural engineer, contributed to the building's elegant stature by designing a structure based on two full-width reinforced-concrete diaphragm walls that reduce in size toward the top. The thickness of the floors was dispensed with by making them taper at the edge. This allowed Ponti to design a facade that does not have the arbitrary repetitiveness of curtain walling but, instead, one that emphasizes the finiteness of the building and creates the illusion of lightness.

The quest for lightness in mass was an underlying element in Ponti's architecture. The concept of using walls as screens to give a sense of transparency first appeared in his competition project for the Palace of Water and Light at the "E42" Exhibition (1939) in Rome. The idea was further developed in the Pakistan House Hotel (1963) in Islamabad, the Church of San Francesco (1964) in Milan, the Church for the Hospital of San Carlo (1966) in Milan, and the facade of the INA building at no. 7 Via San Paolo (1967) in Milan. It culminated in the Taranto Cathedral (1970) and the Denver Art Museum (1971) in Denver, Colorado, where the walls are purely an enclosure surrounding the volume within.

Ponti's 60-year architectural practice was paralleled by a host of other activities. Commencing with his public debut at the Biennial Exhibition of the Decorative Arts in Monza in 1923, Ponti became involved in the organization of the subsequent Triennial Exhibition (known as the Ponti Triennale) in Milan as a member of the executive committee. From 1923 to 1930, he worked at the *Manifattura Ceramica Richard Ginori* in Milan and Sesto Fiorentino, changing the company's whole output. From 1936 to 1961, he was professor on the permanent staff of the Faculty of Architecture at the Milan Polytechnic. In 1941

Denver Art Museum, designed by Gio Ponti (1971)

he resigned as editor of *Domus* and set up the magazine *Stile,* which he edited until 1947. In 1948 he returned to *Domus,* where he remained editor until his death. He also wrote an article in every one of the 560 issues of the magazine. He designed fabrics for the Jsa factory from 1950 to 1958. In 1957 he created the *Superleggera,* or Ponti-chair, for Cassina. Light enough to be lifted with one finger, the *Superleggera* chair has become a universally classic feature.

Ponti's vitality was proverbial among those who knew him. He worked relentlessly to promote Italian culture and over the years produced work that maintained the freshness of experiment and influenced generations of Italian designers and architects.

HAGIT HADAYA

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POPE, JOHN RUSSELL 1873–1937

Architect, United States

After World War I, John Russell Pope's neoclassical architecture helped define an American national image as the United States took on grandiose powers and managerial confidence. Pope sought to create a nationally recognized American architecture along conservative Roman and Greek classical design. From his earliest proposals for the Lincoln Memorial and the proposal requested by Assistant Secretary of the Navy Franklin D.Roosevelt to romanize Alfred Mullett's State, War, and Navy Building to his completed plans for the National Gallery of Art, Scottish Rite Temple, Constitution Hall, Pharmaceutical Building, National Archives, and Jefferson Memorial, no one else would so successfully dominate the look and space of the U.S. capital.

Pope studied architecture under William Robert Ware at the Columbia University College of Mines. After graduating from Columbia in 1894, he won both the McKim Traveling Fellowship and the first student award granted by the American School of Architecture in Rome (later the American Academy in Rome). After a year and a half in Rome, Pope attended the École des Beaux Arts in Paris. These experiences marked Pope's architecture for the rest of his career. The influence of the Beaux Arts school as well as his personal connection to Charles Follen McKim set Pope on a path of large-scale public buildings of neoclassical design that relied on a wide range of classical tropes. These ideas, as well as landscape, art, and writing, created a sense of reflection for the visitor. Also of some significance to Pope's early career and future success was his marriage to Sadie Jones, the stepdaughter of Henry Walters, a cousin of the Delano family—a fact not lost on Franklin Delano Roosevelt.

Pope apprenticed with Bruce Price, an architect notable for his domestic Shingle style. In 1905 Pope opened his own office. During this time, his chief intellectual mentor, Charles Follen McKim, became the architectural adviser on the Senate Park Commission, where he designed the dome for the first building the Senate Park Commission built on the north side of the National Mall, the United States National Museum, which is now the Natural History Museum. Along with Daniel Burnham, McKim played a central role in the creation of a planned monumental core for Washington, D.C., that followed the neoclassical design of the Capitol and James Hoban's White House. McKim and

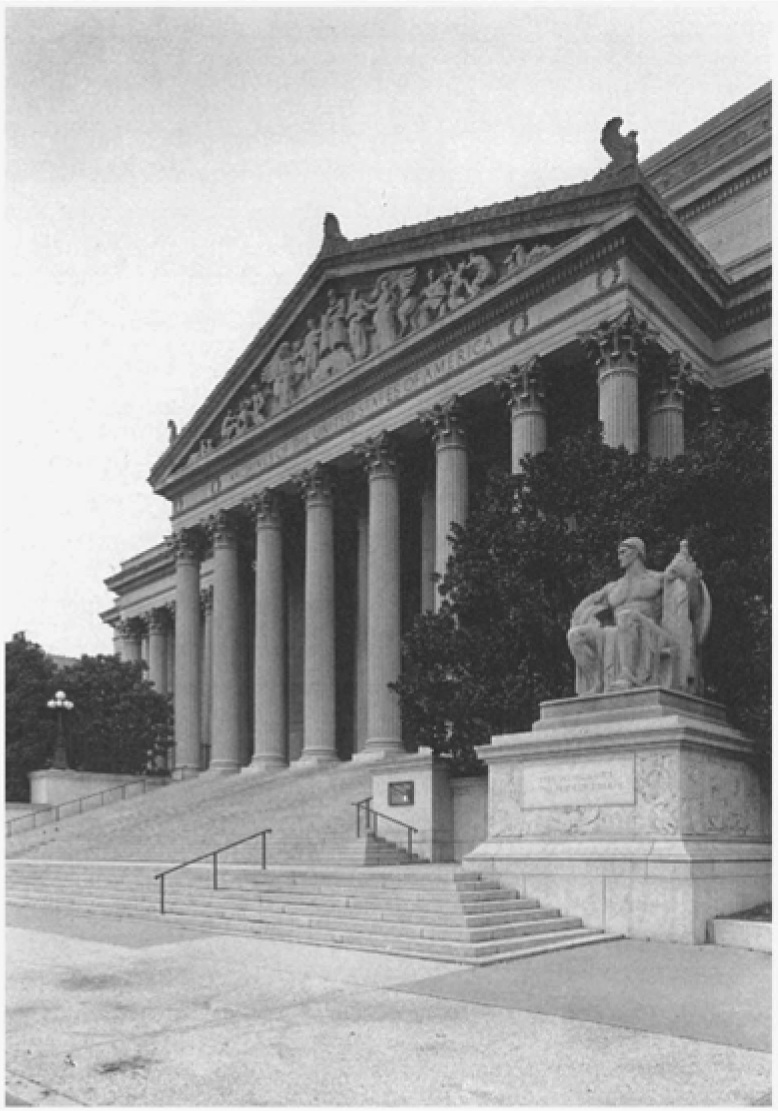
Burnham were picked by Senator James McMillan of Michigan, chairman of the Senate Committee on the District of Columbia, to be the architectural advisers for the Senate Park Commission. The Senate Park Commission's plan to memorialize Abraham Lincoln became one of the most significant design programs of the National Mall. In 1911 Congress appropriated money to create the Lincoln Memorial Commission, which began an 11-year process of designing and locating the monument to Lincoln. The commission requested that Pope and Henry Bacon, both protégés of McKim, prepare designs for the memorial, but the commission finally chose Bacon's beautiful adaptation of the Parthenon for the western end of the Mall.

Pope's work was to come later. During the first two decades of the 20th century, he designed classically inspired mansions: the Robert and Katharine McCormick House, the John R. McLean House, and the Henry White House, all in Washington, D.C. In 1929 he contributed a classical addition to the Constitution Hall and designed the National City Christian Church. This work, along with his work on the Baltimore Museum of Art (1929) and connections to Roosevelt, made him the preeminent architect for the nation's capital during the third decade of the 20th century.

Pope's American Pharmaceutical Association Building (1933) was so cleanly designed that it received some praise from modernists for its compatibility with Bacon's Lincoln Memorial. However, his other projects would not receive such positive notices from the modernists. In 1937 Frank Lloyd Wright attempted to convince Franklin Roosevelt that Washington, D.C., needed to represent a distinctly American architecture and not just repeat the historicist styles of Europe. No one was more responsible than Pope for the miles of columns in the national capital.

Pope's most successful building is generally agreed to be the National Gallery of Art (1936–41), in which he revised the Roman Pantheon as a Beaux Arts temple of art. The exterior view of the building is designed to prepare the visitor for entry to the building. The exterior volumes of the building express the plan and elevation of the building. Andrew Mellon, the major art donor to the national collection, selected pink Tennes-see marble for the exterior. The color of the solid blocks of marble gradually lightens toward the top of the walls to keep the large scale of the walls from being perceived as overwhelming.

Built at the same time, the Jefferson Memorial was one of Pope's least successful buildings and provoked Wright to compose another letter to President Roosevelt expressing his disdain for what he characterized as an "arrogant insult to the memory of Thomas Jefferson." Although the open monument, also inspired by the Roman Pantheon, can appear as a restful gazebo from some vistas—mostly when viewed from across the tidal



National Archives building, Washington, DC (1935)

basin or the Potomac River—it fails to work as successfully as Bacon's Lincoln Memorial. Like the National Gallery of Art, it is a model example of Beaux Arts design, in which architecture, sculpture, and engraved inscriptions are organized to create a sense of balance and harmony.

Pope was consistently able to create monuments and buildings that captured the popular taste of many Americans during the first half of the 20th century. Remarkably, they retained a great deal of their appeal and presence during the changes of the second half of the century, and that accomplishment has a lot to do with his architectural language of classicism, which continues to speak to Americans about themselves and their place in the world.

CHAR MILLER

See also **Classicism; Lincoln Memorial, Washington, DC; McKim, Mead and White (United States); Wright, Frank Lloyd (United States)**

Selected Publications

Yale University: A Plan for Its Future Building, New York: Cheltenham Press, 1919

The Architecture of John Russell Pope, with introduction by Royal Cortissoz, New York: Helburn, ca. 1924

Plan and Design for the Roosevelt Memorial in the City of Washington, New York: Pynson Printers, 1925

University Architecture, New York: Helburn, 1937

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Bedford, Steven McLeod, *John Russell Pope: Architect of Empire,* New York: Rizzoli, 1998

PORTLAND PUBLIC SERVICE BUILDING

Designed by Michael Graves; completed 1982 Portland, Oregon

After its completion in 1982, Michael Graves's Portland Public Service Building quickly became a major icon of Postmodernism, notable for its references, symbolism, and ornament. With its stylized pilasters, rusticated surfaces, oversize keystone motif, and strong colors, Graves's design was clearly a turn away from modernism. Almost immediately, Graves's design became an icon representing the reinvented eclecticism of Postmodernism, and soon it became both an emblem and a target. For supporters of Postmodernist aesthetics and approaches to architecture, the Portland Building (Portland Public Services Building) became an emblem of a renewal of architectural vitality. Graves's design represented an alternative to a fussy, intellectualized, and overly complicated modernism that spoke to no one but the architectural elite. With the Portland Building, architecture regained the symbols and syntax from past historical styles, thus allowing the architect to communicate with a larger segment of the public. In contrast, modernists, including Pietro Belluschi, attacked the design of the Portland Building and the Postmodernist approach that it represented. Standing apart from its neighboring buildings, the Portland Building represented a return of revivalist eclecticism—with a new twist—that they had fought so valiantly to overcome in the early decades of the 20th century.

In June 1979, the City of Portland sponsored a competition for the design of the Portland Building. This new building was to house city offices and commercial offices on the upper floors and to provide space for retail businesses at the street level. Philip Johnson and his architectural partner John Burgee were appointed advisers to a committee of jurors drawn from local political and business circles. In January 1980, three competition finalists were chosen: Michael Graves, Arthur Erickson, and Mitchell/Giurgiola. Graves's design was declared the winner, but the city council, unready to accept that design, called for a second competition between Graves and Erickson. Graves was again declared the winner. Graves's victory was in part the result of his strict adherence to the stated budgetary restriction placed on the project. The competition called for 362,000 square feet of interior space for just over $22 million, or $51 per square foot. Graves's plan was the only one that met these budgetary goals.

The decision to award Graves first prize was clearly influenced by Philip Johnson, who was sympathetic to Postmodernist objectives. Portland's city council had specified that it wanted an excellent and exciting design that would symbolize civic pride and responsible government.

Thus, the Portland Building focused the attention of the architectural and popular media on Portland. When the building

Portland Public Services Building, designed by Michael Graves (1982)

was opened in October 1982, the response was mixed. Certainly, this is the norm for any architectural design that breaks with tradition. In the instance of the Portland Building, Postmodernism is expressed through a colorful exterior with dark red-brown verticals and blue-green base contrasted with cream-colored walls while two-dimensional garlands ornament the facades on the north and south sides. On the east and west facades, large pilaster-like vertical bands of windows and wall topped with massive, projecting capitals support a keystone-shaped segment made up of alternating bands of windows and bands of painted concrete. Graves plays with color, spatial illusion, and architectural elements from the classical canon to provide associations with past traditions of ornament. He also suggested that a large symbolic sculpture be placed above the main entrance on Fifth Avenue. Although omitted originally because of cost, a 25-foot-tall hammered copper statue, *Portlandia,* by Michael Kaskey, was eventually added to the structure, giving additional prominence to the main entrance. The design has been both criticized and praised by architects and critics.

Praise comes from Gavin Macrae-Gibson: "It is not the cosmic harmony of the Renaissance, the Nature of the Enlightenment, or the machines of Utopian modernism but the nature of the new sublime that holds the fragments of the Portland Service Building in uneasy unity" (see Macrae-Gibson, *The Secret Life of Buildings,* 1985). Macrae-Gibson admired Graves's juggling act that provides active balance of forms and symbols. In referring to the three finalists for the competition, Philip Johnson exclaimed, "It was perfectly clear as we opened the submissions that only one spoke of genius" (Jencks, 1983). Susan Douibilet, on the other hand, found fault with the lack of integration with the park across Fourth Avenue to the east of the structure. Belluschi asserted, "So they demolish the hated glass box and erect the enlarged juke box or the oversized beribboned Christmas package, well-knowing that on completion it will be out-of-date" (Bosker). A supporter of Michael Graves, Charles Jencks, provides a more balanced response: "The Portland [Building] still is the first major monument of Post-Modernism, just as the Bauhaus was of Modernism, because with all its faults it still is the first to show that one can build with art, ornament and symbolism on a grand scale in a language the inhabitants can understand" (Jencks, 1983).

DOUGLAS G.CAMPBELL

Further Reading

The books by Charles Jencks and Michael Graves provide the most useful information. Doubilet's interview contains Graves's responses to criticisms of the project.

Doubilet, Susan, "Conversation with Graves," *Progressive Architecture,* 64 (February 1983)

Graves, Michael, *Michael Graves: Buildings and Projects, 1966–1981,* edited by Karen Vogel Wheeler, Peter Arnell, and Ted Bickford, New York: Rizzoli, 1982

Jencks, Charles, *Kings of Infinite Space: Frank Lloyd Wright and Michael Graves,* New York: St. Martin's Press, 1983; revised edition, London: Academy Editions, and New York: St. Martin's Press, 1985

Olson, Kristina Marie, *Living with It: Michael Graves' Portland Building* (Master's thesis), State University of New York at Stony Brook, 1988

PORTMAN, JOHN C., JR. 1924

Architect, United States

John Portman's self-declared mission as an architect was to create an architecture for people. He combined his skills as entrepreneur, developer, architect, and real estate manager to reinvigorate downtown Atlanta, a city that at the time Portman began his practice in 1953 had not built a high-rise building since 1930. If Portman did little to house Atlanta's citizens, he was intent on designing better environments for work: functional marketplaces for buying and selling and attractive hotels for tourists, conventioneers, and traveling businessmen. His Atlanta Merchandise Mart (1961) initiated the development of Peachtree Center, where he would continue to build for nearly 40 years. Perceiving the city as fundamentally an economic and social entity, Portman resolved to return the historic agora to modern Atlanta.

It was there, at the Hyatt Regency (1967), that Portman introduced the modern atrium hotel, transforming the urban hotel, as traditionally found in dense congested downtowns, to a new, experiential structure. The old form was re-created, traditionally enclosed spaces opened out in order to create active internal public environments promoting social interaction and positive human response. Multistoried, ivy-clad balconies oriented hotel rooms and corridors inward to a 21-story atrium. The hotel lobby became a piazza, with a textured floor inspired by European cobblestone streets and patterned sidewalks. Natural light, water, and trees softened concrete surfaces, and the free movement of pedestrians animated the urban space perceived as an internal park or oasis within the city. Portman gave further expression to the life of the space through the dynamic vertical movement of space-age style, glass-enclosed elevator cabs rocketing through the skylight overhead to a rotating rooftop restaurant called Polaris.

Portman enlarged the Hyatt in subsequent years and added two more hotels to Peachtree Center: the Westin Peachtree Plaza (1976) and the Marriott Marquis (1985). The latter was a theatrical demonstration of architectural space-making that broadened the hotel atrium at its base (to dramatize the interior effect) and extended the volume upward to a staggering 50 stories in height. Office slabs as well as enlarged and newly built exhibition and market structures continued a coordinated expansion of Peachtree Center throughout the 1970s and 1980s until Portman crowned the complex in 1993 with the 60-story office tower, One Peachtree Center.

In addition to Peachtree Center, Portman's other multiuse urban centers included Renaissance Center (1976) in Detroit and the Embarcadero Center (1974, 1976) in San Francisco. He has applied his concepts about livable environments for work, market, and hotel to suburban sites in Atlanta at Riverwood (1989) and Northpark Town Center (1986, 1989). Northpark projected an 18-year, edge-city development to incorporate office towers, hotels, and nearly one million square feet of shopping mall, but the project was cut short by the recession of the early 1990s, by which time only two office towers had been constructed. Portman's Marina Square hotels and shopping mall (1987) in

Singapore and his Shanghai Center (1990) in China spread his ideas internationally.

Portman's architectural language embodied an eclectic modernism. His influences range from such disparate figures as Louis Kahn (whose monumental geometry, exquisitely surfaced concrete, and use of light Portman admired) to Edward Durell Stone (to whose bourgeois ornamentalism and stylizing Portman could not always remain immune). When competing markets forced Portman in 1986 to redesign the lobby of his 1976 Westin Peachtree Plaza Hotel, he adopted the artificial historicism of Postmodernism and transformed the lobby into a classical masquerade, a stage-set of architectonic props of the kind Charles Jencks has decried as the carnivalesque. Portman's remodeling was an effort to redress a constricted concrete-encased hotel lobby that was originally little more than the leftover space

Portman, John C., Jr. (United States)

R.Howard Dobbs University Center, Emory University, the Asbury Circle entrance (1986)

Photo © Mary Ann Sullivan

around the elevator core. Portman took a lesson from the Mediterranean bazaar and crowded into the lobby an assemblage of elongated arcades, pedimented pavilions, and glittering lights; attracted by published images of a now upscale hotel, the people returned.

One of Portman's most successful projects outside the arena of commerce and trade was the Emory University Student Center (1986) in Atlanta, sited on an axis with his earlier Physical Education Center (1983). Portman preserved the exterior facade of architects Ivey and Crook's dining hall (1926) as a backdrop for a theatrical interior space enclosed by a semicircle of terraced balconies reminiscent of theater loges, dress circles, and balconies. The classicism of the integrated dining hall elevation appears to be onstage, and the whole calls to mind Andrea Palladio's Teatro Olimpico (1580) in Vicenza, Italy. This referential focal point is set against elements of Le Corbusier-inspired white modernism outside, where *pilotis* and interpenetrating ramps join a formal geometry shaping the main entry. The travertine-like surface richness of the exterior walls and trim references as well the marble cladding were perhaps inspired by Kahn and Emory's earlier architecture.

The quintessential Portman project is the beach house he designed for himself on Sea Island, Georgia—a 22,000-squarefoot retreat named Entelechy II (1986). It was one of Portman's most controversial projects but was unquestionably his most personal. Although it embodied Portman's life experiences and public work, it also expressed in very personal ways his various interests in art, including his own painting and sculpture, and it reveals Portman as a modernist who is open to a wide range of eclectic possibilities in design. The name Entelechy is inspired by the Aristotelian concept of "becoming," and the beach house followed Portman's creation of Entelechy I (1964), the architect's suburban home in north Atlanta. Entelechy I was the early progenitor of Portman's fundamental vocabulary. It was the first significant project to generate Portman's forms, architectural conceits, and environmental design devices—including "exploding columns," water and plantings, and a geometric ordering in plan—and to employ art objects as appointments—all features later evidenced in his hotel and urban center complexes. In the same way, Entelechy II recapitulated and embodied in visual form a life enriched by travel, reading, observing, and studying art.

Entelechy II was a synthesis of house and museum, studio and retreat, weekend vacation home and monumental megastructure. The house provided enclosed garden settings, poolside terraces, courtyards, lawns, and traditional rooms in which to display sculpture and paintings that its architect-owner admired, including reduced-scale maquettes of sculptural forms that adorn major public spaces in Portman's urban projects. At the same time, the studio-retreat was a workplace for Portman's own production of art. Since the mid-1980s, Portman has expanded his artistic range by creating art in other media: abstract expressionist paintings filled with the colors and light of the South; metal, stone, and bronze figural sculptures; furniture (including his delightful Rickshaw Chair [1985] made for the poolside at Sea Island); and large-scale abstract, yet referential, pop sculptures inspired by such disparate personalities as Mickey Mouse, Dolly Parton, and Cyclopes Polyphemus.

This Pop side of Portman's work suggests that as a popular modernist in architecture, his kindred spirits extend from the heroic form-makers of the 1950s and 1960s to such commercial stylists as Morris Lapidus. Despite his thoughtful introspection about his work, the public admires him not for the intellectual content of his work but for his inherent romanticism. His travel experiences in the East and West have been as rich as those of the most cosmopolitan of his contemporaries. His intention always has been to gather these disparate forces, influences, and stimuli in service to the creation of environments for life and work—architectural spaces embodying human values and promoting social interchange. If his buildings may be said to display a signature, it is reflected in their references to fundamentals: to nature, to art, and to an architectural beauty based in humanistic and organic principles.

ROBERT M.CRAIG

See *also* **Historicism; Hotel; Kahn, Louis (United States); Lapidus, Morris (United States); Postmodernism; Stone, Edward Durell (United States)**

Biography

Born in Walhalla, South Carolina, 4 December 1924. Attended the United States Naval Academy, Annapolis, Maryland 1944; studied at the Georgia Institute of Technology, Atlanta; bachelor's degree in architecture 1950. Married Joan Newton 1944:6 children. Served in the United States Naval Reserve 1942–44. Employed by Ketchum, Gina and Sharp, H.M.Heatley Associates, New York and Atlanta 1945–49; worked for Stevens and Wilkinson, Atlanta 1950–53. Private practice, Atlanta from 1953; partner, Edwards and Portman 1956–68; president, John Portman and Associates from 1968; president, Central Atlanta Progress 1970–72. National Advisory Board Member, Georgia Institute of Technology, Atlanta 1975–78; director, Atlanta High Museum of Art 1982. Principal, Portman Properties; chairman of the board, Portman Barry Investments Incorporated; chairman of the board, Atlanta Market Center; president, Peachtree Center Management Company; chairman of the board, Peachtree Purchasing; chairman of the board, Portman Hotel Company; principal, Project Time and Cost; director, Citizens and Southern Bank; director, Commerce Club; trustee, Atlanta Arts Alliance; advisory council member, Agnes Scott College, Decatur, Georgia; trustee, National Jewish Hospital and Research Center; trustee, Scottish Rite Children's Hospital; trustee, Georgia Technology Foundation. Honorary consul of Denmark in Atlanta; fellow, American Institute of Architects; member, Royal Order of the Knights of Dannenborg, Denmark 1975; officer, first class, Royal Belgian Order of the Crown 1983.

Selected Works

Atlanta Merchandise Mart, Atlanta, 1961
John Portman House (Entelechy I), Atlanta, 1964
Hyatt Regency Hotel, Peachtree Center, Atlanta, 1967
Levi Strauss, Two Embarcadero Center, San Francisco, 1974
Westin Peachtree Plaza Hotel, Peachtree Center, Atlanta, 1976
Three Embarcadero Center, San Francisco, 1976
Renaissance Center, Detroit, phase I, 1976
Westin Bonaventure, Los Angeles, 1977
Atlanta Apparel Mart, 1979
George Woodruff Physical Education Center, Emory University, Atlanta, 1983
Marriott Marquis Hotels, Atlanta and New York, 1985
Northpark Town Center, Atlanta, phase I, 1986; phase II, 1989
R.Howard Dobbs University Student Center, Emory University, Atlanta, 1986
Entelechy II, Sea Island, Georgia, 1986
Marina Square, Singapore, 1987
Peachtree Center Athletic Club, Atlanta, 1989

INFORUM, Atlanta, 1989
Riverwood, Atlanta, 1989
Shanghai Center (project), 1990
One Peachtree Center, Peachtree Center, Atlanta, 1993

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The Architect as Developer (with Jonathan Barnett), 1976
"An Architecture for People and Not for Things," *Architectural Record,* 161/1 (January 1977)
"The Architect and the American Dream," in *The American Dream: A Collection of Essays,* edited by Claire A.Downey, 1983
J*ohn Portman* (with Paolo Riani and Paul Goldberger), 1990
J*ohn Portman: An Island on an Island* (with Robert M.Craig and Aldo Castellano), 1997

Further Reading

Portman's *The Architect as Developer* (1976, with Jonathan Barnett) *and John Portman* (1990, with Paolo Riani and Paul Goldberger) offer the best overviews of Portman's work. The first focuses on his joint role as developer and architect (as does the 1969 *Architectural Forum* article on Atlanta's downtown development); the second includes color photographs of Portman's major projects. Saxon treats Portman's prototypical atrium hotels historically as well as from the viewpoint of design, fire safety, construction, and other technical perspectives. "Back to Babylon" discusses the prototypical atrium hotel masterpiece, the Regency Hyatt House (Hotel) in Atlanta. Leitner's *Art in America* essay and Portman's 1977 *Architectural Record* essay (see under Selected Publications) articulate the architect's philosophy of designing for people. Craig's 1988 *Southern Homes* essay and his article in *John Portman* consider Portman's Entelechy I, while Entelechy II (the beach house) is the focus of Goldberger's *Architectural Digest* essay as well as the major 1997 monograph on the house by Portman, Craig, and Castellano. The 1997 monograph moves beyond descriptive discussion to analytical and critical appraisal of Portman's design and publishes furniture, sculpture, and paintings by the architect and others adorning this museum-beach house. Barkin-Leeds's exhibition catalog essay discusses major themes observable in Portman's paintings and sculpture. Finally, *Craig's Journal of American Culture* essay considers Portman among popular modernists in Atlanta.

"Atlanta," *Architectural Forum* (April 1969)
"Back to Babylon," *Interiors* (July 1967)
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Craig, Robert M., "Making Modern Architecture Palatable in Atlanta: POPular Modern Architecture from Deco to Portman to Deco Revival," *Journal of American Culture,* 11/3 (1988)

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Leitner, Bernhard, “John Portman: Architecture Is Not a Building,” *Art in America* (March 1973)
“Metropolitanizing Atlanta: John Portman’s Continuing Peachtree Center Program Weaves Intimate Human Amenities into a Major Urban Core,” *Interiors* (November 1968)
Saxon, Richard, *Atrium Buildings: Development and Design,* New York: Van Nostrand Reinhold Company, and London: Architectural Press, 1983; 2nd edition, 1987

PORTOGHESI, PAOLO 1931

Architectural historian and Architect, Italy

Paolo Portoghesi, an architectural historian in Italy, single-handedly revived interest in baroque architecture in the 1960s, leading to important contributions to Postmodern design and theory. A series of books and articles include *Guarino Guarini* (1956), *Borromini nella cultura europea* (1964), *Roma barocca* (1966), *Bernardo Vittone* (1966), *Francesco Borromini* (1967), and *Borromini, architettura come linguaggio* (1967; Borromini, Architecture as Language). Every historian of Italian baroque architecture acknowledges Portoghesi for generating interest in this area. Subsequently, during the 1970s and 1980s, Portoghesi was a leading figure in the Postmodern movement in Italy and beyond, both as a historian and as an architect. In the 1990s, Portoghesi has been a leading figure in the Architecture and Nature movement in Italy. He is a prodigious architect as well as a prolific writer and is recognized internationally as an articulate critic of architecture and urban projects.

Portoghesi was born in Rome in 1931 and graduated from the University of Rome in 1957. From 1962 to 1966, he taught the history of criticism at the Faculty of Architecture in Rome. He was also professor of the history of architecture at the Milan Polytechnic from 1967 to 1979 and the dean there from 1968 to 1976. In 1966 he was elected a member of the Accademia di San Luca, Italy’s most prestigious arts academy. Since 1979 he has been the director of the architecture section at the highly important Venice Biennale. There he received great praise for making important progress in the advancement of Italian architectural culture. He currently teaches architecture at the University of Rome. He recently moved his studio from Viale Aventino in Rome to Calcata, a medieval *borgo* 30 miles north of Rome, where he lives in a house that he restored.

Portoghesi’s other books include *Infanzia delle macchine* (1968; The Infancy of Machines), *Victor Horta* (1969), *Le inibizioni dell’architettura moderna* (1974; The Inhibitions of Modern Architecture), *Dopo l’architettura moderna* (1980), and *Postmodern, L’architettura nella società post-industriale* (1982). In 1997 he published an exhibition catalog called Arte *e natura,* and a new book, *Natura e Architettura,* was published in 1999. Important architectural projects include the Casa Balsi (1961), the Casa Bevilacqua (1973), the Church of the Holy Family in Salerno (1974), and the Mosque and Islamic Cultural Center (1984) in Rome. Whereas many architectural historians and architects have learned from Portoghesi's writings about baroque architecture and contemporary architecture, several writers have in turn made Portoghesi the subject of their own books and articles. The long list of authors includes Francesco Moschini, Mario Pisani, Carlo Argan, and Christian Norberg-Schulz, a conclusive testimony to Portoghesi's importance to 20th-century architecture.

As a historian, Portoghesi was influenced mainly by the methods of Carlo Argan and Rudolf Wittkower. Like them, he has always seen architecture as a language, with a particular vocabulary and syntax. This approach has dominated his analyses of architecture in its historical context and its relevance to contemporary practice. He even went so far as to classify the various design motifs incorporated by Francesco Borromini as language tropes to explain the architecture in terms of language itself. A

Mosque, Rome, designed by Paolo Portoghesi (1984)

freedom from restraint can be seen as common to Portoghesi's career: the baroque, the Postmodern, and art and nature all suggest his theoretical interests in an architecture that embraces discipline and spontaneity in its study of the past.

Throughout his career, Portoghesi's architecture reflects his preoccupations as a historian. His early work is based on the appropriation and reinvention of baroque forms. A historical consciousness is present in all his designs, especially those of the Postmodern period, in which he sought, both as a historian and as an architect, a new language of architecture. His most successful designs contain the presence of history, yet they are free from the restraints of the formalized systems of 20th-century architecture and modernism. In the Postmodern movement, Portoghesi found sympathy in the work of Philip Johnson, Michael Graves, and Stanley Tigerman, among others, which he introduced to a receptive Italian audience in his book *Postmodern.* The themes from this book evolved to include Portoghesi's more recent concern with the relation between architecture and nature. In this ageless relationship, he seeks to develop and explain architecture as a natural organism, an "architecture born of architecture." According to Portoghesi, the, architect is seen as an element in a great biological process in which architecture is seen as an instrument for understanding this process. Portoghesi's architecture, for example, has been characterized as "crystallized music." For inspiration, Portoghesi has looked to the work of Frank Lloyd Wright and Louis Kahn, among others, who brought a profound understanding of nature and architecture to the architectural profession. As always, Portoghesi continues to search for new languages of architecture, new forms of expression, always rooted in the study and lasting memory of history.

JOHN HENDRIX

Biography

Born in Rome, 2 November 1931. Attended the University of Rome; graduated with a degree in architecture 1957, and a degree in art history 1958. Opened his own architecture office 1958. Taught history of criticism at the Faculty of Architecture in Rome 1962–66; professor of the history of architecture 1967–79, and dean 1968–76, Architecture Faculty of Milan Polytechnic; professor of the history of architecture, University of Rome 1982-. Elected member of the Accademia di San Luca 1966, and Academy of Arts and Design of Florence 1978. Director, *Dizionario enciclopedico di architettura e urbanistica* (Encyclopedia of Architecture and City Planning) 1968; director, *Controspazio* (magazine) 1969–83; director, *Eupalino* (magazine) 1983–; director, *Materia* (magazine) 1990–. Director, Architecture Section at the Venice Biennale 1979–82, and President 1983–. Currently lives in Calacata, a medieval *borgo* 30 miles north of Rome.

Selected Works

Casa Bevilacqua, Gaeta, Italy, 1973

Church of the Holy Family, Salerno, Italy, 1974

Mosque and Islamic Cultural Center, Rome, 1984

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POST OFFICE SAVINGS BANK, VIENNA

Designed by Otto Wagner; completed 1904

Designed by Viennese architect Otto Wagner, the Post Office Savings Bank was completed in 1904. A member of the Viennese Secession, Wagner was educated at the Weiner Technische Hochschule, or Polytechnique (a program modeled on the Paris L'École Polytechnique), and the prestigious Bauakademie in Berlin, where he was influenced by members of the Schinkelschule.

Wagner's approach to architecture at the turn of the century was essentially an amalgamation of the rationalism of the Schinkelschuler (members of the so-called Schinkel School, so named after the 19th-century German architect Karl Friedrich Schinkel) and the 19th-century "architects of the Ringstrasse" (Gottfried Semper and Karl von Hasenauer). Yet Wagner's polytechnical education also made him aware of the significance of technology and impending social change for architecture. Like his predecessor Gottfried Semper, his awareness led him to formulate an antiacademic position—one against the stodgy rule-based and tradition-bound education of the Vienna Academy of Fine Arts. Supported by Wagner, architects Josef Maria Olbrich (Wagner's chief assistant) and Josef Hoffman (his most prized student) joined with two prominent Viennese artists, Gustav Klimt and Koloman Moser, to form the Viennese Secession in 1897. Under the skilled leadership of Klimt, the Secession group developed a new vision for architecture, inscribing *Ver Sacrum,* a publication devoted to the aims and ideas of the Secessionists, with works and ideas expressive of their revolutionary approach to the arts and architecture. The Secessionist claims and actions were indeed revolutionary. Wagner stood as an elder statesman of the group, supporting not only the program of the Viennese Secession but also its leaders and adherents through his pedagogy and his works of architecture.

A principal example of Wagner's embrace of Secessionist ideas for architecture is his design for the Imperial and Royal Vienna Post Office Savings Bank, known as the Postsparkasse. The building, completed in two phases (1904–06 and 1910–12), is regarded as one of the primary examples of early modern architecture. Although Wagner's Secessionist colleagues—Klimt, Moser, and to some degree Olbrich and Hoffman—were caught up in esoteric and utopian visions, Wagner remained attentive to contemporary technical and social developments and their effect on architecture in a similar manner to those architects who understood the nature of building in their own context as well as the context of the history of architecture. In an essay titled "Die Qualität des Baukünstlers" (The Quality of the Building-Artist) in 1912, Wagner argued that "the ultimate goal of the architecture of his day was to add a building from our own time to the symphony of monumental buildings of all times" (Mallgrave, 1996). Yet he did not discount the symbolist aspects of the Secessionist movements; elaborate and diverse material and structural details adorn the building's exterior and interior.

The essential form of the building is trapezoidal, with the main hall—the public area of the building—axially placed in almost equal measure between the two major wings extending perpendicularly from the building's main facade. Programmed as large work spaces that could be partitioned as necessary, the bank administration, postal offices, and mailrooms are located in these wings.

The exterior of the building is sheathed in thin sheets of Sterzing marble, the details of which Wagner obsessively manipulated to produce an undulating plane along the projected face of the long, horizontal main facade. The building's foundation is faced with granite, and the bolts holding the granite slabs are countersunk, giving them even greater prominence on the facade. Wagner also used aluminum—a material that only since the mid-19th century could be mined in great quantities—to refine certain details on the facade. The acroteria—an ornamental aluminum "structure" and details by the Viennese artist Othmar Schimkowitz—crowns the building. The liberal and pointed use of aluminum signals both Wagner's embrace of advanced technologies and materials and, in his accentuated use of materials and ornamental detailing, his adoption of Secessionist ideas.

Wagner continues his essay on the use of technology and materials throughout the entrance sequence and interior of the main public hall. The main facade, fronting a fairly narrow street, opens out to the Ringstrasse across a public square that focuses the main entry and extends slightly into the urban space. Immediately on crossing the building threshold, the space of the city is compressed into a stair hall of elaborate plasticity. Flowing forms and animated light stancheons reduce the scale of the space even further, lending it an aura of mystery. The stair—reminiscent of Michelangelo's stair leading into the Laurentian Library or perhaps, more directly, similar to Schinkel's elaborate orchestration of public and private space in the entry of the Altes Museum—leads through a cross axis of discrete secondary circulation just beyond the view of the public. The entire procession—from the Ringstrasse through the square into the projected face of the main entry—attenuates both time and the usual sense of separation accorded thresholds; in this case, the movement from the scale of the city into a series of zones or chambers suggests a new kind of threshold where one side (the public) borrows and extracts from the other (the private) and vice versa. Accordingly, the spaces produce a quizzical, even aporetic form of experience, a kind of "intimate urbanism"—a scenario that

Post Office Savings Bank, Vienna, designed by Otto Wagner (1904)

Fritz Neumeyer suggests is akin to a railroad car or an "economical, efficient modern *mask"* (Mallgrave, 1996). Wagner's expressive use of form and materials on the interior furthers the building's sense of intimacy, in particular where the interior spaces are punctuated by animated figures choreographed within dynamic, rarified spaces. With great discipline, Wagner engages every available design opportunity, and stancheons, details, light, and materials together engage the range of bodily senses. The light of the public spaces, in particular the triple-naved counter space covered by the horizontal lights of the etched glass ceiling and the glass-and-steel floor, suggests mysterious activities just beyond that which can be seen. Distinctions between artificial and natural light are blurred to this effect, and the concrete structure and mechanical systems, both designed with contemporary technological advances in mind, only add to Wagner's conflation of symbolist ideas and built form.

Throughout the interior, Wagner continued to fashion the spaces and furniture in accordance with the tactility of the materials used (marble, glass, aluminum, ceramic tile, and iron), pervasive diffuse light, and the animated details that constitute a seamless marriage of function and ornament. In so doing, he wedded what were generally regarded as two separate domains of architecture: urbanism and interior (private) space. The sensuousness of the building's interiors, suggested by the erotic attention to detail on the exterior, promoted the unmasking of bourgeois sensibilities and restraint that defined fin-de-siècle Viennese society—one of the primary aims of the Secessionists. Thus, Wagner's architecture was motivated by social and cultural aims; he understood that buildings must strive to communicate significant cultural ideals, in particular those that embraced change and development. Yet Wagner also affirmed another deeply held belief for modern architects: the need to embrace modern technologies, materials, and constructional methods. The marriage of both in the Vienna Postal Savings Bank—social and cultural responsibility and technological—marks an important step for the nascent Modern movement in architecture.

ELIZABETH BURNS GAMARD

S*ee also* **Art Nouveau (Jugenstil); Vienna Secession; Wagner, Otto (Austria)**

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POSTMODERNISM

Postmodernism became an intellectual buzzword within architectural circles in the 1980s and 1990s. Traced to literary theory, where Postmodernism was used to refer to new modes of fiction characterized by self-reflexivity, linguistic play, and the use of referential frames within frames (the "Russian doll" effect), the term rapidly entered other fields, such as the visual arts and architecture, to end up as a common denominator to describe the cultural climate of the last decades of the 20th century. The precise content of the term has always been elusive—the more it was in vogue, it seemed, the less precise its meaning. In architecture, however, Postmodernism has been understood to refer to a formal language that could clearly be distinguished from its modernist predecessor because of its free use of historical, vernacular, or populist references. A closer look, however, reveals that also in architecture, the confusing connotations and paradoxical overtones of the term "Postmodernism" often gain the upper hand.

Important Publications and Exhibitions

Charles Jencks, in his widely influential *The Language of Postmodern Architecture* (1977), argued that modern architecture had run its course. He even provided a precise "death" of modernity: in St. Louis, Missouri, on 15 July 1972, at 3:32 p.m., when several of the 14-story slab blocks that together formed Pruitt Igoe, a prize-winning social housing scheme designed by Minoru Yamasaki and built only 20 years before, were demolished—the final proof, thought Jencks, that modern architecture could not live up to its promises and failed to provide its users with a liveable environment. Lacking in modern architecture, Jencks stated, was communication: modern architecture did not conceive of buildings as conveyors of meaning and did not treat architecture as a language. Modern architecture's ideals of purity, transparency, and functional efficiency (elements of the established International Style) failed to relate to a general public. A Postmodernism characterized by meaningful architecture that was sensitive to its urban context would provide the substitute. For Jencks the most important feature of this new architecture was its "double coding": Postmodernist buildings communicate on two levels at once—they convey a specific meaning to a minority public of experts (other architects, art historians, and the like), who recognize formal references to historical styles, innovations, or ironic gestures, while at the same time they communicate with a larger public by invoking images that satisfy feelings of nostalgia and continuity. Whereas modernism rejected all popular references as kitsch, Postmodern architecture would rather embrace the input of mass culture.

The criticism of modern architecture formulated by Jencks was not completely new. In the 1960s, there had been a growing literature that critiqued modern architecture and urbanism for their abstract and anonymous character, their paternalistic attitudes, and their negation of history. In 1961 Jane Jacobs published her widely influential book *The Death and Life of Great American Cities,* in which she attacked modern urbanism for failing to design liveable and safe environments. She argued that modern architecture's hatred of the street was especially noxious, for it led to the creation of monotonous, monofunctional, utterly boring, and even unsafe dwelling environments in which social interaction was hampered rather than stimulated. Robert Venturi complained in his 1966 *Complexity and Contradiction* that modernist ideals such as purity or directness led to a kind of order that was rigid and stereotypical, whereas the complexity and contradictions of ambivalent formal languages, such as mannerism, were much more capable of evoking a continuing interest. Instead of the puritanically moral language of orthodox modern architecture, he preferred "hybrid" rather than pure elements, compromising rather than clean, distorted rather than straightforward, and ambiguous rather than articulated.

Aldo Rossi, in *L'architettura della città* (1966; The Architecture of the City, 1982), claimed that the modernist precept "form follows function" was naïve. Study of the history of the city reveals a persistence of historical forms rather than constant innovation: urban forms tend to endure, even if their functions wither; this persistence gives rise to the emergence of new functions. For Rossi the city (and context) is a crucial phenomenon at the heart of architecture. A contemporary architecture, therefore, has to base itself on the morphotypological study of the city (morphology referring to the historical development of the form of the city, typology to the study and classification of types in their relationship to the urban form).

The books of Jacobs, Venturi, and Rossi are some of the earliest significant publications that analyzed a nascent Postmodernism. Other publications, such as Sibyl Moholy-Nagy's *Matrix of Man* (1968), Peter Blake's *Form Follows Fiasco* (1977), and Colin Rowe's and Fred Koetter's *Collage City* (1978) exerted influence. For Rowe and Koetter, it was clear that modern architecture's utopian beliefs had grown outdated. They proposed a "collage city," in which the modernist technique of collage would bring together several urban fragments stemming from different traditions. The collision of these fragments would lead to an amalgam of simultaneous order and disorder that would allow for diverging interpretations, thus opening up the city for choice and freedom, as well as multiplicity and ambiguity.

Another important impulse during the 1960s and 1970s concerned the interest in popular and vernacular architecture. These populist architects criticized modern architecture for its paternalistic, bureaucratic, and antidemocratic character. Publications such as Sibyl Moholy-Nagy's *Native Genius in Anonymous Architecture* (1957), Bernard Rudofsky's *Architecture without Architects* (1964), or Amos Rapoport's *House, Form and Culture* (1969) provoked a genuine interest among a whole generation of architects for such factors as culture, site, climate, or conventions, which had been more or less neglected within modernism. John Turner (1968) pointed to squatter settlements as "an architecture that works" (p. 355), arguing that the housing problems in developing countries should be solved by a bottom-up approach, relying on the experiences of self-builders in squatter settlements, rather than by the top-down approach favored by large-scale modernist housing programs. Advocacy planning and participatory design gained influence in the United States as well as in Europe. At the same time, there was a growing interest in built products such as Levittown, New York, or Las Vegas. This trend culminated in Venturi, Scott Brown, and Izenour's *Learning from Las Vegas* (1972), a book in which they pleaded for the ordinariness of everyday life.

That Postmodern architecture also sought a different relation with history was evidenced at the 1980 Venice Biennale *The Presence of the Past,* organized by Paolo Portoghesi, who characterized the evolution away from modernist orthodoxy as "the end of prohibition." The exhibition featured work by Venturi, Charles Moore, Hans Hollein, and Ricardo Bofill, as well as Aldo Rossi's Teatro del Mondo, a small wooden theater, built on a ship, echoing the shape of the monuments of the San Marco basin where it was temporarily moored. Another important, dually sited exhibition—"Revision der Moderne" (Frankfurt, 1984) and "Nouveaux Plaisirs d'Architectures" (Paris, 1985)—included the work of Peter Eisenman, Frank Gehry, Rem Koolhaas, Oswald M.Ungers, Hollein, Moore, Rossi, and Venturi. Curator Heinrich Klotz argued that Postmodern architecture meant not a rejection but rather a revision of modern architecture, thus aiming at a third way between reaction and rupture. For Klotz, Postmodernism embraced fiction alongside function: a building is not just an instrument but also a work that involves representation, poetics, and metaphor.

Tendencies within Postmodernism

A dominant distinguishing strand of Postmodernism is that of the vernacular, relying on popular images and references. Robert Venturi's first building, the house for his mother, Vanna Venturi (Philadelphia, 1962), cleverly played with the archetype of the house. Its front facade looks appealingly conventional, but a closer look reveals that the interior layout is quite complex and that what at first appears as a rather large chimney in fact hides a shifted stair and a small extra room. The house features ornamental strips, mullion windows, and arches—elements that were banished from any modernist building.

Charles Moore, Michael Graves, and Robert Stern have contributed a great deal to Postmodern architecture in the United States. Moore's Piazza d'Italia (New Orleans, 1979) is without doubt one of the most influential projects exemplary of a populist and pluralist approach. The Piazza was commissioned to reflect the identity of the Italian community in New Orleans. Moore combined several references to Italy in the design, such as columns in an Italian order, a raised platform in the form of the Italian boot, and a fountain. At the same time, the design was built in a highly unusual combination of materials, using not only marble and stainless steel but also neon and cardboard. Michael Graves's Portland Public Service Building (1982) in Portland, Ohio, and his Humana Tower (1985) in Louisville, Kentucky, show how a Postmodernist language can be applied to the facades of office buildings that in terms of program and plan differ only slightly from their modernist predecessors. Stern did a similar exercise with his Point West Place (1984) in Framingham, Massachusetts, but is also capable of reinterpreting more faithfully historical languages, such as the Shingle style (e.g., Bozzi Residence, 1983, East Hampton, Long Island).

Whereas in the United States the populist tendency relies on play with formal elements, the best-known examples of participatory design are found in Europe; namely, Lucien Kroll's building for the Medical Faculty of the Catholic University of Louvain (Brussels, 1974) and Ralph Erskine's Byker housing project (Newcasde upon Tyne, 1981). Kroll's "La Mémé," as it is affectionately called, provides its student inhabitants with the possibility of continuously redesigning the distribution of its interior spaces. The building's facades appear as hybrid collages bringing together a surprising diversity of styles and references, implying that behind these walls a similar diversity of students has found shelter. Erskine's housing project in Newcastle resulted from a laborious design process involving the future inhabitants. Where the project faces a highway at its northern side, it features a very high wall with only a few openings. It shows a much more friendly face toward the other side, sprinkling the facade with a multitude of balconies made of wood and painted in bright orange and blue.

Throughout the 1980s, however, in Europe the neorationalist tendency became eclipsed by the populist model. Following the theoretical lead *of Ross'is Architecture of* *the City,* neorationalism favored an urban architecture imbued with analyses of historical urban fabrics and forms. Instead of inventing new prototypes, neorationalists argued, new contributions to the city should be based on the rational transformation of existing types in accordance with their historical and urban context. This approach has been highly successful in the work of Aldo Rossi, Giorgio Grassi, Rafael Moneo, and Oswald Ungers. For example, Rossi's Modena Cemetery (1985) combines multiple references to urban forms and to symbols of life and death with an abstracted language to convey a feeling of melancholy. Moneo designed the impressive Roman Museum (1983) in Merida, where he included archaeological findings in the foundations of the building and managed to provide the whole with a magnificent sense of Roman grandeur. Ungers's highly regarded Deutsches Architektur Museum (Frankfurt am Main, 1985) reinterpreted the tradition of the urban villa by including in a bourgeois residence alongside the Main River a house within a house, thus evoking a fundamental architectural theme appropriate for a museum of architecture.

Whereas the neorationalists saw their work as the continuation and transformation of a progressive historical genealogy, there were other protagonists of the so-called reconstruction of the city who advocated a straightforward return to classicism. Authors such as Demetri Porphyrios, Maurice Culot, and Leon Krier—with the occasional support of England's Prince Charles—argued that only a faithful reproduction of 18th-century typologies and formal idioms would be capable of providing a true sense of urbanity. According to such critics, industrialization and modernization had deprived architecture and the city of their very essence, turning architecture into a soulless repetition of the same and the city into a loose conglomerate of freestanding buildings without any streets or squares in which public life could unfold. The desire for a return to preindustrial forms has led to various built projects in Brussels (the complex in the Lakense Straat [1994] designed by different architects commissioned by the Archives d'Architecture Moderne), London (Richmond Riverside [1988] by Quinlan Terry), and elsewhere. Its most successful exponent might well be the increasingly influential movement of New Urbanism in the United States, which combines urbanist ideas similar to those of Léon Krier and Culot with an architectural imagery that refers to the American colonial tradition of small towns.

A classicist revival can also be recognized in the work of the Belgian Charles Vandenhove, who built in Belgium, Holland, and France. Vandenhove began his career developing an eloquent modernist language in a series of individual houses and larger projects, gradually transforming this language toward a more classicist idiom. Vandenhove's Theatre des Abesses complex (1996) in Paris faithfully finishes the urban block it is part of, looking as if it has always been there. The buildings facing the street are inconspicuous, built in the Parisian idiom familiar since the mid-19th century. The theater, lying in the back, is more outspoken, featuring a Palladian entrance with a fronton and a vestibule with pillars.

In the United States, Philip Johnson has, with his partner John Burgee, occasionally designed projects that were faithful replicas of historical examples (e.g., his College of Architecture [1985], Houston, Texas, a replica of a project by Claude-Nicholas Ledoux), but his Postmodernist stage is rather characterized by a free and informal use of historical references (such as his AT&T Building [1984], New York).

There are also many architects whose work is clearly Postmodernist but who cannot be categorized straightforwardly in any of the previously mentioned classifications (populist, neorationalist, or classicist). Ricardo Bofill of Spain, for example, is well known for his unorthodox use of classicist elements (columns, pilasters, pediments, cornices, and moldings) within social housing schemes. James Stirling combined classicist references with highly populist elements in his Neue Staatsgalerie (1984, with Michael Wilford) in Stuttgart, a building that can be seen as exemplary of Postmodernism's multiple references, urban sensitivity, and witty connotations. Austrian Hans Hollein's Abeitburg Museum (1982) in Mönchengladbach, Germany, sensitively interacts with its urban context, reinterpreting several building types and combining these into a difficult whole that nevertheless has a clear signature. In Japan and in Southeast Asia, an eclectic attitude has been especially prolific, as exemplified in the work of Arata Isozaki. His Tsukuba Civic Center (Tsukuba, Japan, 1983) features a replica of Michelangelo's Campidoglio that is sunk under a plaza among other Western sources.

Such examples underline Jencks's initial characterization of Postmodernism as a radical eclecticism. Postmodern architects are free to borrow elements from the context, from the past, from classicism, from popular culture, and from the architectural language and concepts of modernism. The latter makes up for a confusing connotation, for it means that sometimes the work of architects such as Richard Meier or Rem Koolhaas has been labeled Postmodernist, although it clearly continues a modernist tradition (be it with ironic or even cynical overtones).

The Postmodern Condition

The common element among the different strands of Postmodernism in architecture seems to be the rejection of the narrow focus on functionality and efficiency that characterized modernism. Postmodernity is brought about by the loss of the grand narratives of modernism: the modernist ideal of an increasing rationality that would result in progress and emancipation for all mankind has lost its validity and is seen as an illusion. In this sense, Jencks's diagnosis of Postmodernism in architecture corresponds with the French philosopher Jean-François Lyotard's interpretation of *La Condition Postmoderne* (1979; The Postmodern Condition). According to Lyotard, the main feature of the Postmodern condition is that the grand narratives (in literature, history, art, and philosophy) have come under scrutiny. Grand narratives are collectively shared ideas and convictions that are communicated by repeatedly told stories that grant legitimacy to institutions and values that form the basis of society. Such grand narratives, Lyotard argues, have lost their self-evident character, and their importance tends to become devalued in the minds of the people to whom they are addressed. Hence, there is a general loss of shared ideals that can act as guidance for decisions about future developments in our society.

This, however, is about as far as the correspondences between Jencks and Lyotard can be stretched. Jencks describes Postmodernism as that which chronologically succeeds modernism, whereas Lyotard discerns much more complex relations between the modern and the Postmodern. In his later essays on Postmodernism, Lyotard claims that the relationship between modern and Postmodern can never be simply chronological because the modern includes in a certain way the Postmodern: modern is what is new, but this means that it always follows on the previous thing, which was new (Lyotard, 1991). Jencks, moreover, stresses the aspect of communication and symbolism: Postmodernism treats architecture as a language, capable of conveying meanings, although he does not question how cultures navigate such communication. One of the arguments raised by Lyotard is precisely that the power of the grand narratives rests on their presumed comprehensibility by all, whereas it has become clear to him that societies, generations, and classes do not share a universal "metalanguage."

Criticizing Postmodernism

One of the earliest critics of Postmodernism in architecture was Jürgen Habermas (1980, 1981). Habermas blamed Post-modernism for hiding a conservative attitude behind a seemingly progressive mask. For him, Postmodernists have given up the project of modernity, the project of emancipation, to seek refuge in nice and pleasant but socially irrelevant formal games. Americans David Harvey (1990) and Fredric Jameson (1991) elaborated similar criticisms. According to Harvey, the post-Fordist version of capitalism produces a need to express social distinctions among people and classes. This need brings forth the fascination for ornaments and decorations, which are seen as codes and symbols expressing social distinction. At the same time, these codes are not clearly legible but, rather, tend to dissimulate the real geography of social unevenness by piling up a series of images and reconstructions that act as costume dramas, rendering invisible the tragedies going on behind the screens. Jameson also sees Postmodernism as a discourse generated by the economic necessities of late capitalism in which the commodity consumption has usurped modernity's critique of those very forms and processes.

Kenneth Frampton (1980) has most rigorously criticized Postmodernism's tendency toward superficiality and sheer visual attractiveness. He pleads for a critical regionalism that would uphold modernism's longing for authenticity and critical responsibility while at the same time respecting local factors of site, climate, and materials. Diane Ghirardo (1991) blamed Postmodernist and other star architects for the fact that their return to art and their interest in issues of appearance had diverted attention away from the toughest issues in land development and the building process toward trivial matters of surface.

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S*ee also* **AT&T Building, New York; Bofill, Ricardo (Spain); Deconstructivism; Eisenman, Peter (United States); Erskine, Ralph (England); Frampton, Kenneth (United States); Gehry, Frank (United States); Graves, Michael (United States); Hollein, Hans (Austria); Isozaki, Arata (Japan); Jacobs, Jane (United States); Johnson, Philip (United States); Neue Staatsgalerie, Stuttgart; New Urbanism; Portland Public Services Building, Portland, Oregon; Portoghesi, Paolo (Italy); Regionalism; Rossi, Aldo (Italy); Scott Brown, Denise; Stern, Robert A.M. (United States); Stirling, James (England); Ungers, Oswald Mathias (Germany); Vanna Venturi House, Philadelphia; Venturi, Robert (United States)**

Further Reading

Jencks (1977) wrote the publication introducing the term Postmodernism in the architectural discourse. Jencks has later published a lot more on Postmodern architecture. Of these later publications, the lavishly published book from 1987 is most interesting, as in this publication Jencks narrows down Postmodernism to new classicism. Good surveys of Postmodernism in architecture can be found in Klotz 1988 and Ghirardo 1996. Portoghesi 1983 rather focuses on theoretical issues. Tzonis and Lefaivre 1976 is especially recommended for giving an overview of participatory and populist tendencies. General introductions into Postmodernist culture at large, also covering other fields (philosophy, visual arts, performance art, film, television, and so on) are Connor 1997 and Woods 1999, and both also offer very helpful bibliographies. Docherty 1993 is a very good reader collecting key texts in different fields. An early critique is formulated in several essays in Foster 1983, with influential texts by A.O.Habermas, Frampton, Crimp, and Baudrillard. Harvey 1990 and Jameson 1991 analyze Postmodernist culture from a point of view that is informed by neo-Marxist analytical tools and that stresses the links between cultural phenomena and the economic realities of late capitalism. Larson 1993 focuses on the links between architectural culture, economy, and the struggle for professional excellence. Watson and Gibson 1994 is a very interesting reader, collecting materials from architecture, urbanism, and geography.

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POWER PLANT

Energy consumption is directly related to gross national product, and the expansion of the world market due to industrialization has accelerated the demand for energy. Originally, small electrical generators were built by factory owners in Europe and the United States for their own manufacturing, but in the 20th century the proliferation of electric lights and appliances required the construction of centralized stations. Throughout most of the century, power plants were icons of progress, but since the last quarter of the century, the power plant has come to embody the threat of environmental degradation. The high-tech exoskeletal aesthetic organic to many steam-generated power plants has been borrowed and modified by architects such as Richard Rogers (England) and Eric Owen Moss (United States). Curiously, however, power plants themselves have received almost no attention, remaining virtually invisible features in the landscape unless identified as an environmental hazard.

Power plants come in a variety of types and forms, but ultimately they do the same thing: spin a turbine connected to an electric generator, thus producing electricity. One type is distinguished from another by the mechanism used to spin the turbine. Power plants are large-scale machines converting kinetic energy into electrical energy, usually by transforming thermal energy into kinetic energy first. The form of a power plant often expresses this process by architecturally compartmentalizing the stages of transference in distinct structures connected by plumbing and other conveying systems. Some types are spread across the landscape, however, taking advantage of the energy stored in local meteorological phenomena, such as wind blowing through a pass, a river propelled downstream by gravity, or the sun's energy after it filters through the earth's atmosphere.

Steam-Generated Power Plants

Most power plants use steam to generate electricity, and the first public electric-generating stations were built in Europe and the United States in the late 1880s. Boilers of increasing size and complexity were developed in the 20th century, fired successively by wood, coal, oil, and natural gas and then by nuclear, solar, and geothermal energy.

In steam-powered electricity generators, water is pumped into a steel chamber called a boiler, where it is heated by the consumption of the fuel (e.g., the burning of coal). The resulting steam is then channeled to nozzles that inject the steam against the fins of a turbine, forcing it to spin. Coal-fired plants are the most common, and a typical coal-burning plant will produce 600 megawatts of energy in this process. The steam is then condensed back into water and returned to the boiler or expelled for cooling either in a cooling tower or in artificial ponds. Cooling towers are perhaps the largest and most architecturally distinctive features of power plants, usually constructed of reinforced concrete and parabolically tapered from a broad base to a narrower top. Although condensed steam is clean, if discharged prior to cooling in such a tower (or in its horizontal equivalent, a cooling pond), its high temperature can disturb and even kill fish and other wildlife. Waste from fuel, especially coal and oil, must also be expelled. Chimney stacks, like boilers, became increasingly complex throughout the century, and a system of scrubbers and filters have been developed to reduce levels of sulfuric dioxide, which creates acid rain. By the 21st century, a coal-fired steam-generating electrical plant could be expected to have three principal structures: the multistory boiler, the precipitator or scrubber, and the chimney stack (the streamlined character of the chimney belies the complex machinery inside its tapered conical form).

Non-Fuel-Burning Power Plants

There are two types of active solar power electric-generating plants, and both are rare compared to fuel-burning plants. The first reflects the sun's rays by the use of hundreds of reflectors arrayed in a field. The reflectors, called heliostats, are mechanically tilted to follow the sun's arc and to reflect light onto a parabolic receiver located approximately 50 meters atop a tower to the south. Water is pumped to the receiver, where it is boiled by the reflected thermal energy, thus producing steam. The experimental Eurelios plant at Adrano, Italy, built in the 1980s, utilizes this process and produces 1 megawatt of electricity. The second type of solar plant uses semiconductors called solar cells to directly transform the sun's energy into electricity. Like the first type, a solar field consists of hundreds of panels mechanically aligned to track the sun's trajectory. The first plant of this variety was built in Hysperia, California, in 1982 and produces as much electricity as the Eurelios plant and occupies the same land area, approximately 1,000 square meters.

Hydroelectric plants skip the steam-generating process, using the force of water to spin the turbines. Dams are the best-known hydroelectric generators and the most monumental, but water may also be pumped to a high point (a hill or a tower) and then allowed to rush down to the turbines. Wind farms utilize the kinetic energy of air currents to produce electricity, and a typical farm consists of thousands of steel windmills 30 to 50 meters high, each installed with an electrical generator behind the propeller. The surreal landscape of the wind farm is highly visible since they are often sited in passes where the flow of air is funneled and where civil engineers are likely to situate highways. The 6,500-turbine wind farm at Altamont Pass, California (1986), for example, generates only 300 megawatts (at maximum capacity, which it rarely reaches). By comparison, Hoover Dam (1936) generates 650 megawatts, while the Volta Dam (1965) in Ghana generates 750 megawatts (and nuclear power plants typically generate nearly 900 megawatts). Although these two types of plants do not pollute the environment like fuel-burning plants do, they still have an impact on the landscape. Dams, especially when built in a series called a cascade (such as those in the Tennessee Valley in the United States or on the Dnepr River in the former Soviet Union), often raise the water table in areas on the upstream side of the reservoir, even flooding basements in urban areas. Farms along rivers can be inundated, impacting local economies and ecologies. Even windmills can have adverse environmental effects since the siting of wind farms on migration routes seriously disturbs the nesting and foraging habits of birds.

Geothermal power plants have been constructed since the last third of the 20th century in Ireland, the United States, and parts of Europe. These plants, or fields, consist of a scattering of wells several kilometers deep, each well comprised of two bores. The objective is to tap in to the heat generated in the earth's core and stored in the earth's mantle. Water is pumped into the first bore and heated by the magma or dry rock at the bottom of the well. It is then pumped back out the second bore as steam, at temperatures of 200 degrees Celsius or greater. The steam is then used to power the electric-generating turbines.

Nuclear Power Plants

Nuclear power was hailed in the third quarter of the 20th century as a clean source of energy, and the first power plant was constructed in 1956 at Calder Hall in Great Britain. With core meltdowns in the United States (Three Mile Island in 1979) and the Soviet Union (Chernobyl in 1986), however, the former, optimistic view has been substantially revised.

In nuclear plants, a steel-encased core consisting of thousands of fuel rods (usually uranium, sometimes plutonium) encased in zircaloy creates heat via fission. Discovered in 1938, fission is the splitting of uranium or plutonium atomic nuclei, a process that creates energy in the form of heat. The fuel rods are cooled by either water (at high pressure), gas, or liquid steel, which circulates through the core before it is pumped into another steel container called a heat exchanger. There, the heated coolant is circulated in pipes inside a secondary water supply that in turn becomes heated, thus producing steam. In some cases, the heat exchanger is omitted, and water circulates directly from core to turbine. More so than in other steam-generating systems, nuclear power plants require an elaborate network of plumbing and instrumentation to monitor the flow of coolant. Because radioactivity is generated during fission, the core and its coolant are extremely hazardous, and containment structures are usually constructed around the reactor and the heat exchanger. If too little coolant is present in the reactor core, fission accelerates, and heat is increased to the point of meltdown. This is what happened at both Three Mile Island and Chernobyl, and in the case of the latter, the remaining water in the core became so hot under pressure that a steam explosion blew the roof off the reactor, exposing the core to the atmosphere. The reactors at Chernobyl were not enclosed in a containment building. After the catastrophe, the Soviets encased the dangerous reactor in a steel-reinforced concrete bunker dubbed "the tomb," an allusion to the 10,000-year half-life of the contaminated material buried inside.

JERRY WHITE

S*ee also* **Factory/Industrial Town Planning**

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PRAGUE, CZECH REPUBLIC

The Vltava River (Moldau), a natural axis of the settlement basin surrounded by hills, forms a favorable area for habitation. The city of Praha (Prague) was established in the 8th and 9th centuries, when the center of the then-Slavonic state was transferred to Bohemia (Czech lands). The old town of Prague, with its narrow, winding streets along with the churches, monasteries, and palaces, was built in the Romanesque period. The new town, built as a medieval city, was established in 1348 by a royal edict issued by Charles IV. At that time, the city, adorned by more than 100 churches and chapels with a population of 50,000, was larger than London or Paris. Today, Prague holds more than 1.5 million people. The epithet given to Prague—the Hundred Spire City—is more than deserved, and this ancient character continues to define Prague's 20th-century urban setting.

In the middle of the 19th century, architecture became an instrument to obtain a political autonomy from the Habsburg monarchy. One building in particular, the National

Theater, had been a political and cultural symbol for the rise and culmination of the Czech national revival. Built from the national collection, the original theater, designed by Josef Zitek, was located on the prominent Vltava riverfront and was completed in 1881. Three months later, however, it burned down, only to prompt another collection to rebuild the burned building. The theater, rebuilt by Josef Schulz, an associate of Zitek's, was constructed in 1883. Thus, the patriotic Czechs have been very emotional regarding their National Theater and any changes with it or its surroundings.

Ever since 1918, when Prague became the capital of the new republic of Czecho-Slovakia, proposals were made to modernize and enlarge the theater. Shortly after World War II, it was determined that both the exterior and the interior of the National Theater needed reconstruction and that the operation and running of the theater needed more space for expansion. Two national design competitions were held, and a number of design studies were made on the subject of expansion. The design submitted by the Brno architect Bohuslav Fuchs was selected as the winner. However, reservations about the decision-making process slowed down the design development of the project. After the death of Fuchs in 1972, the team resigned from the project commission. The necessity of the reconstruction overshadowed the expansion project. After seven years of work, in 1983 the reconstruction and addition to the National Theater in Prague was completed in time to mark the centennial. Although the result of the arduous effort is there, the polemic is continuing. The relationship between old and new remains a topic of debate among citizens of the city and the nation alike.

At the turn of the 20th century, historicism was countered by Jan Kotera (1871–1923), Pavel Janak (1882–1956), Josef Gocar (1880–1945), and Otakar Novotny (1880–1959). In the midst of Art Nouveau, these architects were characterized by rationalism. The first important Art Nouveau design by Kotera, the Peterka House (1899–1900) on Wenceslas Square, clearly expresses the different building uses on the street elevation. The Mozarteum (Urbanek Department Store, 1912–13) is a symmetrical composition with the ground-floor commercial storefront and second-floor ribbon-window fenestration. The upper residential consists of three progressively upward-recessed bays of brick in-fill framed into stepped concrete verticals. This dynamic facade predates Kotera's later Cubist period.

The Jan Stenc Publishing House (1909–11) by Novotny, finished in patterned bricks of different colors, features a functional layout. Daylight pours into the printing press halls through the large expanses of glass. Janak was at first the ideological leader who later designed fine Functionalist buildings, relying on Cubist forms. The stately Reuinone Adriatica Insurance Company building (1923–25) of a late Cubism, referred to as Rondo Cubism, has a dominating presence on the busy Narodni Trida (the Nation's Avenue). However, the key buildings of Prague's Cubism are Grocar's House at the Black Madonna (1912) and the Josef Chochol's (1880–1956) tenement and single-family houses (1912–14) below Vysehrad Hill. Side chairs, armchairs, tables, desks, dressers, and sofas were designed in Cubist language by Chochol, Gocar, Janak, and Novotny as well as Vlastimil Hofman (1884–1964), Jiri Kroha (1893–1974), Antonin Prochazka (1882–1945), and Rudolf Stockar (1886–1950).

The 1918 foundation of the democratic Republic of Czechoslovakia gave the intelligentsia a new platform of liberal ideology. In 1920 an avant-garde group of artists, writers, architects, musicians, and actors started a society called the "Devetsil" (the Nine Powers). The group published a journal and organized lectures and exhibitions. The ARDEV (the Architects of Devetsil) members produced studies of different housing types. The "Purist Four"—Jaroslav Fragner (1898–1967), Karel Honzik (1900–66), Evzen Linhart (1900–47), and Vit Obrtel (1901–88) with Josef Havlicek—were instrumental in founding the ARDEV. In 1932 the art critic and theorist Karel Tiege, the leader of Devetsil, published housing studies in the book *Nejmensi byt* (The Smallest Flat). The ideas of communal housing came from the socialist ideas of Soviet Constructivism. Novotny, on the other hand, was active in the "SVU (Society of the Fine Artists) Manes." The building for this important institution, which housed a gallery, meeting rooms, and a restaurant, was designed in 1927–30 by Novotny. Straddling the Vltava River and executed in a clear modern idiom, the Manes has held shows of trendsetting artists and architects of Prague ever since.

To demonstrate new ideas of modern dwelling, Prague architects organized a housing exhibition with goals similar to the Weissenhofsiedlung in Stuttgart (1927–29) or the New House in Brno (1928). Master planned by Janak, the Baba Housing (1928–32) single-family homes were designed by Gocar, Janak, Jan E. Koula, and Linhart. The family living was extended outdoors by means of large window openings, balconies, verandas, and roof terraces. A new type of office building was defined in the Pensions Institute (1929–34), designed by Havlicek and Honzik. The architects employed here the quintessential elements of functionalist architecture: a uniform structural modular system, expressed vertical circulation, ribbon windows bringing maximum daylight into a free-plan interior, and a roof terrace.

Following the 1938 Munich Treaty, then the devastation of World War II, the Communist takeover in 1948, the invasion of Czechoslovakia by the Red Army in 1968, and the political and social changes brought about by these events, Prague suffered many setbacks. During the 41 years of the Communist Party totalitarian regime, architects were expected to design in a government-dictated style called socialist realism. Functionalism was condemned as an expression of bourgeois cosmopolitanism. The November 1989 "Velvet Revolution" marked the fall of the Communist government, and free Prague emerged again.

In the last quarter of the 20th century, despite the totalitarian regime's restriction of free expression and the imposition of Moscow-style aesthetics, several new buildings stand out as important contributions to 20th-century Prague architecture. These include the Department Store "Maj" (1973–75) on the Narodni Trida by Miroslav Masak (1932–), Martin Rajnis (1944–), and Johnny Eisler (1946–); the Tennis Stadium (1986–89) on Stvanice Island by Jana Novotna (1946–) and Josef Kales (1934–); and the Retirement Home (1983–89) at Chodov by Jan Lynek (1943–), Vladimir Milunic (1941–), Tomas Kulik (1954–), and Jan Louda (1949–). The husband-and-wife team of Jan Sramek (1924–78) and Alena Sramkova (1929–) designed a key transportation hub of the Main Train Station (1972–79) and the CKD Building (1976–83) on the Narodni Trida. The Vltava riverfront has been complemented by the National Netherlands Building (1992–95), known as the "Fred and Ginger," by Frank Gehry with Vladimir Milunic.

PETER LIZON

S*ee also* **Art Nouveau (Jugendstil); Czech Republic/Czechoslovakia;**

Weissenhofsiedlung, Deutscher Werkbund (Stuttgart 1927)

PRAIRIE SCHOOL

The Prairie School was an indigenous Midwestern phenomenon. Beginning in the Chicago suburbs during the 1890s, it spread outward through the entire region in the first two decades of the 20th century. Many of its most distinctive achievements were in small towns, such as Mason City, Iowa, and Owatonna, Minnesota. Unquestionably, the spiritual leader of the movement was Louis Sullivan (1856–1924), who developed a philosophy that emphasized the organic quality inherent in a successful building. In his buildings, by his writings, and by the force of his charismatic personality, he passed this philosophy on to a group of young architects who became his disciples. Without doubt, the most gifted of these was Frank Lloyd Wright, who was with Adler and Sullivan for six years prior to his departure to found his own office in 1893. Wright saw the provision of well-designed houses for the newly affluent Midwestern upper-middle class as a great opportunity. His clients did not possess great fortune but were generally technological entrepreneurs. Many had a taste for music. Wright gave them dwellings that responded to the vision of Sullivan and that at the same time went beyond that vision to achieve a synthesis very much his own. For the next 15 years, he pursued his goals with remarkable vigor and great success. The first executed houses in which the new style was fully visible were the Bradley house (1900) in Kankakee, Illinois, and the Ward Willits house (1901) in Highland Park, Illinois. In the next few years, there followed a number of important works, notably the Davenport, Dana, Heurtley, Huntley, and Thomas houses, all finished by 1904. These houses had important elements in common: flowing interior space, directional or centrifugal lines, generous low roofs with pronounced overhangs, broad chimneys, reduced floor heights, rows of casement windows, geometric leaded glass, and an intimate relationship to the site. The interiors featured furniture and sometimes fabrics designed by the architect. Wright's objective was to control every aspect of the architectural experience. All were designed on a unit system, meaning that they were based on a single module with a length equal to some specific architectural element, often, as in the Willits house, the distance between center lines of window mullions. None of these houses show any hint of historicism. Although most were located in suburbs, with varying kinds of topography, all reflected the horizontal lines of the prairie.

The sources of these designs, for Wright and for the gifted young men and women in his Oak Park studio, were mixed. They owed something to the earlier Shingle style, and they owed much to the contemporary English Arts and Crafts movement. The houses of Voysey and the theoretical writings of C.R.Ashbee were discussed as they appeared in the pages of *The Studio.* In addition, they owed a debt to Japanese art, which most of them knew through prints (Hokusai and Hiroshige were familiar names). After 1904, the year of the St. Louis World's Fair, there was a bit of influence from Germany and Austria. All these influences, however, were melded by Wright and the staff of his studio into a distinctive Midwestern and American expression.

Among Wright's studio apprentices, the most important were Marion Mahony, Walter Burley Griffin, William Drummond, and Barry Byrne. All were substantially influenced by Wright, and all in later years made substantial contributions of their own. Their contemporaries spoke of a "New School of the Midwest." Outside the studio, Hugh Garden, Robert Spencer, and George Maher, at different times in their careers, produced excellent designs in the Prairie School manner.

In Minneapolis the firm of Purcell and Elmslie developed its own distinctive version of the style. By 1910 it was generally recognized in the nation's architectural press that the most progressive tendencies in American architecture were in the Mid-west. Wright's own series of articles in *The Architectural Record* titled "In the Cause of Architecture" (1909) were perhaps the clearest evidence of this evaluation. International recognition came with the publication of the famous Wasmuth folio on his work (Berlin, 1910) and with the influential articles of Hendrik Berlage for the *Schweizerische Bauzeitung* in 1911. These publications had substantial impact on the Modern movement in Europe.

For Wright the climax of his Prairie period came with the great houses of 1908–09, particularly the Robie (1908) and Coonley (1909) houses, the first in Chicago and the second in Riverside, Illinois. Among public buildings, his major achievements were Unity Temple (1904–05) in Oak Park and the headquarters for the Larkin Company in Buffalo, New York, done in the same years. The Prairie School idiom, however, was not one that lent itself easily to large public buildings and industrial structures. There are a few of these. In the latter category, Hugh Garden made some noteworthy contributions with the Grommes and Ullrich Building (1901), the Schoenhofen Brewery (1905), and the Dwight Building (1910), all in Chicago. The last structure was for a printing company and was framed in flat-slab concrete. The Prairie School architects also did a few churches. Of these, Sullivan's Methodist Episcopal Church (1910) in Cedar Rapids, Iowa, with a contribution by George Elmslie, is perhaps the finest. On the whole, however, the Prairie School aesthetic lent itself to houses and small commercial buildings, and it is these building types by which its practitioners should be judged.

Prairie School architects attempted almost every problem in the decorative arts, and they had great success with chairs, tables, case furniture, fabrics, and perhaps most important of all, leaded glass; their achievements would have been impossible without the cooperation of cabinetmakers such as John W.Ayers and glass studios such as Giannini and Hilgart and the Linden Glass Company; and for Wright, the assistance of the Milwaukee interior decorator George Niedieken was vital in such large commissions as the Robie and Coonley houses and the May house (1909) in Grand Rapids, Michigan. The architects saw building as a cooperative process in which client, designer, and artisan all had important roles to play. Among themselves, they deplored the tendency of Wright to claim all the credit for their achievement, as he commonly did after 1913–14.

In certain respects, the Prairie School style can be understood as an idiom that could be employed by architects who had little or no contact with Wright, Sullivan, or Chicago. For the central figures—Wright, Sullivan, Griffin, and Purcell and Elmslie—architectural design was an act of faith, an optimistic faith in the liberal ideals of American democracy. They liked to think

Arthur Heurtley House, Oak Park, Illinois, designed by Frank Lloyd Wright (1902)

Photo © Mary Ann Sullivan

of their architecture as “progressive” and strongly disliked the academic traditionalism of McKim, Mead and White and their Eastern contemporaries. In fact, they viewed it as a rehash of outworn European forms. The Prairie School manner, however, was sufficiently attractive that it was sometimes employed by architects who had relatively little sympathy with the ideals of the leaders. Thus, Osgood and Osgood in Grand Rapids, a firm that was essentially eclectic, did two houses in a distinctly Prairie School manner. These dwellings might well have been responses to client demand. Sidney Robinson and Richard Guy Wilson have shown that Iowa is dotted with buildings that have Prairie School elements. The same kind of demonstration could easily be made for Minnesota, Wisconsin, and Illinois. Wilson and Robinson also argue that the Prairie School had two distinct and separate phases. The first has been identified as from 1900 to about 1920. They date the second from Wright’s return to the Midwest in the 1930s and cite his later Iowa houses and the work of Alfred Caldwell in Dubuque. This position is arguable, and it has recently received support in *Frank Lloyd Wright and Colleagues: Indiana Works* (Michigan City, Indiana, 1999). This exhibition catalog also includes certain projects by the landscape architect Jens Jensen, whose stature in his field is comparable to that of Wright in the building arts. Jensen certainly had a prominent role in the development of the Prairie symbolism.

The gradual decline of the original Prairie School after 1914 was the result of several broad historical factors. For a variety of reasons, the supply of clients willing to accept the innovations advocated by the architects dwindled considerably. Women were becoming increasingly important in American society, and as Thomas Tallmadge pointed out, wives now received their education from magazines edited in Boston and New York. In 1910 *House Beautiful,* which had always been sympathetic to the Prairie School architects, moved its offices to New York. The last prairie houses appeared in its pages in

1914. The story *of Country Life in America* is similar. Its last mention of a prairie house was in January 1914, when it featured a dwelling in Seattle by Andrew Willatzen, who had worked in Wright's office and absorbed some of his thought. The general shift of the publishing industry to New York had enormous consequences for the cultural life of the entire nation, as it meant a homogenization of American culture. The Prairie School had flourished as a healthy type of regionalism, and regionalism became unfashionable.

The architects themselves withdrew from the Midwestern scene. Wright's personal life was chaotic, and he spent much of the decade of World War I in Japan. Sullivan, the philosophical leader of the group, was able to build only a handful of small banks and gradually descended into poverty and alcoholism. Walter Burley Griffin and Marion Mahony, two of Wright's most talented apprentices, went to Australia in 1913 and spent most of their careers in that country. Purcell went to Philadelphia in 1918 to enter the advertising business and in 1922 moved to the West Coast because of ill health. Nonetheless, the achievement of the Prairie School was substantial, and it left the Midwest a great legacy in the form of a large number of buildings that are sought out and admired to this day.

LEONARD K.EATON

S*ee also* **Chicago, (IL), United States; Griffin, Walter Burley, and Marion Mahony Griffin (United States); Larkin Building, Buffalo, New York; National Farmers' Bank, Owatonna, Minnesota; Purcell, William Gray, and George Grant Elmslie (United States); Robie House, Chicago; Sullivan, Louis (United States); Taliesin West, near Phoenix, Arizona; Unity Temple, Oak Park, Illinois; Wright, Frank Lloyd (United States)**

Further Reading

The drawings of Frank Lloyd Wright are held by the Taliesin Foundation in Scottsdale, Arizona. The Northwest Architectural Archives at the University of Minnesota holds the Purcell and Elmslie Collection, whereas the Prairie Archives at the Milwaukee Art Museum holds those of George Niedecken. The Burnham Library at the Chicago Art Institute and the Avery Library at Columbia University also have many drawings relating to the Prairie School.

Art museums across the United States own examples of Prairie School work in the decorative arts including the Chicago Art Institute, Milwaukee Art Museum, and Minneapolis Art Institute, Minnesota. The Metropolitan Museum of Art in New York has the important triptych of windows from the Coonley Playhouse and has restored the living room of the Francis Little house (Wayzata, Minnesota, 1913). Both of these are works by Frank Lloyd Wright. Several of Wright's prairie houses have been restored. The most notable ones are the Susan Lawrence Dana house (Springfield, Illinois, 1902) and the Meyer May house (Grand Rapids, Michigan, 1909). A restoration of the Robie house (Chicago, 1908) is in process.

The literature on Frank Lloyd Wright is enormous and continues to expand. Aside from the important but often *misleading An Autobiography* (New York and London: Longman Green, 1932), the most significant comprehensive works for Wright's prairie period are:

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The files of *The Prairie School Review* published by Bill and Marilyn Hasbrook of Park Forest, Illinois, from 1964 to 1972 is another invaluable source of information. Particularly notable are the articles by Joseph Griggs on Iannelli (2, 4, 1965), David T.Van Zanten on Marion Mahoney Griffin (3, 2, 1966), Donald Hoffman on Parker Berry (4, 1, 1967), and Robert E.McCoy on Griffin's work at Mason City (5, 3, 1968). Through the Prairie School Press, the Hasbroucks have also made available reprints of many important Prairie School documents such as the original publication on Purcell and Elmslie in *The Western Architect.* In the end, however, the most important documentation of the Prairie School is the buildings themselves. They stand as the legacy of an era in which the Midwest, in no uncertain terms, challenged the traditional cultural leadership of the East. As the years pass, the challenge looks increasingly significant.

PRECAST CONCRETE

Precast construction typically refers to concrete that is manufactured in a factory rather than at the site. Poured-in-place concrete, in contrast, is a process where formwork and reinforcing bars are set and the wet concrete and its aggregates poured in the precise position that they are to occupy in the completed building. Poured-in-place construction allows contractors to tailor the various components of a building and more easily compensate for minor discrepancies discovered during the course of a project. In many cases, however, precast construction offers both technical and cost advantages. Precast components are manufactured in factories, transported to the site, and then assembled and fastened together on the job. They may or may not be reinforced, but if so, they are usually prestressed.

The technical advantages of forming reinforced-concrete components in a factory first involve environmental factors. Heat and humidity influence the length of time that concrete requires to set and cure as well as its load-bearing strength. The factory environment allows manufacturers to control these atmospheric variables far better than at a site. Precast structural members are often designed at higher strength than most on-site counterparts (which are designed typically for 3,000 pounds per square inch, 28 days after pouring). Temperature can be raised in a factory, accelerating the amount of time that concrete requires to cure. Also, reinforcing can be more precisely set into place, and the tolerances and coverage of concrete around the reinforcing steel can be more accurately controlled, thus producing more efficient structural components. Complex rebar configurations and more accurate lapping of one rebar over another can be more easily managed and inspected in a factory, where the movement of laborers and technicians is not inhibited by on-site obstacles. Site conditions are also rarely conducive to the pretightening of steel tendons, and thus prestressed structural sections are far easier to construct in a factory setting. Prestressing is a process where steel cables called tendons are anchored to the ends of formwork and tensioned before concrete is poured. After the concrete hardens and gains sufficient strength, the cables are released. This internally applies a precompressive stress, which potentially reduces or minimizes undesirable tensile stresses created by the structural member's own weight as well as the load that it will have to support once installed in the building. Prestressing tends to minimize cracking as well as de-flections. Finally, factory conditions also tend to allow better control over the finished appearance of concrete, including surface sheen, aggregate density, and color.

The cost advantages of precast construction derive from an economy of scale. Factory settings are economical when manufacturing multiple copies of the same component. Poured-in-place construction requires assembling the formwork for components on-site, setting the rebar, pouring the concrete, and then removing the formwork for reassembly at the next pour, usually requiring more time and labor than manufacturing the equivalent part in a factory. This is important because it can have a significant impact on the overall cost and length of time to complete a building project.

Precast construction comes with inherent limits, however, dictated primarily by the problem of transportation. Manufactured components must be transported from the factory to the building site via ship, train, or truck and sometimes by a combination of means. Consequently, components must not be so long or heavy that they prohibit transportation. Generally, components longer than 30 feet are impractical. Weight is an especially crucial factor in transportation, and it is common for engineers to anticipate the problem of transport by incorporating steel hooks or loops anchored in the concrete for the purpose of lifting and lowering by crane. The cost-effectiveness of precast construction can be compromised by building sites located in remote areas or in regions where infrastructure is insufficient. A mountainous site, for example, may be a poor choice for precast construction if existing roads twist and turn at radii that a large truck cannot negotiate.

The ramifications of precast construction affect both engineering and aesthetics. Construction schedules must be carefully planned so that needed components arrive on-site when needed. Since some parts may be built on-site and others manufactured in a remote factory, and in many cases precast components may be manufactured in separate factories miles apart, the interface between components is a crucial concern of engineers and architects. A kit-of-parts approach to construction encourages the manufacturing of standardized parts that can fit together in a variety of configurations. Generally, irregular building designs can be problematic, while modularity tends to be advantageous in precast construction.

The most common precast structural components tend to be linear: beams, ribbed beams (also called T beams), inverted T beams, solid flat slabs, hollow-core slabs, and tilt-up wall panels. Unreinfbrced-concrete components include wall panels with specific finishes either poured or applied as veneer. Unlike poured-in-place reinforced concrete, precast construction lacks the structural advantage of continuity, where rebar segments can be lapped in a series the entire length of a structure. This is why connections between components require great care. Slip-slab construction is a hybrid method where floor slabs are poured on grade at the site, then lifted into place by jacks secured to building columns. This process is cost-effective for multistory buildings with repetitive floor configurations since the forms do not need to be moved from one floor to the next. However, the connection between floor slabs and columns requires the same expertise as precast construction connections.

JERRY WHITE

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PREDOCK, ANTOINE 1936

Architect, United States

The architectural vision of Antoine Predock is spiritual, environmental, and symbolic. His work, grounded in ideas derived from the varied landscapes of the American Southwest, returns to architecture a mysterious connection with place and human feeling that many believe has been eroded by 20th-century life. A key element in his approach to design is context. For Predock, however, context goes beyond contextualism to embrace the site and all that will happen there over time. Predock has applied his architectural vision to a variety of building types, but his ideology is most vivid in his institutional works—such as the Spencer Theater for the Performing Arts (1998) in Alto, New Mexico; the Arizona Science Center (1997) in Phoenix; and the American Heritage Center Art Museum (1993) at the University of Wyoming, Laramie—and in his designs for domestic space, including the Venice House (1991) in Venice, California; the Rosenthal House (1993) in Manhattan Beach, California; and the Hotel Santa Fe (1992) at Euro Disney, outside Paris.

Predock's work is affected by all his life experiences, ranging from a visit to the Egyptian pyramids to a ride on his motorcycle. He received his bachelor of architecture degree from Columbia University in New York City in 1962 after beginning his education at the University of New Mexico in Albuquerque in 1957. While a student in New York, he became involved in the art of dance. Predock translated the movement of the body in dance into spatial elements within his architecture as both a strong processional component and a focus on an accumulation of viewpoints. Through the many different buildings of the complex, the Nelson Fine Arts Center (1989) at Arizona State University in Tempe architecturally offers a number of processional choices that are further multiplied by the transition from daytime to nighttime. The complex can also be interpreted as a piece of performance art with its numerous balconies, arcades, loggias, and steps, each providing a different stage for the user to engage and act on.

Predock's early work was relatively modest in scale. After working for three years as a designer in the offices of I.M.Pei and Partners in New York City and Gerald McCue Associates in San Francisco, Predock founded his own firm in Albuquerque in 1967. The four-person office built its reputation on houses and institutional buildings that blended comfort with the vernacular Southwest image, depicted by Predock in the employment of natural desert colors and contextual materials in a tough, defensive architecture. The 1986 completion of the Fuller House in Scottsdale, Arizona, marked the national and international recognition of his bold, abstracted, and original style. The house is deeply set into the earth and oriented with respect to the east-west axis, which provides the potential heating and cooling properties of each room. Nature is brought into the design through the inclusion of a sunrise terrace and a sunset tower separated by a circular pool, which acts as the terminus of the water channel that runs parallel to the east-west axis of the house.

Inspired by architects such as Louis I.Kahn and Frank Lloyd Wright, Predock included with his regional sensibility the elements of the modern in his 1993 design of the Turtle Creek House in Dallas, Texas. Giant limestone ledges recall the geologic setting of Dallas, and the great glass wall recalls architecture of the International Style. The house, surrounded with trees and plantings, provided a specialized setting for the patrons who were avid bird-watchers. Not only do the plantings welcome the birds but also the siting of the house along the major north-south migratory flyways greets the feathered creatures. This same axis also became the dominant processional path through the house.

Predock's interpretation of the Tucson, Arizona, environment dictated the design of the Ventana Vista Elementary School (1995). From a distance, this "city for children" nestles into the landscape and color palette of the desert site. At the heart of the complex, Predock placed a large white tent, reminding the children of the larger environment and imparting his notion that life in the desert was not always so predictable or sedentary. The fourth- and fifth-grade neighborhood is located on the highest part of the site. The walls of this neighborhood's classrooms are easily opened up to the exterior by large rolled-up garage doors. The second- and third-grade neighborhood revolves around spaces for reading, such as the sorcerer's terrace, and

American Heritage Center and University Art Museum, University of Wyoming, Laramie, designed by Antoine Predock (1993)

spaces for contemplation and dreaming, including the desert kaleidoscope, where children can peer through cylindrical skylights into a shallow dome and out to the sky. The sense of discovery continues for all children on the path to the celestial realm and the solstice wall, the apertures of which not only frame distinct views of the landscape and sky but also align with the sun during the summer and winter solstices. Spy holes in the classroom walls enable children to catch a glimpse of their classmates at work.

Predock's firm continues to receive outstanding commissions, including the San Diego Padres Park at the Park in San Diego, California, and the Cornerstone Arts Center at Colorado College in Colorado Springs. Underway at the University of Minnesota in Minneapolis is the Gateway Center, a granite-clad geode attached to two parallel copper boxes. Its architectural distinctiveness draws from Minnesota themes, particularly in the 90-foot-high granite geode that evokes Lake Superior's north shore. Fissures of glass, allowing natural light in during the day and bathing the surrounding area with projected light at night, crisscross the granite planes. The Gateway Center illustrates Predock's fascination with engineering and architecture, developed early in his career at the University of New Mexico under the tutelage of his mentor, Don Schlegel.

Predock's creative and insightful work has won numerous worldwide awards and has been the subject of many architectural exhibitions. His projects, invigorated by the form and spirit of the place, including its environment, rituals, and culture, have brought to architecture a soul and character unknown in the work of many of his contemporaries. Although his buildings are not easily copied in the formal sense, the ideology of his design provides an exciting model for those practicing today. For Predock, architecture is more than a fleeting moment in a designer's mind. A building has a life all its own, one that takes on a magical quality from things that come before, during, and after its original conception. As Predock has stated, "We remind ourselves that we are involved in a timeless encounter with another place, not just a little piece of land. All of the readings that have accumulated and been assimilated there, that are imagined there, that may happen there in the future—all of these collapse in time and become the raw material with which we interact."

VICTORIA M.YOUNG

Biography

Born in Lebanon, Missouri, 24 June 1936. Attended the University of New Mexico, Albuquerque 1957–61; bachelor's degree in architecture 1962; studied at Columbia University, New York on a traveling fellowship. In private practice, Albuquerque from 1967. Kea Distinguished Professor, University of Maryland, School of Architecture 1981–82; visiting professor, Arizona State University 1982–83 and 1983–84; visiting professor, Southern California Institute of Architecture 1984 and 1990; visiting professor, Harvard University, Cambridge, Massachusetts 1987; architect in residence, California State Polytechnic University, Pomona 1988; distinguished visiting professor, Clemson University, South Carolina 1988; distinguished visiting professor, University of Genoa 1988. Fellow, American Institute of Architects.

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Ventana Vista Elementary School, Tucson, Arizona, 1995
Arizona Science Center, Phoenix, Arizona, 1997
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PREFABRICATION

Buildings are traditionally constructed by assembling materials and components of the building trades according to an approved set of design drawings and specifications on a given site. Having a smooth and timely pace for erecting buildings is highly dependent on the quality and steadiness of supplies, the availability of qualified labor, a safe and conflict-free working environment, and, last but not least, the weather. Because all these more or less controllable variables pose substantial risks, the desire to standardize the design and to relocate the production process into a highly controllable, productive factory environment is an old dream of builders and clients alike. The technique dates back to the early stages of industrialization, at the turn of the 20th century, with prime examples being London's Crystal Palace, built in 1851 for the Great Exhibition in Hyde Park, London, by Joseph Paxton, and cast-iron building facades created for commercial structures in the fire hazard-prone early metropolitan areas of our times.

The term "prefabrication" in architecture normally describes the assembly of buildings or their components at a location other than the building site. With the help of this method, the risk-creating variables of cost control, weather, and a dependable and, because of repetition, experienced workforce helps to optimize the use of materials and time in a controlled environment. Prefabricated units can range from singular building parts that later find their way into a conventional on-site construction project, such as doors, windows, and roof trusses, to room-size elements, from bathrooms to entire buildings. Prefabrication can also take place on-site if the scope of the project is very large, as in the case of housing developments of the 1960s, 1970s, and 1980s in Eastern Europe, the former Soviet Union, and Scandinavia.

Historically, the main materials for prefabrication are wood, iron, and concrete. Early traces of wood for prefabrication date back to the 1848 gold rush in the United States; experiments with prefabricated housing units made of wood in Great Britain, Germany, and Sweden were conducted between the two world wars. In 1850 in New York, complete wooden houses where shipped as building kits to California in response to the huge demand in the West. Several hundred housing units made of other materials, such as corrugated galvanized iron, were imported from Manchester, England, completely fitted with wallpaper, water closets, and furniture to satisfy the demand for housing in California, where an established building industry was not yet available. Patented plantation and camp buildings produced by lumber dealers in New York and Boston consisted of a number of interchangeable parts and could be erected in hours. In Germany the company of Christoph and Unmack, founded in 1882, produced load-bearing wood panels for cabins and camp buildings that were shipped in very large quantities to many parts of the world. The oldest known U.S. firm specializing in prefabrication was founded in Boston in 1892. Ernest F.Hodgson manufactured dwellings of wood, which the firm labeled in a patent, dating back to 1861, "the portable house." Other derivatives of early prefabrication in the United States are so-called mail-order houses. Companies such as Sears, Roebuck, and Company (Newark, New Jersey), Montgomery Ward (Chicago, Illinois), Aladdin Company (Bay City, Michigan), Gordon-Van Tine Company (Davenport, Iowa), and many others produced "precut" timber kits of parts, designed for owner erection. Many might consider the system of precutting not to be a true prefabrication process. The enormous number of produced units, the industrialized process of factory-controlled cost estimating, the purchasing and cutting of wood products, numbering industrialized quality control, and packaging all were carried out in a efficient factory-assembly-line manner. Between 1908 and 1940, customers ordered some 100,000 houses from Sears, Roebuck, and Company alone. The designs could be selected from a catalog, ordered by mail, and shipped by rail. Approximately 450 ready-to-assemble designs covered almost every style, from cottage to mansion. Beside Sears's brick and concrete masonry unit homes, the traditional wood frame erected on a wooden platform was used as the standard method of construction.

Industry in the United States also experimented with concrete and iron as prefabrication methods. In 1920 story-height precast reinforced-concrete stone elements were produced under trade names such as “Armostone,” “Moore Unit,” and “Tee-Stone.” Frank Lloyd Wright designed a precast system in 1920 that consisted of two precast-element walls: one interior wall and one outside, reinforced and connected with tie-rods and separated by an insulating air space. The large sizes of concrete elements made handling on a conventionally equipped, small-scale construction site difficult. Smaller-scaled precast units, such as 16-by-8-by-8-inch concrete blocks, were, and still are today, more widely accepted.

Early experiments of prefabrication in Great Britain with elements made of iron date to Victorian times, when numerous prefabricated buildings were shipped from Britain to every corner of the world. British settlers on the Australian west coast could order corrugated-iron cottages from the Phoenix Iron Works in Glasgow, Scotland, and from the firm of Richard Walker. Other requests from Australia called for the shipment of “portable” churches, temporary metal structures to replace the hastily improvised timber structures of the early days. In Melbourne alone, 19 metal churches were erected with kits shipped from the homeland between 1836 and 1851. When it was packed and ready for shipment to the colonies, a church weighed about 50 tons; the cost in the second half of the 19th century was £1000, and the building was ready to be used in five weeks. Before shipment to foreign coasts, it was common practice to fully assemble the structure on the grounds of the factory as a final quality check, which always attracted public attention. The lighthouse in Gibb’s Hill, Bermuda, is a sturdy, prefabricated iron structure shipped from England in 1857; the so-called Gordon’s Lighthouse in Barbados, a fully prefabricated-metal construction, stood for 112 years. The Iron Palace for King Eyambo on the banks of the Calabar River in Nigeria, erected in 1843, was built by the foundry of Laycock, Liverpool, “a composite structure of plate and panels of iron upon a wooden skeleton merely,” as the *Liverpool Times* described it.

Besides prefabricated galvanized sheet-metal elements, cast iron contributed to a large degree to the importance of metal prefabrication techniques. James Bogardus is more identified with the advances of cast-iron prefabrication than any other inventor. Already holding numerous patents for metal fabricating tools and mills, Bogardus conceived the idea of taking cast iron beyond its already widely accepted role as a decorative building material to a multistory structural system. His first building would be his own factory in New York City, for which he tried to associate with other veteran iron makers to raise the necessary funds. Bogardus’s system consisted of basic elements: a hollow column with flanged sides, a C-shaped hollow beam, a spandrel panel, and a diversity of decorative cast-iron elements, such as cornices, entablatures, window elements, cornerstones, and Medusa-head keystones, the trademark of the Bogardus Ironworks. With these decorative elements, which suited the Victorian taste of the time, a variety of designs could be created. The buildings were assembled by bolted connections, hidden on the inside of every element, forming rigid moment connections between columns and beams. Bogardus was granted a patent for his “building system” in 1850. It did not take long for numerous commercial buildings with cast-iron facades to surface, and other founders and builders created competition. It was also clear that the new technique would not be confined to New York but instead would spread to every major commercial center in the United States. Stove makers, founders of cook pots, and hardware manufacturers soon entered the field of cast-iron architecture. Part of the attraction of cast iron as a building material was its fire resistance. Despite Bogardus's claim that his own factory was made entirely out of metal, many cast-iron buildings used a significant amount of timber and stone building materials. Many of Bogardus's own designs, both in Baltimore (1904) and in Chicago (1871), were consumed by fire. At the end of the Victorian period, the material and the associated prefabrication techniques fell out of favor. Despite early hopes, they were not fire safe, nor could they resist strong winds, as shown by the entirely demolished cast-iron warehouses in Havana, Cuba—destroyed in 1906 by a hurricane.

Neither fire safety nor resistance against wind is a major concern for reinforced precast concrete. With the invention of heavy trucks in the 1930s, reinforced precast concrete elements could be transported to almost every construction site. The first modern use of precast concrete was in the Notre Dame du Haut Cathedral in Raincy, France, by the architect-engineer Auguste Perret in 1922. The main structural systems of the church still show a largely in situ concrete system, yet the wide use of precast elements for in-fill walls and partitions led the way for the industry. Such is the case with iron: prefabricated structures in concrete can be distinguished as load-bearing elements, such as columns, beams, and floor slabs, and in-fill materials and components, such as windows, panels, and utility cores. Yet concrete lends itself to a few interesting new techniques, developed in the years before World War II and employed in the years after the war, that are uncommon in any other prefabricated process. The technique of a "lift slab" casts the reinforcedconcrete slabs of a multistory building on grade, one over the other, with sleeves designed for slab connections to previously erected columns. After the curing process is completed, the "stack" of slabs is lifted into place and bonded to the connections with the vertical structural member, the column. Volumetric steel forms with a high degree of precision and built-in heating equipment to accelerate the curing process can produce U-shaped "tunnel forms" stacked on top of each other. It was mostly building types with a high degree of equally sized room cells, such as hotels and apartment buildings, that were erected with this method. Advantages to prefabrication methods employing concrete are an organized, orderly supply and storage of aggregates at a different place than the site of erection; a clean construction site; the multiple re-use of expensive formwork; and the improved surface quality of the finished product. Despite these advantages, the prefabrication of entire room cells (or "big boxes") or ceiling-height big panels never caught on in the United States. In Europe, South America, and the former Soviet Union, including most of its allies, a significant number of housing projects were carried out with prefabricated-concrete panels. Notable innovations in the technique originated in Scandinavia and France and were paralleled by extensive large-scale developments in East Germany, Yugoslavia, and the Soviet Union. Most of the panel systems in these cases were based on the full wall-size big panels. Despite the large number of projects executed, big panels proved to be expensive overall, called for multitude of joints that had to be made in the field, and seldom permitted the degree of prefinishing and shop incorporation of utilities as originally anticipated.

Today, prefabricated "architectural" precast concrete is widely used in the United States and worldwide mainly as building components (not as a primary structural material), either for enclosure or highly repetitive elements, such as staircases. The surface quality of architectural precast concrete produced in developed countries is high compared with the beginnings of the industry. Because of the advantages in thermal properties over glass, mainly because of thermal mass inertia, precast concrete for building envelopes has the chance to become a prime material in times of increased energy costs.

RALPH HAMMANN

S*ee also* **Concrete; Notre Dame, Le Raincy; Precast Concrete; Reinforced Concrete**

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PRIMITIVISM

Primitivism is a set of ideas arising in Western Europe during the 18th century, a period of unprecedented European colonial expansion. Primitivism does not name a group of artists or architects or a style arising at a particular moment but, rather, encompasses the various responses produced by contact between Western and non-Western societies during the colonial period. It has three primary meanings: a belief in the superiority of a simple life close to nature, a belief in the superiority of non-industrial society to that of the present, and a valorization of the art and architecture of primitive peoples or primitive creators. All three definitions indicate that primitivism is a critical attitude toward present society, culture, and art and a preference for societies, cultures, and art from simpler times, states of evolution, or mentalities. It is also used to indicate the art and architecture of primitive peoples or cultures, although this is not a correct usage, as primitivism is a phenomenon of Western culture, not the product of "primitive" peoples. The word *primitivism (primitivisme)* was used first in France in the 19th century; William Rubin traces its appearance to the *Nouveau Larousse* between 1897 and 1904, meaning "imitation of primitives." The *term primitive* has a wide range of meanings, including original, primeval, little evolved, elemental, natural, naïf, characteristic of an early stage of development, and produced by a relatively simple people or culture or a self-taught artist. This term is generally used to designate societies considered to have a lower level of evolutionary development than Western societies.

There are two tendencies in primitivism: a search for origins in the classical, exemplified by the primitive hut of Enlightenment theories, and the valorization of peasant, vernacular, or non-literate culture as a means for producing a more primal art or architecture. This latter meaning is used extensively in the history of modern art but applies to modern architecture as well. In his groundbreaking book of 1938, *Primitivism in Modern Painting,* Robert Goldwater defined "primitivism" as a search among Western artists for something below the surface of things—further back in time, psychology, or geography—that is simpler and more profound, valuable, or powerful because of its simplicity. The primitivists assumed that delving beneath the surface would reveal this basic quality. This search for simplicity unites the disparate primitivist movements, but the nature of "simplicity" varies with the goals of the seeker. Primitive art is usually, according to Goldwater, a stimulus or catalyst to modern art, not directly borrowed from or the direct cause of primitive qualities in that art. The primitive helped Western artists and architects formulate their own goals and methods and served as a referent, not a direct source. Colin Rhodes, historian of primitivism in modern art, points to an equivocal issue at the heart of primitivism: although artists used the primitive as a support and justification for cultural or social change, their efforts were directed toward change expected to emerge within the West. There was no question of the comprehensive substitution of Western culture, or its unacceptable aspects, by the primitive.

Enlightenment primitivism was motivated by a search for origins, a "higher" source, and a belief in the superiority of a simple life close to nature, exemplified by Montaigne's and Rousseau's valorization of the savage who lived in a more natural, less corrupt state of being. Enlightenment theories of architecture posited a primal architectonic form, the primitive hut, from which all forms of architecture derived. The glorification of the "noble savage," as Peter Collins notes, contributed to the 19th-century revivals of Greek and Gothic architecture and the valorization of such styles as primitive, pure, and natural. In the mid-19th century, artists and architects sought a lost, relatively simple style that was part of their tradition. This form of primitivism demonstrates a preference for non-industrial society to that of the present. A.W.N.Pugin, John Ruskin, and William Morris shared a distaste and distrust for the mechanization and materialism of the industrial age. They called for the revival of medieval art and architecture as a way of healing society and people, who had become extensions of machines rather than whole beings. Their theories stimulated the Gothic Revival, illustrated by Charles Barry and Pugin's Houses of Parliament (1836–51) in London and the Arts and Crafts movement. The Mission Revival in the United States merged Arts and Crafts sensibility with a primitivist vision of early California under the Spanish missionaries (Charles Lummis, El Alisal, Los Angeles, begun 1898).

In the 19th century, the search for primitive origins converged with Darwinism and the "discovery" of primitive civilizations by Western colonizing powers to produce a hierarchy of races and cultures, with Europe and the United States at the apex. Colonization was justified, in part, by reference to the crude technology and material culture of the colonized peoples, seen as a sign of their innate evolutionary inferiority. Certain figures, such as Paul Gauguin, resisted the characterization of non-European culture as inferior; instead, they championed primitive cultures as an alternative to the overcivilized art and intellect of Western society. Primitivist artists appreciated archaic and non-Western styles for their sincerity, vigor, and expressive power, qualities that these artists and architects missed in the official art of their day. Whereas bourgeois society prized the virtuosity and finesse of academic realism and classicism, some artists and architects began to value the simple and naïf and even the crude and raw. Primitivism in this sense is a comparative concept, a theory of difference, and an implicit challenge to the assumption that Western culture was superior to the primitive. The Greene brothers, for example, emulated Japanese architecture in their Gamble House (1908) in Pasadena, California. They took the craftsmanship of the Eastlake and Craftsman styles and combined them with Japanese influences to create a freer attitude toward the organization of spaces and an integrated system of woodwork, stained glass, and custom furniture. Frank Lloyd Wright drew on Japanese and Mayan architecture, recreations of which he saw at the World's Columbian Exhibition of 1893 in Chicago. The effect of Japanese architecture asserted itself in the horizontal lines, unpainted wood, and delicate colors of Wright's Prairie-style work. In his concrete, textile block houses of the 1920s, such as La Miniatura (1923) in Pasadena, Wright may have been inspired by Mayan sculpture and massing.

Art Nouveau, Jugendstil, or Style Liberty was heavily influenced by primitive sources. The "new art," which flourished from about 1893 to 1905, was so called because it rejected historical precedent, academic regulation, and static convention. Art Nouveau borrowed from Japanese decorative art and Mycenaean art and was motivated by a primitivist intent to create a more direct, less refined art by means of light, sinuous ornament and materials. Victor Horta, in Belgium, combined the emphasis on structure of the Gothic Revival, new materials such as iron and plate glass, and the inspiration of natural forms from the Arts and Crafts. Horta's first important Art Nouveau work was the Tassel House (1892–93) in Brussels, in which the twisting iron columns and ornament united with painted decoration to create a total environment of serpentine forms. He used iron without stone cladding along with materials and vocabulary derived from industrial and public buildings, such as railway stations.

By this time, according to Goldwater, the search for beginnings had shifted from cultural to physical-emotional and became a search for "lower" rather than "higher" origins. In the 20th century, exotic, indigenous arts and those made by children and madmen were valued for expressing emotional intensity. Expressionism exhibits this tendency toward emotional primitivism. Expressionist architects in the Netherlands and Germany, such as Michel de Klerk (Eigen Haard, 1917–20, in Amsterdam) and Hans Poelzig (Chemical factory, 1911–12, in Luban), explored highly individualistic, expressive form. Modern architects looked to the primitive as a source of artistic and architectural stimulus that was not regulated by the norms of European civilization and that would provide the means for a more primal architecture. Bruno Taut wrote several visionary books in the 1910s and 1920s, including *Stadtkrone* (1919), in which he imagined agrarian, craft-based settlements reminiscent of Morris's vision of medieval society. Each city had a crystalline "city crown" *(Stadtkrone),* a religious and spiritual center, designed in pyramidal form like a Gothic cathedral, that acted as a symbol of the community spirit uniting the city's dwellers. The Bauhaus was, at its foundation, based on similar utopian ideals of community and the cooperation of all the arts under architecture. It was a social project for the future, realized through educating a new guild of craftsmen. Architecture would be the one unifying element in society, according to the ideals of the Bauhaus founders. They chose to emulate the Gothic cathedral because all the people of the cathedral towns had participated in building these monuments and because they unified sculpture, painting, weaving, and the other arts within one structure. The Glass Chain participants—Walter Gropius, Bruno and Max Taut, the Luckhardt brothers, Hans Scharoun, and others—explored free, unconscious form, an extension of utopian Expressionism, as an alternative to rational, machine-based design.

Le Corbusier passed through the three types of primitivism during his career. His early work in La Chaux-de-Fonds was part of a regional Arts and Crafts movement, creating design founded on natural forms and vernacular buildings (Villa Stotzer, 1907). After his Voyage d'Orient (1911), Le Corbusier became a staunch advocate of universal, classical language, translated into the undecorated, machine vocabulary that he believed was appropriate for the times (Villa Savoye, 1929, in Poissy). In his later work, he employed vernacular types and emphasized less finished materials, such as brick arches and stone (Maisons Jaoul, 1954–56, in Neuilly). This "peasantism" influenced younger architects, especially members of Team X and the New Brutalists in Britain.

In the post-World War II period, there was a shift toward a universalizing view of humanity: the Family of Man. The earlier emotional primitivism continued, manifested in psychosocial references to primal qualities, such as shelter, enclosure, and place. Bernard Rudofsky's *Architecture without Architects* (1964) devalued professional training and "designed" form in favor of organic, natural architecture produced by indigenous peoples in non-industrialized countries. The New Brutalism, which took its name from Dubuffet's *art brut,* attempted to create a simpler, more immediate architecture that expressed a new aesthetic of coarseness and the primitive. Allison and Peter Smithson's proposal for Golden Lane housing (1952) in London was illustrated with images of Greek islands, working-class backyards, Casbahs, and other dwellings expressive of a place and a way of life. Dutch architect Aldo van Eyck referred to the settlements of the Dogon in Africa and the Pueblos in the southwestern United States to create a more socially responsive architecture, as in his Orphanage (1957–62) in Amsterdam. In Italy the firm BBPR revived elements of the medieval *palazzo* tower in the Torre Velasco (1956–58) in Milan, rendered in concrete. Bruce Goff used an extravagant naturalism in the Bavinger House (1950) in Norman, Oklahoma, as Dell Upton notes, that connects to a wider anti-artificial primitivism. Upton links American primitivism to European trends, with the difference being that the noble savage was the Indian in American mythology.

Postmodernism contains primitivism as a return to highclassical origins and a search for "low" origins in vernacular or popular sources. The rigorous classicism of Quinlan Terry, for example, revived a universal, timeless classical language; by contrast, Charles Moore employed forms derived from such vernacular sources as northern California barns (The Sea Ranch, 1965) and Italian hill towns (Kresge College, University of California, Santa Cruz, 1974). Frank Gehry's appropriation of the ephemeral, vernacular constructions of southern California—lifeguard stations, chain-link fences, plywood walls, and strip-mall stucco (Gehry House, 1977 and 1992, Santa Monica)—exhibits a primitivism of low building sources.

The issue of "primitivism" in Third World countries challenges its definition as a purely Western phenomenon. Work by Western-trained architects such as Hassan Fathy, Luis Barragán, Balkrishna Doshi, and Geoffrey Bawa combines local materials and traditional building forms with modern programs and systems. This postcolonial architecture confounds the hierarchies and patronizing attitude established by social Darwinism, imperialism, and primitivism. Instead of a search for origins in a distant time, place, or culture, these architects produce hybrids of modernism and indigenous forms responsive to particular local conditions. The classical primitive hut has been abandoned in favor of other traditions.

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PRISON

The prison is an ancient building type and has always served essentially the same purpose of involuntary detention. The pris-on's status among architects has varied over time: in the 19th century, the creative possibilities opened by the reinvention of the building type occupied many of architecture's recognized leaders, and hopes for the reform of society through architectural means were widely shared. However, as most of today's experts affirm, this first period of inventiveness generated most of the major ideas in prison architecture: the broad outlines of debate have stayed the same since that time. Private prisons, "direct supervision," and other contemporary preoccupations are simply refinements and restatements of century-old strategies that have come in and out of favor over the years. For most of the 20th century, the construction of prisons was a healthy industry but had relatively little to offer to, or gain from, the architectural imagination.

One of the key principles in the development of modern prison architecture was the attempt to render imprisonment in itself neutral. Other than the deprivation of liberty for a certain length of time according to the offense, the prisoner was, at least theoretically, to suffer no other punishment. This generated a new need for self-contained buildings that could provide for a relatively complete range of human needs and behaviors. The cell in particular stimulated early experiments in central plumbing and heating. Some of the seminal ideas in both architectural and judicial reform were stated by the utilitarian philosopher Jeremy Bentham in his *Panopticon,* first published in 1787. At once an architectural and a social project, the proposed building consisted of a stacked ring of cells open toward a shuttered surveillance tower in the center. Although strict copies of this project were rare, such ideal geometries of surveillance were taken up in a significant number of projects, built and unbuilt, that followed.

Early debates over round-the-clock confinement led to reformers' taking sides between the "Pennsylvania" and "Auburn" systems. The former and more radical of the two had been developed from the 1780s by Quaker reformers, finding its definitive statement in William Haviland's Eastern State Penitentiary, opened in Philadelphia in 1829. Each cell, arranged in double-loaded cell blocks radiating from a central hub, was equipped with complete furnishings for solitary life and work, including a small individual courtyard. Although developed in the United States, the system was much more widely adopted in Europe. The Auburn system, named after a New York State prison completed in 1816 (W.Britten and J.Cray), provided a combination of individual cells for sleeping and spaces for collective—but silent—work by day. Perhaps because it was less expensive to operate, it became the norm in the United States for the next century and a half, and elements of the system are still embraced all over the world. The architecture of the Auburn-style prison placed cells back to back in long, rectangular volumes, separated by a galleried surveillance space from the exterior wall. The main cell block at Alcatraz, completed in 1912 (and now part of a popular national park site), is an example of this approach, which quickly took advantage of advances in reinforced-concrete and steel technology. Here, cells could be smaller and simpler than under the Pennsylvania system, as they were to be used only for sleeping.

The first decades of the 20th century essentially prolonged the 19th century's debate over solitary confinement and its variants. The cell remained the heart of the system, and it continued to be designed as a single-occupancy space, even though population pressures were such that very few remained so for long. After the radial plans associated with the Pennsylvania system, the barracks-like rectilinear arrangements of the Auburn system, and a few experiments with courtyard and Panopticon-type cylindrical arrangements, all of which had been explored in the 19th century, the 20th century began with a new enthusiasm for what became known as the "telephone-pole" prison. The principle, first seen at Fresnes Prison (1898, F.-H.Poussin) near Paris, was the symmetrical distribution of rectilinear cell blocks along a covered security corridor—the "pole" of the arrangement. This arrangement, like radial plans, put an emphasis on efficient and secure circulation but without the difficulties linked to the use of the triangular outdoor spaces left over.

Beginning in the 1920s and continuing to the present, some city jails on limited sites have been built as high-rise buildings, although these pose special security problems. Not long after, on the eve of World War II, some minimum-security prisons began to be conceived according to a so-called campus or open arrangement, where buildings representing different services would be scattered across a relatively open site plan and where only the perimeter was definitively secured. Like the (physically) similar forced-labor camps found notably in the Soviet Union and Germany at the same time, the architecture inside was less specialized—and less expensive—than that of the high-security institutions. However, as this provocative comparison indicates, the human relations component of incarceration became more central, with corresponding possibilities, as the direct preventive role of the architecture diminished.

Since the 1970s, cell blocks have become "housing units," and surveillance is often deemphasized through the use of less "institutional," but no less carefully placed, guard stations. Indeed, as with hospitals and hotels, the size of new projects is measured in beds, not prisoners or cells. Some experts contend that as such efforts to normalize prison life intensify, the prison itself will dissolve into the community, with only a vestigial presence in the form of decentralized services provided to the inmates. Others predict the increasing dominance of wholly electronic means of surveillance, already in partial and experimental use in several parts of the world. However, apart from an apparent tendency to rely more and more on private subcontractors, most modern states maintain an extensive prison system—led by the United States and Russia, where per capita imprisonment is reaching historic high levels. "Correctional architecture," as prison design is now known, will likely remain an important and lucrative, if somewhat obscure, specialty field in architecture.

DAVID VANDERBURGH

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Evans is an excellent analysis of historical and formal issues in prison architecture; although limited to the 19th century, many of the arguments are applicable to the present. Di Gennaro et al. is still probably the most thorough single source for 20th-century projects. Spens surveys some of the most recent realizations, some stylistically ambitious.

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PRITZKER ARCHITECTURE PRIZE

The Pritzker Architecture Prize, established in 1979 and awarded annually, is a major international prize for architecture given to a living architect for a body of work. Created by Jay and Cindy Pritzker and funded by the Hyatt Corporation through the Hyatt Foundation, the prize is intended to "honor a living architect whose built work demonstrates a combination of those qualities of talent, vision, and commitment, which produced consistent and significant contributions to humanity and the built environment through the art of architecture." From its inception, the prize was intended to increase public awareness of both individual architects and the profession. The high standards for selection, the open nominations procedure, and the independence of the international jury have led to the prize being referred to as the "Nobel Prize" of architecture, after which many of the procedures are modeled. Laureates receive a $100,000 grant, a formal citation certificate, and (since 1987) a bronze medallion. Before 1987 a limited edition Henry Moore sculpture was given to each winner. Although the award is a form of competition, there is no commission for a project to build; rather, the winner receives the honor of being recognized as one of the best in the profession.

There is an open nomination process for the Pritzker Architecture Prize, continuous from year to year, with more than 500 architects under consideration annually. The executive director accepts nominations from any licensed architect and also seeks them actively from critics, the jurors, past prizewinners, professionals in related disciplines, and academics—in short, from anyone interested in advancing the profession of architecture. The nomination procedure closes every January and is followed by jury deliberations in the early part of the year that include site visits to as many projects as possible. These site visits to experience the buildings in context are considered an integral part of the jury process because winners are judged primarily by their built works, not by publications, theoretical ideas, portfolios, or other means. An international jury makes the final selection, and all the jury deliberations and voting are done in secret. A decision and its official announcement are made annually in the spring, followed in May or June by an awards ceremony with a dinner for several hundred members of the architecture and art communities.

The jury consists of eight people on average and has been chaired from the beginning by J.Carter Brown, director emeritus of the National Gallery of Art in Washington, D.C., and chairman of the United States Fine Arts Commission. Jurors are selected for their extensive and broad knowledge of the field, professional integrity, and capacity for unbiased judgment. The Pritzker family participates neither in the selection of the jury nor in the selection of the winner. Jury members have included Cesar Pelli, architect and former dean of the Yale University School of Architecture; Giovanni Agnelli, chairman of Fiat of Torino, Italy; Ada Louise Huxtable, American author and architectural critic; and architects Frank Gehry, Philip Johnson, Arata Isozaki, Ricardo Legorreta, Fumihiko Maki, and Charles Correa. Although the composition of the jury has changed gradually over the course of the prize's first 21 years, its purpose and procedures remain relatively constant.

Although the Pritzker Architecture Prize has achieved its stated goals of making the public more aware of the discipline of architecture and the work of the laureates, some of the weaknesses in the structure of the profession are reflected in the juries' selections. For example, as of the year 2000, no women have been awarded the prize. In addition, because the prize is awarded to a body of work, most of the winners are already established architects. The award has not been a vehicle for the discovery of younger architects, and in general, the juries have historically avoided the avant-garde. Furthermore, the winner's contribution to the discipline and effect on the profession do not always seem to be considered in the decision-making process. In some cases, such as Christian de Portzamparc (1994) and Tadao Ando (1995), the prize was awarded to an architect whose work has not had a significant effect on their peers, whereas more influential architects, such as Jørn Utzon of Denmark, have been overlooked. In the history of architectural awards, the Pritzker is still relatively young, and the extent of its lasting effect remains to be seen.

The Pritzker Architecture Prize laureates to date are Philip Johnson of the United States (1979), Luis Barragán of Mexico (1980), James Stirling of Great Britain (1981), Kevin Roche of the United States (1982), I.M. Pei of the United States (1983), Richard Meier of the United States (1984), Hans Hollein of Austria (1985), Gottfried Boehm of Germany (1986), Kenzo Tange of Japan (1987), Gordon Bunshaft of the United States and Oscar Neimeyer of Brazil (1988), Frank O.Gehry of the United States (1989), Aldo Rossi of Italy (1990), Robert Venturi of the United States (1991), Alvaro Siza of Portugal (1992), Fumihiko Maki of Japan (1993), Christian de Portzamparc of France (1994), Tadao Ando of Japan (1995), Rafael Moneo of Spain (1996), Sverre Fehn of Norway (1997), Renzo Piano of Italy (1998), Sir Norman Foster of the United Kingdom (1999), and Rem Koolhaas of the Netherlands (2000).

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PRUITT IGOE HOUSING

Designed by Minoru Yamasaki; completed 1954–76 St. Louis, Missouri

Pruitt-Igoe was an early and important post-World War II public housing project. Built on the near north side of St. Louis as part of a massive urban-renewal program, Pruitt-Igoe was one of the largest public housing complexes in the United States. With 33 buildings rising through 11 stories and towering over 57 acres of the city, it was hailed in the early 1950s as an innovative application of modernist design principles to the problem of chronic urban-housing shortages. At its peak, it housed some 14,000 people in 2870 apartments. Yet by the early 1970s, the project was crumbling and nearly derelict, its residents plagued by crime, isolation, and persistent poverty. Pruitt-Igoe was not only the worst housing project in the city but also one of the most glaring failures of federal housing provision in U.S. history. For many architects, planners, and critics, the demolition of three Pruitt-Igoe buildings in 1972 symbolizes the death of architectural modernism.

Pruitt-Igoe emerged as one piece in a larger postwar urbanrenewal program. As with most northern and midwestern cities, World War II had taken a toll on St. Louis, as large numbers of southern black and white migrants streamed into already dense inner-core neighborhoods in search of industrial work. Returning soldiers and their burgeoning families further exacerbated a widespread strain on housing and municipal services. To provide cities with the legal and fiscal tools to cope with deepening urban problems, Congress passed the 1949 Housing Act, which enabled municipalities to create redevelopment authorities with broad powers to assemble land parcels for clearance and "urban renewal." The St. Louis urban-renewal program, overseen by veteran city engineer Harland Bartholomew, made full use of the federal provisions. Bartholomew and his protégé, Charles Farris, working for a succession of Democratic-machine mayors, undertook an unprecedented transformation of St. Louis through a program of slum clearance, zoning application, expressway construction, and public housing development.

As prerequisites for improving their city, planners and politicians viewed the eradication of blighted neighborhoods and the reorganization of the urban landscape into modern, efficient land uses. Thus, the St. Louis public housing program developed both as a catchment system for urban residents displaced through slum clearance and as a way to funnel federal largesse into a visible showcase of modern municipal action. In 1950 the city was ready to translate this "city-efficient" vision into reality with federal backing for 5800 units of public housing. Disposed toward large-scale project design and development, Bartholomew and then-Mayor Joseph Darst allocated nearly half of these units to one public housing development: Pruitt-Igoe.

Designed by Minoru Yamasaki of Hellmuth, Yamasaki, and Leinweber, the Pruitt-Igoe plan called for a Le Corbusier-like *"ville radieuse"* of garden apartments and high-rise edifices interspersed with broad tree-lined and landscaped plazas. Innovative skip-stop elevators would open onto every third floor, enabling a broad gallery to stretch for 85 feet across the front of the building. Not only would the skip-stop elevators reduce costs, architects argued, but the galleries would provide space for "vertical neighborhoods" to replace the streets and sidewalks of the low-rise city. Here, above the noise and congestion of the old neighborhoods, children could play, and adults could gather without fear for their safety.

In an attempt to ameliorate both white residents and segregationist political interests, the project was divided on the drawing board into racially distinct clusters. Officials designated the Wendell Olliver Pruitt Homes for black families and the James Igoe Apartments for white families. However, Pruitt-Igoe was completed in 1954, in the wake of the *Brown vs. Board of Education* decision, and the project had to be integrated on settlement. As a result, most white families dropped off the rolls, leaving the project desegregated by law while segregated in fact.

Meanwhile, federal cost-cutting measures eliminated many of the best features of Yamasaki's design, such as scattered lowrise units, landscaping, playgrounds, and recreation facilities, while increasing the density from 30 to 50 units per acre. Federal officials also insisted on the elimination of ground-floor bathrooms and most recreational facilities. With little foresight, they ordered an increase in the number of two-bedroom apartments at the expense of spaces for larger families, which led to overcrowding and structural strain.

Despite these problems, most families that initially settled the project regarded their move into Pruitt-Igoe as an improvement in their housing conditions. Many enjoyed indoor toilets and laundry facilities for the first time, and the project did eventually boast a number of amenities, including a playground, recreation center, public library branch, Boy Scout troop, day care center, and health clinic. Families managed to carve out new networks within the project and to raise children amid difficult circumstances. Many residents were involved in tenant organizing and civil rights campaigns through the 1960s. Today, many former residents remember Pruitt-Igoe not simply as the desolate landscape of media and scholarly accounts but as home—the place where they grew up and where they experienced many important life events.

Statistics collected by the St. Louis Housing Authority show that Pruitt-Igoe residents were similar in nearly all respects to residents of other public housing projects—at least in the first five years. Over time, however, they came to differ in one crucial respect: the high percentage of female-headed households. Many better-off families left the project for market-rate housing in the increasingly depopulated neighborhoods around the project, creating an irreversible occupancy crisis. The Housing Authority tried to maintain occupancy by filling Pruitt-Igoe with very poor, single-parent, female-headed families. The relative absence of black male adult residents, sociologists have argued, left women and children more vulnerable to crimes of property and violence. By the mid-1960s, Pruitt-Igoe was regarded as the most dangerous public housing project in the city. Firefighters routinely refused to answer alarm calls, and mail carriers and other service agents avoided the project. A series of highly publicized murders and snipings sealed the project's fate as a symbol of inner-city urban decay and crime.

As the personal safety and morale of residents declined with an alarming rapidity, the physical structure of Pruitt-Igoe deteriorated as well. Shoddy construction had already resulted in constant problems with doors, locks, windows, cabinets, heaters, and electric wiring. However, rising vacancy rates in the project left dwindling funds for maintenance and upkeep, placing the Housing Authority in a severe financial strain. The skip-stop elevators frequently malfunctioned, and the dim stairwells and galleries became gauntlets of crime that residents had to run on a daily basis. Plumbing systems that were poorly installed and maintained frequently froze and burst, causing widespread water damage. Without ground-floor bathrooms, children constantly urinated in the stairwells and elevators. Ongoing disagreements between the Housing Authority and the City of St. Louis over

Pruitt Igoe Housing Project, designed by Minoru Yamasaki, April 21, 1972 demolition

Photo by Richard Moore © Missouri Historical Society

trash pickup and project maintenance resulted in an environment littered with refuse and garbage.

Numerous attempts were made in the mid- to late 1960s to improve the project. Pruitt-Igoe happened to exist in a city with a renowned collection of urban sociologists and political scientists who were loosely connected through Washington University's Urban Research Institute and Social Sciences Institute. Scholars such as Alvin Gouldner, Eugene Meehan, Roger Montgomery, Lee Rainwater, George Wendel, and William Yancey lent their talents to the study of Pruitt-Igoe and to the implementation of intervention strategies. The project was part of a Model Cities target area, and a variety of urban poverty programs and tenant control strategies came and went in an effort to reverse the decline. Pruitt-Igoe tenants themselves joined other public housing residents in a citywide rent strike that drew national attention to their plight. The strike dramatized the physical and mental stress of life in the projects and called attention to the civil rights and social justice issues involved.

Yet no interventions proved successful in the long term. By 1972 Pruitt-Igoe had become such an embarrassment to the city government and the Housing Authority that they decided to demolish it. Even the residents themselves were divided over the fate of the project: some favored partial demolition, whereas others favored low-rise retrofitting.

Between 1972 and 1976, however, the project was detonated, leaving a 57-acre empty lot in the middle of the city. Aside from a small elementary school built on the southwest corner in 1992, the site remains empty.

Over the years, scholars and critics have grappled with the causes of the project's failure. Architectural critics generally hold that design is at the heart of the matter. Oscar Newman's widely read manifesto *Defensible Space* argues that high-rise public housing projects such as Pruitt-Igoe fail because they preclude spatial regulation and defense by tenants, leaving them vulnerable to crime. Colin Rowe and Fred Koetter argue in *Collage City* that the spatial organization of Le Corbusier-influenced landscapes reveals a deep-seated authoritarian impulse toward social engineering inherent in modernist design. Both Charles Jencks *(The Language of Post-Modern Architecture)* and Peter Blake *(Form Follows Fiasco)* use Pruitt-Igoe as a metaphor for the failure of modernist architecture. Jencks argues that the modern design idiom abolishes history and ignores the contexts of place—attributes that had long governed architectural practice. Blake presses Pruitt-Igoe into a broad attack on CIAM (Congrès Internationaux d'Architecture Moderne) design principles, arguing that they result in sterile, inhuman environments. Each of these critics regard the 1972 detonations as a clarion call for a new era of architecture, one sensitive both to the weight of history and to the contingencies of local environments.

Social scientists, on the other hand, hold that Pruitt-Igoe's failure has less to do with design and more to do with structural conditions of racism and poverty. Lee Rainwater's now classic *Behind Ghetto Walls,* derived from lengthy interviews with Pruitt-Igoe residents in the mid-1960s, demonstrates that racial segregation, joblessness, and chronic poverty result in socio-economic isolation and anomie among public housing residents. Eugene Meehan's definitive policy analysis The *Quality of Federal Policy Making* holds that public housing was doomed to failure from the outset because it never addressed the root causes of poverty and inadequate housing. Rather, the provision of public housing was always an ambivalent goal, hamstrung by fiscal austerity and lack of commitment. Roger Montgomery's concise article "Pruitt-Igoe: Policy Failure or Societal Symptom?" shows how problems endemic to the St. Louis housing market led to the decline of the city's public housing program. He rejects the prevalent view among politicians and journalists that Pruitt-Igoe failed because of inadequate design or liberal welfare policies, arguing instead that the project unraveled because of declining land values, increased housing options in neighborhoods depopulated by "white flight," persistent racism, and inner-city poverty.

More recent research by historians and urban analysts supports this latter view. Although design was clearly a factor in the decline of Pruitt-Igoe, scholars such as Mary Comerio and Kate Bristol demonstrate that it was not the cause. In fact, Bristol argues that the decline-by-design thesis is a rhetorical strategy common among architects and critics, one that serves to bolster the power of the profession by inflating the role that architects actually play in housing policy. Architects, Bristol argues, deceive themselves with their own rhetoric because they fail to grasp the basic fact that design cannot by itself compensate for drastic social inequalities. Moreover, Pruitt-Igoe itself was never the example of modernist hubris that its critics claim. Contrary to standard memory, Pruitt-Igoe won no architectural awards, and its own designers were critical of the high-rise form as a strategy for mass housing. Their designs were merely constrained by criteria dictated in advance by the Housing Authority, which favored high-rise, high-density public housing.

Mary Comerio's research takes the onus off design and places Pruitt-Igoe's failure within the broader historical context of urban renewal and redevelopment, industrial relocation and economic restructuring, "white flight," and the dwindling urban tax base. Pruitt-Igoe, she argues, and the larger public housing program in the United States were caught up in entrenched historical processes over which architects—and even, to an extent, planners and municipal officials—had little control. Moreover, treating public housing as an issue of design obscures the social realities of race and class in urban environments and distracts critics from the deeper political and economic structures within which designers and planners operate.

In the end, Pruitt-Igoe reflects a federal capital investment of $50 million, a relatively small portion of the postwar federal housing chest. Tens of thousands of people found themselves directly involved with the project, whether as designers, planners, politicians, builders, residents, social workers, librarians, or police. This is a small number when compared with the tens of millions of Americans affected by the federal underwriting of suburban expansion and home building. However, the power that Pruitt-Igoe continues to exercise over the practices of architecture, policymaking, and planning is disproportionately great. For better or worse, and with more passion than accuracy, Pruitt-Igoe will long stand as a symbol of flawed urban design ideals, municipal redevelopment schemes, and federal housing policies.

JOSEPH HEATHCOTT

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While there is an extensive literature on Pruitt-Igoe, much of it is dispersed through scholarly and trade journals, edited collections, occasional papers, and conference presentations. Three book-length monographs from the 1970s use Pruitt-Igoe as a backdrop for research on social issues such as black family life and structure, welfare programming, and public housing policy. Most of the literature falls within either social science, policy analysis, or architectural criticism. Only recently have scholars outside of these fields turned attention to PruittIgoe and to its history as an urban place.

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PUBLIC HOUSING

Often used loosely, the term *public housing* describes several very different categories of housing. In a narrow sense, particularly in the United States, public housing tends to refer to dwellings funded by the national government and owned and operated by a local authority. In a broader interpretation, public housing consists of those units whose occupants cannot afford housing available on the so-called free market and who benefit, according to income-linked criteria, from some form of public assistance, extended either directly to the tenants or to developers or owners, who in turn provide discounted rent. Finally, one may argue that all housing targeted for any type of public subsidy is public housing, regardless of who owns it.

This last perspective would indicate that in the United States and many other countries most housing is, in fact, subsidized with public funds. This is so because its cost to private owners is lowered by national, state, and local governments through tax expenditures (for example, the deduction of mortgage interest and property tax from personal taxable income, amounting to more than $65 billion annually) and the provision of public infrastructure (such as roads), among other subsidies. Indirect subsidies of this type are not tenure neutral (they benefit owners much more than renters), and they are also highly regressive (they benefit households with high incomes much more than those with low incomes).

These distinctions and their implications are highly significant in the debates that help shape housing policies and programs in the United States and elsewhere. However, it is not possible here to engage the full scope of this discussion. This brief article focuses mainly on U.S. public housing in the more conventional, narrower definition.

Historical Background

Public housing is a means-tested, non-cash transfer program. Only households with incomes below specified levels are eligible. At present, they pay 30 percent of income for rent. Initially authorized by the (Wagner Steagall) Housing Act of 1937, public housing in the United States was meant to house families who were temporarily poor as a result of the economic depression. Its establishment came after a hard-fought, lengthy battle in which the National Association for Real Estate Boards, the U.S. Savings and Loans League, and the U.S. Mortgage Bankers Association opposed “socialist” government intervention in the housing market. The compromise that was reached has been seen by many as more an effort to boost the construction industry and reduce unemployment than to provide affordable housing.

After World War II, the Housing Act of 1949 declared the goal of “a decent home and suitable living environment for every American family.” It called for the construction of 810,000 public housing units in six years. However, production fell far short, and private commercial interests succeeded in appropriating funds that had been tied to residential redevelopment. In the following decades, the U.S. commitment to public housing steadily declined, and in January 1973 President Richard Nixon imposed a moratorium on all federal housing assistance. The moratorium was lifted the following year with the enactment of legislation oriented to demand-side subsidies.

Subsequent significant changes in housing policy included a shift away from large projects (scattered-site approach), a trend toward privatization (e.g. in management and sale of units), and especially an increased use of the existing housing stock through a system of allowances and vouchers that reduced the cost of housing to tenants. Today, few new units are built. The total number of public housing units is, in fact, declining at present, as large problem projects are being torn down and replaced by higher-quality redevelopments built at lower densities.

Profile and International Scope

Public housing in the United States provides homes to about 3.3 million people, accounting for about 1.5 percent of all occupied dwelling units. The percentage is also relatively low in other countries that have traditionally relied heavily on the private-sector supply to meet housing demand: Australia (6 percent), New Zealand (5 percent), and Canada (5.5 percent), to name three. In Japan, which has also favored a minimal role for government in housing provision, public housing for low-income households similarly constitutes 5 percent of the total stock. These figures contrast sharply with those in regions where national government has played an active role in creating a relatively large postwar social housing sector, such as Israel (13 percent), France (18 percent), Germany (20 percent), Denmark (24 percent), Britain (31 percent), Sweden (36 percent), The Netherlands (45 percent), Hong Kong (50 percent), and Singapore (86 percent). Privatization trends have more recently resulted in a decline of some of these figures, although they remain high in comparison. Countries in Eastern Europe and Russia have long had a very large housing sector controlled by the central state. During the 1990s, their economies underwent a process of transformation oriented to a more market-based organization of society. Nonetheless, at the end of the 20th century, after significant sell-offs to tenants against nominal prices, diminished but still significant public housing stocks remained in, for example, Russia (49 percent), Poland (25 percent), and Hungary (13 percent).

In the United States, the popular image of public housing conjures up mass-produced high-rises and superblocks built at high densities with low-quality construction materials according to bad designs and situated in undesirable locations. Undeniably, many projects fit that description. The Department of Housing and Urban Development estimates that about 100,000 units are "severely distressed," that is, physically deteriorated and with high vacancy and unemployment rates. However, such units constitute a minority of public housing, concentrated in a few large cities, and they are not representative. In fact, the largest proportion of public housing developments in the United States, 38 percent, comprises two- or three-story walk-ups; 34 percent are single-family attached or detached dwellings. Only 28 percent consist of buildings of four or more stories, a share that is dwindling under the HOPE VI program. Public housing in the United States includes many examples of fine designs, and some of the most recent developments incorporate design concepts strikingly similar to some of the earliest public housing in the country.

Initially, U.S. public housing was intended as temporary housing for poor households expected to work their way up to private-market housing. However, increasingly it became a last resort for people with no prospects for other housing options. As a result, over time, public housing has become residualized. Many residents are dependent on welfare (over 50 percent) and social security or disability payments (25 percent). About 75 percent of households are headed by a single adult, usually an elderly person or a single parent. A majority are nonwhite.

In western and northern Europe after World War II, many governments embarked on large-scale housing programs to meet pent-up demand and make up for housing stock destroyed in the war. More than 5 million units were built. Most of this construction occurred in the form of high-rises built on peripherally located estates. By the mid-1970s, the absolute shortages had been eliminated. Demand fell. Households with rising incomes moved out, leaving behind those without choice. Vacancies rose, revenues declined, and conditions quickly deteriorated. Since then, local authorities and nonprofit landlords, oriented to providing and managing social housing, have increasingly faced social welfare challenges engendered by economic, political, and demographic trends in the larger society.

In eastern Europe, national governments controlled property rights and financial resources. Central planning produced a mass-housing sector owned and operated by state agencies and state-run industries. Large estates comprising prefabricated dwelling units in multistory buildings became home to 170 million people. Access to housing was a legislated entitlement, and since wages were low, households spent only a small proportion of their income on rent (often around 3 percent). Limited rent revenues and subsidies insufficient for operating and maintenance needs, often combined with low-quality building materials and fast construction, caused the housing to fall into disrepair quickly. Responsibilities for upkeep and repair became a salient issue in the transition of the former state socialist systems into more market-oriented societies.

In the developing countries, with a few exceptions, public housing has constituted only a minute portion of housing production. Typically, self-help and other informal processes of housing provision have been much more important. Insofar as scarce resources were used for the building of public housing, the beneficiaries have usually been civil servants rather than the poorest segments of the population. Current efforts are generally directed toward enabling housing markets to work, although it remains to be seen whether this approach will extend access to housing to the lowest-income groups.

Design in Context

In terms of architecture and project layout, there have been three stages in the evolution of public housing in the United States. In the 1930s and the early 1940s, semienclosed courts with walk-up buildings dominated, aligned with the streets but with entries usually from the interior of the site. Open areas between lines of row houses or walk-ups or around widely spaced elevator high-rises placed at an angle to the street or in closed streets were more characteristic of projects built from the 1940s through the 1960s. From the late 1970s onward, public housing designs more typically include private yards and semi- or fully enclosed courts for row houses and low-rises with entrances reoriented to front the streets. The different designs have been seen as the enactment of prevailing belief systems concerning the place of public housing and its residents in the surrounding community and society at large.

Illustrative of the broader context of design is the Pruitt-Igoe project in St. Louis, which opened its doors to the first tenants in the early 1950s amid high praise for its design. When it was dynamited scarcely 20 years later, many critics decried design features, such as the lack of semipublic space and the mismatch between the social and physical environment (for example, large families in high-rise apartments), attributing to them the project’s failure. Others, however, have downplayed the significance of design in the demise of Pruitt-Igoe and similar projects, instead emphasizing the role of insufficient budgets and discriminatory policies.

Current Approaches

Public housing remains a valuable resource. It is home to millions of households who cannot afford market housing. Maintaining this resource requires that extant challenges be effectively met. Current approaches fall into two categories. The first is tenant based, primarily under the Section 8 program. It seeks to ameliorate the concentration of poverty by portable subsidies, such as vouchers and allowances, aimed at increasing household mobility, and sometimes provides additional supports, such as job training. The second, area-based, supply-side approach focuses on the housing estates themselves in an attempt to address problems in a comprehensive manner. The latter approach is multipronged (incorporating more accountable forms of management, providing programs and services in support of resident needs, attracting mixed-income tenant populations, and carrying out research-based design) and seeks to avoid past mistakes that led to higher rates of vandalism and crime. HOPE VI funding has stimulated improved architecture and site planning to foster neighborly interactions and promote safety (crime prevention through environmental design). In addition, examples are growing of public housing that integrates programs to assist residents in becoming economically more self-reliant (for example, Project Self-Sufficiency) and that provides services that facilitate independent functioning (such as Section 202).

The problems facing U.S. public housing—problems of design, siting, maintenance, and population composition—are often attributable to oppositional economic and political forces rather than to causes inherent in the public subsidy of housing. Smaller schemes that use individual street addresses rather than project names and that are woven into the fabric of the surrounding community by integrating services and mixing different income groups will make public housing less distinguishable from private housing. Indeed, evidence links the emergence of successful public housing to the dissolution of its standout image and to its being an integral part of a comprehensive approach to housing.

WILLEM VAN VLIET

S*ee also* **Apartment Building; Pruitt Igoe Housing, St. Louis, Missouri**

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PUIG I CADAFALCH, JOSEP 1867–1956

Architect, Catalonia

Josep Puig i Cadafalch was one of the leading architects of the *modernisme* movement that flourished in the Spanish region of Catalonia during the first decades of the 20th century. In many ways, Puig moved elegantly between the organic extravagance of *modernisme* and the ordered geometry of *novecentismo*. This was in part because of the fact that he was much younger than Antoni Gaudi i Cornet and Lluis Domènech i Montaner, the leading architects of the first movement, and somewhat older than the next generation. Puig drew inspiration from 15th-century Catalan Gothic architecture, a style that was decidedly different from classic High Gothic. Despite his almost religious zeal for regional historical traditions, he also looked outside Spain for inspiration. Puig traveled widely throughout Europe, especially Germany and Austria, and wrote approvingly of the work of Henry-Clement Van de Velde, Josef Maria Olbrich, and Otto Wagner. He particularly admired Olbrich's designs for buildings at the Darmstadt artist's colony. The English Arts and Crafts also had an enormous effect on his architectural style.

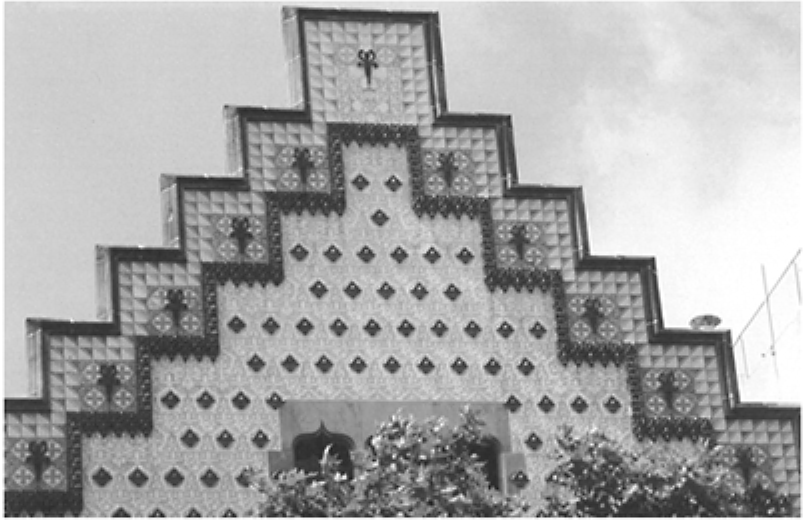
Puig rigorously examined and studied the historical architecture of Catalonia, eventually publishing several leading scholarly texts. He rejected monumentalism and classical forms in favor of a style firmly rooted in Catalan culture and society. Puig abhorred classical styles, declaring that they had little to do with native tradition and were simply another non-Catalan fashion imposed by the central government in Madrid. In his own work, Puig attempted to combine the folk traditions of rural Catalonia with the deliberate artistry and modern materials of urban society. In all his structures, he combined a commitment to local tradition and history with a strong faith in modernity and internationalism.

Puig emphasized simple volumes that echoed the traditional floor plans of Catalan farmhouses. These areas had an organic layout with spaces that gently flowed together. His interiors became known for their remarkable sense of intimacy and warmth produced through diffuse lighting and lavish use of wood as decoration. A strong sense of nationalism and history led him to encourage local craft techniques, including woodworking, ceramics, stained glass, and sgraffito. Puig's structures emphasized a richness of detail combined with a simplicity of form. The exteriors often faced the street with large, planar facades of stucco or unadorned brick punctuated with almost baroque-like stone oriels and decoration. The specific decorative elements ranged from organic flowers and animals to heraldic devices, shields, and symbols of nobility.

His first major work was the Casa Martí (1896) in Barcelona's Gothic quarter. The hulking building recalled a feudal manor house of the medieval Catalan past. The exposed brick walls combined with stonework decoration to give the structure an artisanal feel. The interior contained large spaces covered by wood beams and illuminated by delicate iron chandeliers. This illustrated Puig's deliberate combination of traditional form with modern ornament. It was this interior that, a year after completion of the structure, housed a cafe called the Els Quatre Gats (the Four Cats). The building soon became the social gathering place of Pablo Picasso, Miquel Utrillo, Ramon Casas, and

Puig i Cadafalch, Josep (Catalan) (1990) designed by Casa Antoni Amatller, facade

Photo © Mary Ann Sullivan



Puig i Cadafalch, Josep (Catalan) designed by Casa Antoni Amatller, detail

Photo © Mary Ann Sullivan

Santiago Rusinyol, artists who would soon bring Catalan *modernisme* an international reputation.

The politics of Catalan nationalism, combined with a growing class of wealthy patrons, led to a series of important commissions during the period 1900–05. It was with these houses that the architectural style of Puig found its greatest expression. The first, constructed for a wealthy chocolate maker, was the Casa Amatller (1900). Puig designed the house to be a jewel of individuality set within what he viewed as the rigid conformity of Ildefons Cerdá's gridlike urban plan for Barcelona. He wished to express the opulence and power of his wealthy clients through extravagant use of rich materials and symbolism. The plan exhibited the characteristics typical to rural Catalan homes, with a large central courtyard and a central stair rising to the main public room of the first floor. The interior was richly appointed in wood and plaster. The public rooms contained ornate columns, and the highly decorated wooden ceiling beams recalled traditional Spanish *mudéjar* ornamentation. The flat wall facing the street, however, revealed that Puig was not simply blindly following the ancient tenets. Instead, the wall was peppered with sgraffito and topped by an ornate pediment decorated with brightly colored tiles. The outline of the structure resembled the stepped triangular rooflines of Northern European homes. In addition to the tiles, the architect decorated the front of the structure with both whimsical and pious sculpture. Saint George, the patron saint of Catalonia, shared space with rats, pigs, and frogs. Eventually, Domènech built the Casa Lleó Morera to the left, and the building on the right was replaced by Gaudí's Casa Batlló, making the short block one of the single greatest concentrations of modernist architecture in the entire city.

A second home designed for a wealthy patron was the Casa Terrades (1905), better known as the "Casa de les Punxes" (House of the Points). The nickname came from the building's four small round turrets and a large main tower topped by sharp spires. It again demonstrated Puig's affection for Northern European designs. A series of profusely decorated doorways and window openings punctuated the plain brick walls. The decorative sculpture again included a large ceramic plaque dedicated to St. George. The choice of decoration illustrated the ostentatious religiosity of the wealthy bourgeoisie and also their nationalism.

In addition to being a practicing architect, Puig had a second career as an architectural historian. He employed a scientific approach that emphasized observation and measurement. Puig was convinced of the connections between all aspects of a region's culture, including language, art, and architecture. He thought of architecture as a communal art form created by peoples and nations rather than individuals and that historic forms had been dictated by the particular needs and traditions of the region. Although exiled following the Spanish civil war, Puig's theory and practice continued to influence Spanish architecture. The emphasis on regional design elements and quality decoration was later taken up by members of the loosely organized School of Barcelona, which included Ricardo Bofill, Oriol Bohigas, and Studio Per.

BRIAN D. BUNK

Biography

Born in Mataró, Spain, 15 October 1867. Graduated from the Escuela Superior de Arquitectura, Barcelona in 1891. Municipal architect, Mataró 1891–97. In private practice as an architect, Barcelona from 1897; made important contributions to the study of Catalan Romanesque architecture. Professor, Escuela Superior de Arquitectura, Barcelona from 1897. Died in Barcelona, 24 December 1956.

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Further Reading

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PURCELL, WILLIAM GRAY, AND GEORGE GRANT ELMSLIE

Architecture firm, United States

The partnership of William Gray Purcell (1880–1965) and George Grant Elmslie (1871–1952) was remarkable in the annals of architecture. It lasted from 1909 until 1922. During these years, the two men made a major contribution to the Prairie School and created some of its finest buildings.

Born on a farm in northeastern Scotland, Elmslie attended the famous Duke of Gordon School in Huntly. His education included a strict Presbyterianism along with a consciousness of the mysticism that is a strong feature of the Scottish heritage. With his family, Elmslie immigrated to the United States in 1884. They settled in Chicago, where his father was already working. After a brief period in business school, Elmslie followed the suggestion of his parents and began the study of architecture in the office of Joseph Lyman Silsbee, where George Maher and Frank Lloyd Wright were already working. When Wright left Silsbee in 1889 to join Adler and Sullivan, he asked Elmslie to come with him. The offer was accepted, with momentous consequences for both Sullivan and

Elmslie. When Wright left the office in the mid-1890s, Elmslie became Sullivan's chief draftsman, a position that he held for 15 years. During this period, Elmslie learned thoroughly the principles of organic architecture and became adept at designing ornament in the Sullivan manner. He detailed nearly all the exterior ornament for the Wainwright Building (1890) in St. Louis, designed the ironwork entrance for the Carson Pirie Scott Store (1901–03) in Chicago, and had a major share in the design of the National Farmers Bank (1908) in Owatonna, Minnesota. By 1909 business in the Sullivan office had declined to such an extent that Elmslie was open to the offer of a partnership from William Gray Purcell, a young Minneapolis architect whom he had known since 1903.

Purcell had grown up in Oak Park, Illinois, in comfortable circumstances. He was educated in its excellent schools, at a liberal private academy, and at Cornell University, where he took an architectural degree in 1903. The academic curriculum was profoundly distasteful to Purcell. (In correspondence with this writer, he always referred to it contemptuously as "Bozart.") Nonetheless, he mastered conventional drafting techniques and, after graduation, was briefly in Sullivan's office, an experience that stayed with him for the rest of his life. He also worked in Berkeley for John Galen Howard and in Seattle. Then, in 1906, at the suggestion of his father, Purcell departed for a yearlong odyssey in Europe in company with his Cornell classmate George Feick. The two young men not only visited the classical sites in Greece and Italy and the French cathedral towns but also called on such progressive leaders as Hendrik Berlage in the Netherlands, Martin Nyrop in Denmark, and Ferdinand Boberg in Sweden. On their return to the United States, Feick convinced Purcell that there was room for a new kind of architectural firm in Minneapolis. They opened an office in February 1907. Elmslie joined them in 1909, and in 1913 Feick withdrew. Although Purcell moved to Philadelphia in 1916, he continued his association with Elmslie until 1922.

The great years for Purcell and Elmslie and for the other Prairie architects were those immediately preceding World War I. Elmslie brought with him much domestic work from clients who wanted progressive houses but could no longer endure the difficulties of working with Sullivan. These clients included

Babson Stable and Service building, inner court showing east elevation of garage Riverside, Illinois *(c.* 1916 additions and alterations to the 1908 original Babson House by Louis Sullivan)

© Historic American Buildings Survey/Library of Congress

Henry Babson, the Cranes, and the Bradleys. For Babson there were several additions to his estate in Riverside, Illinois, and for the Bradleys there was the much-admired “bungalow” (1913) at Cape Cod. There were other important domestic commissions as well: the Powers House (1910) in Minneapolis, the Decker House (1913) at Lake Minnetonka, the E.S.Hoyt House (1915) at Red Wing, and an exquisite small house on Lake Place in Minneapolis for Purcell himself in the same year. This last dwelling has been beautifully restored and is today the property of the Minneapolis Institute of Arts. All these houses had in common an open plan, beautiful proportions, a knowing choice of materials, and where the budget allowed, furniture and leaded glass in a highly individualized manner. Superficially, they resemble the contemporary Prairie houses of Frank Lloyd Wright, whose work Purcell and Elmslie had earlier admired. The houses of Purcell and Elmslie, however, were usually lighter in feeling and often more livable.

The other great specialty of the firm was the small-town bank. Encouraged by the success of the Sullivan-Elmslie Bank (1908) for Carl K. Bennett at Owatonna, Minnesota, the new partnership actively sought similar omissions throughout the Midwest. Happily, they found a number of similar progressive-minded bankers. Their banks in Leroy, Grand Meadow, and Adams, Minnesota, and in Rhinelander, Wisconsin, are particularly fine. These banks stand like jewel boxes in hamlets that are reminiscent of Gopher Prairie in the novels of Sinclair Lewis. The largest of their banks, a superlative creation, is the Merchants’ Bank (1912) of Winona, Minnesota. For this building, the firm used pier-and-lintel framing with steel girders set on brick piers to define the cubic form of the banking room, thus relieving the walls of support function so that they could be opened up for large panes of leaded glass. There was also a great deal of terracotta ornament, and the chairs and the other furniture were designed to match the architectural elements, all in keeping with Prairie School principles.

The largest building to be constructed by Purcell and Elmslie was the Woodbury County Courthouse for Sioux City, Iowa, done in association with William L.Steele. Steele won the commission in 1916 and then asked Elmslie to develop a plan expressing the agricultural wealth of the region and the sturdy population of its inhabitants. Despite opposition from several quarters, the Elmslie concept was carried through. It featured an amazing amount of terra-cotta ornament and a series of massive friezes by Alfonso Iannelli, who had earlier worked with Wright at the Midway Gardens. About 60 percent of the designing was done by Elmslie, who moved to Sioux City for the duration of the job. The remainder came through the Minneapolis office. The courthouse is a building of an almost indigestible richness.

Design procedures in the office of Purcell and Elmslie were essentially democratic, with both partners contributing at differ-ent stages to the finished project. In a profound sense, the two men were necessary to each other. Elmslie had a deep understanding of the organic principles underlying the architecture of Louis Sullivan, but at times his preoccupation with the role of ornament could degenerate into decorative efflorescence. Purcell, equally convinced of organic and democratic principles but more cautious by nature, was a restraining influence and at the same time was stimulated by his partner to explore the essential nature of design. Elmslie tended to think graphically. Purcell was happy with verbal expression and in later years wrote a column of architectural criticism for *The Minnesota Architect*. Both were committed to social progress and to experimentation with the low-cost dwelling. Their work can generally be distinguished from that of Wright and the other Prairie School architects by its generally axial order and frequently by a whimsical touch. Spatially, they were not as adventurous as Wright, but in many ways they were more humane. Although Wright did his best to denigrate Purcell and Elmslie, their achievement has been largely recovered by a later generation of architectural historians. Today, it is generally recognized that they made a major contribution to the Prairie School and to the American architecture of their period.

LEONARD K.EATON

Biographies

George Grant Elmslie

Born in Huntly, Scotland, 20 February 1871; family moved to Chicago 1884. Educated in Chicago public schools. Joined the office of J.Lyman Silsbee, Chicago 1888; joined firm of Adler and Sullivan, Chicago 1889; became head draftsman when Frank Lloyd Wright left the firm 1893. Partner, with William Gray Purcell and George Feick, Purcell Feick and Elmslie, Chicago 1909–13; partner, Purcell and Elmslie, Chicago 1913–22. Continued working in Chicago from 1922. Died in Chicago, 23 April 1952.

William Gray Purcell

Born in Wilmette, Illinois, 2 July 1880. Studied architecture, Cornell University, Ithaca, New York; graduated 1903. Worked in the office of Henry Ives Cobb, Chicago 1903; worked in the office of Louis Sullivan 1903; worked for John G.Howard, Berkeley, California 1904; worked for Charles H.Bebb and Leonard L.Mendel, Seattle, Washington 1904. Established, with George Feick, Purcell and Feick, Minneapolis, Minnesota 1907; partner, with Feick and George Grant Elmslie, Purcell Feick and Elmslie, Chicago 1909–13; partner, Purcell and Elmslie, Chicago 1913–22. Private practice, Portland, Oregon from 1922. Died in Pasadena, California, 11 April 1965.

Purcell and Elmslie

Established as Purcell Feick and Elmslie, Chicago 1909; became Purcell and Elmslie, Chicago 1913–22; major architects of the Prairie movement; most active between 1913 and 1920.

Selected Works

The Art Institute of Chicago and the Minneapolis Art Institute hold examples of the furniture and architectural ornamentation of Purcell and Elmslie. The Minneapolis Art Institute also holds the title to Purcells's Lake Place Home (1913). It may be visited by arrangement. The extensive Purcell papers are at the Northwest Architectural Archives, University of Minnesota. These archives also hold many of the firm's drawings.

Powers House, Minneapolis, 1910
Merchants Bank of Winona, Minnesota, 1912
Edna S. (William Gary) Purcell House, Minneapolis, 1913
Decker House, Holdridge, Minnesota, 1913
Edison Shop, Chicago, 1913
Bradley House, Woods Hole, Massachusetts, 1913
First State Bank, LeRoy, Minnesota, 1914
Capitol Building (unbuilt), Canberra, Australia, 1914
E.S. Hoyt House, Red Wing, Minnesota, 1915
Babson Stable and Service Building, Riverside, Illinois, ca. 1916 (with Louis Sullivan)
Woodbury County Courthouse, Sioux City, Iowa (with William L. Steele), 1917
Factories, Alexander International Leather and Belting Corporation, Philadelphia, 1918
First National Bank, Adams, Minnesota, 1920

Selected Publications

Purcell was a prolific writer as well as an accomplished graphic designer. The three articles in *The Western Architect* of 1913–15 are the best contemporary summaries of the work of the firm.

William Gray Purcell

"Expressions in Church Architecture" *The Continent* (29 June 1911)

"Walter Burley Griffin, Progressive," *The Western Architect,* 18/12 (September 1912)

"Made in Minnesota," *The Minnesotan,* 1/9 (April 1916)

S*t. Croix Trail Country,* 1967

William Gray Purcell and George Grant Elmslie:

"The American Renaissance?" *The Craftsman,* 21/4 (January 1912)

"H.P.Berlage, the Creator of a Democratic Architecture in Holland," *The Craftsman,* 21/5 (February 1912)

"The Statics and Dynamics of Architecture," *The Western Architect,* 19/1 (January 1913)

"Work," *The Western Architect,* 21/1 (January 1915)

"Work," *The Western Architect,* 22/1 (July 1915)

Further Reading

A good evaluation of the achievement of Purcell and Elmslie in a broad context is found in Brooks. The exhibition catalog essay by Hammons is thus far the most comprehensive treatment of the work of Purcell and Elmslie and contains a commission list of their executed works and projects.

Brooks, H.Allen, *The Prairie School: Frank Lloyd Wright and His Midwest Contemporaries,* Toronto: University of Toronto Press, 1972; New York: Norton, 1976

Gebhard, David S., "William Gray Purcell and George Grant Elmslie and the Early Progressive Movement in American Architecture from 1900 to 1920" (Ph.D. dissertation), University of Minnesota, 1957

Hammons, Mark I., "Purcell and Elmslie, Architects" in *Minnesota, 1900: Art and Life on the Upper Mississippi, 1890–1915,* edited by Michael Conforti, Newark: University of Delaware Press, 1994

R

RAILROAD STATION

The railroad station as a building type was born in the early 19th century, when vehicles that traveled on their own “railroads” began to be used for the transportation of not only goods but also humans. The primary reason for such a building was the basic need to shelter both trains and people. However, the railroad station fulfilled a psychological need as well. Before the widespread use of railroads, traveling was an arduous and extended affair consisting of a series of gradual transitions from one place to another. By means of the railroad (and later the airplane), traveling became an easier task consisting of merely embarking and disembarking a vehicle, with no stops in between. For the industrial city, the railroad station became what the city gate had been for the medieval city—that special inbetween transitional location, the first and last view of a city, the physical and psychological location of entrance and exit.

The architectural history of the railroad station suggests a dialogue between the building and its train tracks. Buildings were first placed alongside of the tracks, as is still the case in many suburban and rural train stations. Those on both sides of the tracks were sometimes linked with naturally lit steel-and-glass atriums, or train sheds. Those stations that terminated a train line, usually in large urban metropolises, tended to screen both tracks and shed from view by means of either a separate construction, as in Euston Station (1839, Philip Hardwick, demolished 1962) in London, or a third building that linked shed and buildings either side, as in Gare de l’Est (1852, François Duquesney) in Paris. The shed and buildings of St. Pancras Station in London, although touching, were designed and built separately by engineer William H.Barlow (1868) and architect Sir George Gilbert Scott (1876). Toward the end of the 19th century, the size of a railroad station’s train shed became its qualifying criterion, and a contest began to see who could build the largest. Broad Street Station (1893, Joseph and John Wilson, demolished 1953) in Philadelphia reached a limit with its ingenious 300-foot three-hinged wrought-iron shed.

By the turn of the 20th century, the areas around such large urban terminals were no longer on the outskirts of town in unwanted industrial areas. Instead, the city had usually grown up around them, and they found themselves on valuable real estate. To take advantage of this, some train tracks, originally at street level or elevated, were buried below ground, and their land was sold for development. A new station building, not just shed and facade, could then be built on top of these sunken tracks. The main characteristic of this new type of station was its central hall or concourse—large enough to accommodate huge numbers of people and lofty enough to present itself as the center of the city, if not the whole world. Such is the case with Pennsylvania Station (1910, McKim, Mead, and White, demolished 1964) in New York; Union Station (1907, D.H. Burnham and Company) in Washington, D.C.; and Grand Central Station (1913, Warren and Westmore and Reed and Stem) in New York.

In Chicago, the acknowledged railroad city of the early 20th century, Daniel H.Burnham and Edward H.Bennett gave lengthy consideration to the location, multimode functions, and style of the modern railroad terminal in their influential Plan of Chicago (1909). For the next decade or so, City Beautiful architects and planners often made a new railroad terminal one of the chief urban forms.

By hiding the tracks from view, the concourse-type railroad station eliminated the previously mentioned design problem of separate buildings and train sheds. This elimination of separate building and shed is also characteristic of modernist railroad stations where train tracks and their roof covering, instead of being hidden below ground, became integrated into a complete design. Helsinki Station (1910–20, Eliel Saarinen), which does not rely on any 19th-century Gothic, Doric, or Moorish eclecticism for its decoration, is an early example of this. The main station in Florence, Italy (1934–36, Giovanni Michelucci), was one of the first International Style railroad stations, integrating its building and shed so easily perhaps because steel and glass were part of the whole building's palette.

Because of the increased usage of the automobile and the airplane, there were not many new railroad stations built after World War II, with the exception of those rebuilt because of war damage. Stazione Termini (1951, Montuori and Calini) in Rome, although newly built, was a prototype followed by most rebuilt stations: long, flat, and unarticulated facades, attempting to unify both building and shed into one composition.

A general period of railroad station decline occurred in the 1960s and 1970s, as many were abandoned and even de-

Continental Train Platform, Waterloo Station, London, designed by Nicholas Grimshaw and Partners (1993)

molished, particularly in the United States. During the 1980s, a small railroad station renaissance occurred as existing stations were enlarged and appended to become home to shopping malls, restaurants, office space, and other non-rail-related functions. In this way, railroad stations became more of a place to visit and stay rather than just a place to pass through. Charing Cross Station in London had its 1906 train shed removed and replaced with an office building (1984, Terry Farrell). Similarly, Union Station in Washington, D.C., turned its concourse into a giant shopping mall by pushing back its platforms (1988, Benjamin Thompson Architects).

Newly built railroad stations at the end of the 20th century were mostly constructed in response to increased high-speed train lines or the creation of city-center links to out-of-town airports. Atocha Station in Madrid turned its central hall into a palm-treed shopping mall, and another station was built next door to handle a new Madrid-Seville express (1984–92, Rafael Moneo). Waterloo Station in London was appended with a contemporary reinterpretation of a 19th-century train shed to accommodate a high-speed service under the English Channel to continental Europe (1993, Nicholas Grimshaw and Partners). Roissy Station at Charles de Gaulle Airport in Paris cleverly joined high-speed and regional train lines with not only the airport but also a hotel (1994, Paul Andreu). Finally, the form of the Lyon-Satolas Station for Lyon Airport (1996, Santiago Calatrava) in France uses bird-in-flight imagery similar to the TWA Terminal (1962, Eero Saarinen) in New York.

The future of the building-type railroad station in the 21st century obviously depends on the future of rail travel. However, as indicated by the French examples cited previously, a new and faster means of transportation, such as the airplane, does not necessarily mean the decline of new railroad stations and facilities.

CHRISTOPHER WILSON

S*ee also* **Calatrava, Santiago (Spain); City Beautiful Movement; Grand Central Station, New York City; Grimshaw, Nicholas (England); Helsinki Railway Station, Finland; Moneo, Rafael (Spain)**

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RAMSES WISSA WASSEF ARTS CENTRE

Designed by Ramses Wissa Wassef, completed 1989 Harrania, Egypt

The School and Arts Centre at Harrania, which bears his name, is the magnum opus of Ramses Wissa Wassef (1911–74), a prominent Egyptian architect and educator. Convinced of the value of and the need for training and practice in arts and crafts and in the educational and cultural development of young children, he began teaching weaving to a small group of children who attended a primary school that he had designed in Old Cairo in the 1940s. The satisfaction and benefit that those children gained from his devoted teaching and the high quality of the work they produced persuaded Wissa Wassef to establish a school specifically for training children in the arts and crafts.

In 1951, he and his wife bought a plot of land at Harrania, a small village near Giza, for that purpose. There was no precise brief. Wissa Wassef was his own client, and the demand for the sort of school he had envisioned was unknown, unproven; initially, it would have to be funded solely from his own resources. It would have to be built economically, and it must not alienate the community of *fellahin* (peasant farmers and farm laborers) among whom, in the village of Harrania, he had settled. He would use only local materials—the silty brown earth of the narrow fertile plain between the Nile and the desert escarpment to the west—and he would design and build in the vernacular tradition. From the field study visits that he had made with his architectural students to Upper Egypt, he had discovered the quality and the beauty of the Nubian villages; his colleague at the School of Fine Arts, Hassan Fathy, had recently embarked on the planning and design of a new village, in the Nubian vernacular tradition, on the west bank of the Nile near Luxor in Upper Egypt. Encouraged by Hassan Fathy's example and fired with enthusiasm by his own discovery of Nubian architecture, Wissa Wassef described his decision to build in the traditional way:

> I had just visited Aswan, where I had been struck by the beauty of the Nubian houses in the villages of the area, I learnt that it was still possible to find bricklayers who could make vaulted roofs for houses. I felt a strange excitement when I thought that these same methods had existed since the first dynasties of the Pharaohs. They had survived throughout Egyptian, Coptic and Islamic history, and were still used in popular architecture. I decided to make use of

> some these bricklayers from Aswan, and turn their experience to account in building vaults for my school. (de Stefano, n.d.)

The school grew slowly. Village children were enrolled to learn weaving, and they were encouraged to assist the Nubian builders in making mud bricks and building adobe walls for the school buildings: weaving workshops, storerooms, and display spaces. Later, Wissa Wassef introduced the teaching of pottery: kilns, pottery workshops, and storerooms were needed. By the late 1950s, tapestries and carpets designed and made by the students were being exhibited internationally—in the United States, Switzerland, Germany, and Sweden—and money earned from the sale of the students' work was shared between the weavers themselves and the school. The pace and scale of building increased; by 1970, the first phase of building was complete.

In the early 1970s, his daughters Suzanne and Yoanna joined Wissa Wassef and his wife, Sophie, in teaching at the school. The small ceramic sculpture museum was designed and built and named after Sophie's father, the sculptor Habib Gorgy. In 1973, Suzanne married the architect Ikram Nosshi, one of her father's former students at the School of Fine Arts. After Wissa Wassef's unexpected death in 1974 at the age of 63, Nosshi continued the architectural development of the school under the direction of Sophie Habib Gorgy, Wissa Wassef's widow. She expanded and extended the scope of the school, acquiring more land, encouraging the building of houses on the site for her daughters and their families, and creating the Ramses Wissa Wassef Museum, which houses the permanent collection of the Arts Centre and traces the development of tapestry weaving, ceramics, and all the crafts taught there since the early days of its foundation. Completed in 1989, the museum, designed by Nosshi, forms the culmination of the complex and, although designed by a different hand, fits perfectly into the environment created by Wissa Wassef and his wife.

On entering the main gate of the Arts Centre, one enters a new world. The immediate environment is bleak; the village of Harrania has grown out of all recognition since the 1950s, when the Wissa Wassefs began to realize their vision, and has become a peri-urban suburb of greater Cairo. Within the boundary walls, the naturally rendered adobe walls, roof terraces, vaults, and domes of the congeries of buildings are linked by arcaded verandas, courtyards, brick-paved passageways, open staircases, and small shady gardens, all planned in an organic and apparently spontaneous way. The whole complex is surrounded by an extensive garden, planted with a wide variety of trees and shrubs, and has the appearance of an old, established rural community. Internally as well, the various working spaces, large and small, and the museums and galleries for displaying the tapestries, carpets, textiles, batiks, pottery, and ceramics are comfortably cool and appropriately lit with tiny skylights set into domes and vaults, clerestory windows, and simply designed perforated screen walls. The whole place is an oasis of calm and peace and at the same time an ever-flowing spring of creativity. In 1983, its merits were internationally recognized by winning the Aga Khan Award for Architecture. In the award citation, the project was commended "for the beauty of its execution, the high value of its objectives and the social impact of its activities, as well as its influence as an example…for its role as a centre of art and

Pottery Studio in Courtyard, Ramses Wissa Wassef Arts Centre

Photo by Charles Avedissian © Aga Khan Trust for Culture

life and for its endurance, its continuity and its promise" (quoted in de Stefano, n.d.).

At the dawn of the 21st century, the Arts Centre has become an icon of "green architecture," a model of holistic design for architects around the world; and for Egyptians, trying to cope with the environmental pollution and population pressure of peri-urban greater Cairo, it has become a beacon of hope.

ANTHONY D.C. HYLAND

S*ee also* **Wassef, Wissa (Africa)**

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RANCH HOUSE

After World War II, the American ranch house replaced the bungalow and the Cape Cod cottage as the preeminent American house type. Because housing costs had doubled in the 1940s, most architects designed flexible, multiuse spaces emphasizing both function and convenience, including the ranch house. However, because of both the Depression and wartime materials shortages, most consumers could fulfill dreams of a new house only with glossy magazines and corporate-sponsored scrapbooks. The end of World War II brought an enormous demand for new housing. The wartime development of new materials and new manufacturing methods enabled merchant builders to meet postwar consumer demand, which was subsidized by new federal loan programs. Concurrently, consumer magazines, merchant builders, and museum exhibitions promoted the ranch house as affordable shelter for the newly informal, family-oriented, and frequently suburban American lifestyle. Consumers embraced the ranch house as the paradigm for new, modern, and convenient housing, a preference endorsed by consumer magazines, an architectural pedigree that included Frank Lloyd Wright, and the unprecedented growth of suburbia after World War II.

The postwar ranch house is characterized by spaciousness facilitated by new building techniques, new materials, and interior design. The single-story house typically featured three zones: an open-plan common space, a centralized service core, and a cluster of private bedrooms. The open plan emphasized the flow of space between rooms, modulated by pass-throughs, open shelving, and built-in storage units. Indoor-outdoor living areas and large expanses of glass promoted the interpenetration of interior and exterior space. The rambling plan, horizontal em-phasis, and low-pitched roof ideally integrated the ranch house into the landscape. Although the single-story ranch house proved prototypical, both the split level and the raised ranch abounded. Architects and merchant builders tailored the plan, exterior facings, and features such as appliances to the home owner’s means. For example, in 1959, *American Home* featured a 1040-square-foot ranch house for $12,950 (including lot), and the *House Beautiful* Pace Setter House boasted 3100 square feet for $51,500 (including indoor pool and air conditioning).

Ranch house designers drew on numerous sources, including Spanish colonial architecture, Frank Lloyd Wright’s Usonian houses, and California modernism, to create a distinctly American house type. Architect Cliff May traced the postwar ranch house to the 19th-century Spanish colonial rancho in the West. Arguing that form followed function, May claimed that the casual, outdoor-oriented “California life” of a small population of wealthy ranchers had generated the rambling, open-plan, singlestory, adobe house with a *corredor,* or porch, instead of a hallway. The 20th-century suburban ranch house retained its associations with California casualness, indoor-outdoor living, and the notion of a putatively native architectural heritage.

Designers also adapted Frank Lloyd Wright’s Usonian houses, first realized in the Herbert Jacobs House (1937). The Jacobs House used the L-shaped, “pollywog plan.” The head of the pollywog contained both common spaces and the service core, including kitchen, bath, and other utilities. The interior expressed Wright’s notion of organic architecture consisting of an open-plan space subdivided by ceiling levels, lighting effects, and built-in furniture. Private rooms, such as bedrooms, the study, and the workshop, formed the tail of the pollywog. Generous eaves, natural materials, and a horizontal silhouette integrated house and landscape. Wright’s rhetoric also commended his domestic architecture to postwar readers of magazines such as *House Beautiful,* which promoted Wright as an American genius whose vision of American individualism embodied by the single-family home not only accorded with Cold War ideology but also affirmed the postwar development of suburbia.

Wright's reorientation of the kitchen, or "work space," from backstairs to the ideological and spatial center of the Usonian house proved fundamental to the postwar ranch house. The kitchen served as the control center, allowing the homemaker physical, visual, and even verbal access to the entire house, such as that afforded by the intercom system, one of a new array of appliances that facilitated the self-sufficiency of the postwar family. Whereas previously even working-class women had hired help to do laundry and heavy cleaning, the postwar economy dictated that most women labored alone, assisted by appliances rather than servants.

Both Wright and California modernists, such as Richard Neutra, used large expanses of glass—including picture windows, window walls, and sliding-glass doors—to integrate interior and exterior space. Similarly, *Sunset* promoted the "total combination of indoor-outdoor space" created by ground-level access to outdoor living areas as the ideal situation for casual living and informal entertaining. The low rambling profile, overhanging eaves, and features such as planter boxes integrated into the facade further unified house and landscape. Exterior adornment drew on both vernacular tradition and architectural design, at times simultaneously. A ranch house might combine the scalloped bargeboards of the Swiss chalet with geometric arrangements of facing materials indebted to modernists such as Edward Durell Stone.

The open plan essential to the ranch house not only maximized space on a limited budget but also promoted American political and cultural values. In a series of articles written during the 1950s, *House Beautiful* associated the open plan with Wright's organic architecture, American sociability, and democratic freedom of choice. Similarly, the ranch house served as a vehicle for American nationalist ideology at the American National Exposition in Moscow in 1959, where exhibits of domestic technology included a "six-room, ranch-type house, completely furnished, within the price range of [the] average US worker" sectioned like a dollhouse and dubbed "Splitnik" ("'Made in U.S.A.'—In Red Capital," *U.S. News & World Re-port* 47 [3 August 1959]). Despite the frequent association of the ranch house with the American way of life, critics such as John Keats noted that the open plan, often curtailed by restricted budgets, actually prohibited the gracious living promised by consumer magazines.

Ultimately, the postwar American ranch house catered to traditional families who not only craved comfort and convenience on a limited budget but also anticipated the American lifestyle promised by consumer magazines, television, and merchant builders' plan books. The postwar popularity of the ranch house eroded regional architectural differences, replacing local traditions with a national archetype. The ranch house embodied the American dream of planned suburban communities populated by city commuters and housebound homemakers who graciously entertained with an array of convenience foods consumed in the spacious confines of the open-plan, indoor-outdoor living area.

KRISTIN U.FEDDERS

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RASMUSSEN, STEEN EILER 1898–1990

Architect, architectural historian, and critic, Denmark

Steen Eiler Rasmussen's broad range of talents were manifest in his activities as an architect, town planner, educator, historian, and critic. Although he exerted influence in all these areas in his native Denmark, his ideas were disseminated to a wider audience via his translated books and his work as a visiting scholar in England, Turkey, Australia, and the United States. Born in Copenhagen in 1898, Rasmussen entered the two-year preparatory course at the Royal Danish Academy of Fine Arts at the age of 18 and, on completion, joined the office of Carl Brummer. During his first year at Brummer's office, he collaborated with Knud Christiansen on three first prizewinning competition entries for the renewal of the Prinsensgade Quarter in Copenhagen and town plans for Ringsted and Hirtshals. Rasmussen was elected as a member of the Academic Council of the Royal Danish Academy of Fine Arts in 1922 and two years later was appointed as its first lecturer in town planning. In 1938, he was promoted to professor of architecture, a post that he held until 1968. During this period, he also served as a member of the Copenhagen Building Commission and the Copenhagen Traffic Commission and as chairman of the Danish Planning Laboratory and the Regional Planning Committee for Copenhagen.

The early inclination toward town planning would continue to occupy Rasmussen throughout his life. His most significant work in this area is undoubtedly "The Finger Plan of 1948," which was an attempt to produce an overall regional plan for greater Copenhagen. Conceived in collaboration with a team headed by Peter Bredsdorff, the plan called for the city to grow along a series of "fingers" marked by railway lines extending radially from the center. The area between these transport corridors was intended for forests and agricultural lands. According to Rasmussen, no one was to live farther than a 10-minute walk to a station, and those living in the outermost areas should be able to reach the center of the city within 30 to 45 minutes. Although the plan was never accorded legal status, the main structure of the plan was carried out in principal at local levels. The significance of the "Finger Plan" lies in the fact that although many other European cities sought to limit the growth of the town and establish "satellite towns," Rasmussen devised a means by which the city could remain a singular entity and extend outward in a controlled manner.

Rasmussen's interest in the city was not confined to his town-planning proposals but also extended to his work as a historian and critic. In 1927, he was afforded the opportunity to serve as a guest lecturer at the Architectural Association in London. Struck by the differences between life in Copenhagen and life in London, Rasmussen began to record the observations made during his initial period of residence and many subsequent visits and compiled the material into the book titled *London: The Unique City,* which was published in 1934. Although the book was almost immediately translated into English and has appeared in a number of editions, Rasmussen experienced disappointment because the book did not fulfill his intention of initiating a debate among legislators and politicians. Speaking of his disappointment in his foreword to the 1973 revised edition of the book, he stated that he had learned that one could not provoke discussion with a large book, but only with short, concentrated attacks in periodic publications. Rasmussen's commitment to debates regarding the quality of the physical environment are clearly seen in the numerous published articles in Danish newspapers and in his work as editor of the journal *Arkitekten* from 1927 to 1933.

In addition to his book on London, two more of Rasmussen's books have been translated into English: *Experiencing Architecture* and *Towns and Buildings.* Both works can be described as primers that provide a clear and cogent introduction to architecture and town planning, and they represent Rasmussen's range of interest and breadth of knowledge. Soon after publication of the English editions of his books, Rasmussen was invited as a guest professor to various schools throughout the world, including the Massachusetts Institute of Technology; Yale University; the University of California, Berkeley; the Royal College of Art; and the University of New South Wales.

Rasmussen described himself as an "unsuccessful" architect as the result of many of his town-planning proposals not being carried through to an acceptable level of resolution because of a lack of commitment by municipal authorities. However, he was involved in a number of architectural projects that demonstrate both his aptitude as an architect and his adherence to the tenets of functionalism as they were expressed in Denmark at the time. Of particular note are Rasmussen's own residence (1937), an extension to the hotel Hornbaekhus (1942), the Rungsted School (1953), and the "Blanche" hostel (1961) in central Copenhagen. Two multifamily housing projects, "Skovgaarden" (1958, 1961) and "Banehegnet" (1962), serve as examples of how Rasmussen's ideas about town planning and architecture could be realized.

Speaking on his teaching methods that were developed over a career that spanned more than 60 years, Rasmussen stated that it was not his wish to tell students how problems should be solved but merely to get their minds working. A survey of his work reveals that his most significant contribution to 20th-century architecture came about not through his architectural and town-planning projects but through acute observations that continue to instruct his readers that architecture and town planning are not ends in themselves.

KEVIN MITCHELL

Biography

Born in Copenhagen, 2 February 1898. Graduated from the Copenhagen School of Architecture 1918. Arranged exhibit *Britisk Brugskunst,* Danish Museum of Decorative Arts, Copenhagen 1932; chair, planning committee for the Copenhagen area 1945–58; cooriginator, Finger Plan for Copenhagen 1947. Lecturer on urban planning, 1924–38, professor of architecture, 1938–68, Royal Academy of Art, Copenhagen. Died in Copenhagen, 19 June 1990.

Selected Works

Rasmussen House, Copenhagen, 1937
Hotel Hornbaekhus (addition), Copenhagen, 1942
"The Finger Plan of 1948," Town Plan, 1948
Rungsted School, Copenhagen, 1953
"Skovgaarden" Housing Project, 1958, 1961
"Blanche" Hostel, Copenhagen, 1961
"Banehegnet" Housing Project, 1962

Selected Publications

London, 1934; translated as *London: The Unique City,* 1937
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O*m at Opleve Arkitektur,* 1957; translated as *Experiencing Architecture,* 1959
K*øbenhavn,* 1968

Further Reading

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RATIONALISM

The Rational School in mid-nineteenth century was an amorphous body of architects who held that architecture was ornamented construction, essentially structural form, however refined or adorned. Found in the philosophy that reason is the source and test of knowledge and best served by deductive inquiry, and as an extension of the Enlightenment, it was French in tradition as bequeathed by master masons of the so-called Middle Ages. It was differentiated from the British empirical tradition that ultimately was popularized as the picturesque, a distinction to exist well into the 20th century. Yet French and German architects consistently applied the theory to classical buildings; an early epitome was J.G. Soufflot's Church of St. Geneviève (Pantheon), Paris, 1757, a building to lead into Romantic Classicism. Academic design rituals were then perpetuated by the École des Beaux-Arts, Paris, followed by its many imitators in North America 1890–1940.

But the *École* had devolved to *classique* formalism, much to the chagrin of committed rationalists such as Jean-Baptiste Rondolet, who in 1802 argued that architecture derives from construction and is not an imaginative art. Or those impressed by the influential books of J.N.L.Durand, Rondolet's contemporary. Proposing that architecture be conditioned—as his fellow revolutionaries insisted—by social demand, that style be the "visible expression of its functioning parts," axial symmetry and classical forms in simple geometry were Durand's aesthetic preferences. As a planning methodology, he used a square grid to order structure and explain plan. It was a type of orderliness that post-1850 attracted theorist and architect E.E.Viollet-le-Duc. But Durand's obsession was French Gothic with its constructional clarity of parts, not just expressed but plainly exposed. His written expositions on modernism (that is, speculation as to an appropriate architecture for his day), on the use of new materials and technologies, on reasoned "principles, as opposed to rules" or imitative forms, on buildings as organisms, on style rather than the styles, and so on, remains highly persuasive.

Traditionally, the architecture of rationalism tended toward classicism, thereby emphasizing its foundation in 18th-century mathematics (measurable truth), therefore geometry plays a significant role. More lately this can be seen, for instance, in the early works of Frank Lloyd Wright, those post-1937 by a disciplined Ludwig Mies van der Rohe, and those beginning in the 1960s by Louis I.Kahn and his intelligent follower Mario Botta. From their individualistic variety we also can see that there is no coherent rationalistic style.

It is generally held that Rationalism arrived in the United States *c.* 1800 through French emigrant architects such as Joseph J.Ramèe, Maximilian Godefroy, and Benjamin H.Latrobe. But it was swamped by Jeffersonian Romanticism and formalism. The counter was found first in the words of Ralph Waldo Emerson and then in the might of industrialization and concomitant technical and engineering developments.

Emersonian nature and utility and inspired sculptor Horatio Greenough, who praised monumental buildings that addressed the "sympathies, the faith, or the taste of a people." He wrote Emerson that architecture was: "A scientific arrangement of spaces and forms to functions and to sit,…features proportioned to their graduated importance in function." The expression of functionality was the demonstration of reason. (The philosopher, whose tool is words, would refer to positivism.) Borrowing from American architect Louis Sullivan, who drew from Kant, Emerson, Greenough, and others, Wright was inspired by the "form follows function" aphorism, extending it by reflection on his family's love of Emerson, who urged a link with those "pertinent object lessons nature so readily furnishes," as Wright said. Is there anything in nature that does not function correctly, wondrously? Rationalism easily becomes entangled with the notion of utility and nearly synonymous with functionalism. But nature was the perfect teacher.

The application of rationalism reached a practical epitome beginning in the 1880s with the frighteningly tall buildings in New York City and Chicago. They had adopted structural systems evolved by engineers and building contractors and contained utilitarian features and technical innovations within a variety of facades. The expression of stacked spaces (to the Romantic), of stacked floors (to the rationalist), and vertical systems (water, people, structure, waste, etc.) was—and is—the architectural problem.

Although many were inspired by Viollet-le-Duc's words Wright made them contemporary and vital by speaking of an organic architecture for America's modern society and by producing works of an articulated (functional) clarity. The demonstration is the Darwin Martin house of 1904–05, and the Larkin Administration building (1903–06), both in Buffalo and both a rationalist's paradigm for differing building types.

Many of Wright's buildings possessed what he referred to as "picturesque" characteristics as he interpreted them from the English Arts and Crafts movement. His persuasion had a marked influence on European theory post-1910. Thus Wright and many of those founding modernists who were inspired by his words (not necessarily by his romantic designs), such as Walter Gropius, Le Corbusier, even Louis Sullivan (from whom Wright had drawn much nationalistic and transcendentalist fervor), and by Albert Kahn's industrial architecture, extracted intellectual sustenance from 19th-century theory and speculation.

In 1902 Sullivan wanted to impress on his audience "the simple truth—immeasurable in power of expansion—of the subjective possibilities of objective things." The architect's role was to interpret those things. In Europe Hendrik P.Berlage wrote about the "pure art of utility" and believed his Amsterdam Exchange buildings (1897–1903) followed principles espoused by Viollet-le-Duc. Auguste Perret was perhaps France's most ardent classical rationalist so dramatically expressed in concrete structures and axial symmetry from 1903–25; consider Notre-Dame Le Raincy (1922–24). Up to the 1960s Le Corbusier was France's most versatile structural rationalist, as a comparison of Monzie house, Garches (1927), and the monastery of Le Tourette, Lyon (1957–60) patently reveal. Yet his three-dimensional compositions are also picturesque in manners that baffle rigid theorists.

When in the 1920s the central Europeans, in particular the Germans, absorbed the visual aspects of the rationalism inherent in Albert Kahn's industrial architecture (where primary considerations were daylight, production process, functionality, money, construction time, and structure), they elected for a reductive, chaste, plain interior and exterior aesthetic constructed in glass, concrete, or steel, usually exposed. Wright and others (such as the Dutch) worried that such an architecture might lead to a rejection of its traditional role as a social art to become merely utilitarian, rationalized rather than rational. In the 1920s the Modern movement was driven by rationalism until its industrial style was found to be a useful expression for internationalism as promoted by the political left. Mies van der Rohe in the 1920s, for example, took much from Wright (and others) to generate a dynamic architecture based on American industrial buildings. By the late 1930s he settled for what is best classified as a severe classicism, appearing rational but in fact it was prescriptively formal and abstract. Thus the reasons for Kahn's industrial aesthetic were abandoned by the Germans when they accepted an aesthetic that claimed to be expressively functional but was in fact a style applied to all building types, regardless of all other considerations.

In the late 1920s seven architects launched the Italian Rationalist Movement, announcing that a "[n]ew architecture, true architecture, must emerge from a strict adherence to logic, to rationality." Their buildings and projects, supposedly born in Italy's traditions (and in opposition to the bustling but defunct futurists) and in fascism were widely diverse in appearance, many with structural clarity while immodestly betraying the influence of Russian Constructivists, Le Corbusier, and the Bauhaus. Giuseppe Terragni was their more expert apostle through the 1930s.

Then in 1941, a theoretical work was released on antecedents of 20th-century architecture by Siegfried Giedion, *Space Time and Architecture.* It was a faithful rationalist document in praise of functionalism. Giedion's intention was to concentrate on "the interrelations with other human activities…[on] architecture, construction, painting, city planning, and science" (1954). This was followed in 1948 by his second seminal study, *Mechanization Takes Command,* whose title reveals all.

In the decades after midcentury, rationalism became both clarified and distorted. Louis Kahn believed that a building had measurable qualities, that there were ordinate and subordinate spaces with natural hierarchies, that these functional aspects wanted to be defined by their unique form, and that perceptual awareness of architecture was in the orderly arrangement of forms. Supported by his poetic philosophy, these relationships were vigorously exploited by simple volumetric geometry, notably his A.N.Richards Laboratories, Philadelphia (1957–61), the second paradigm of 20th-century rationalism. If we accept that architectural form is shaped by programmatic functions, and this should include social and economic conditions, or by the spirit of its time, or by timeless principles, then the two extremes at midcentury were Kahn's romantically, picturesquely ordered forms and Mies van der Rohe's internally preordered forms classically composed. The reaction was the exploitation of form over function and hierarchies that were so apparent in 1950s sensualism and later the work of Arata Isozaki and Morphosis, to cite two examples.

A new neorationalism arose in the 1960s, again in Italy and composed by Fabio Reinhart and Aldo Rossi, among others, who rejected their predecessors. Soon there was the Madrid School, then in Germany architects Mathias Ungers and J.P. Kleihus, and in the United States, architects such as the New York Five, of whom the prolific Richard Meier has since remained the most faithful to original tenets. Again, these architects produced a wide variety of characteristics, none architectonically related, all distinct yet often claiming a mix of rationalistic and existential foundations.

Much of neorationalism was a theoretical twist with the attempt to relate architecture to political theories (usually Marxist) or to social theories, particularly through semiotics, which recognizes that buildings carry meanings (signs) and symbolic overtones, more often than not because of cultural continuity or history. Much of its theory was derived from or instituted in linguistics. Therefore one can understand that the problem of analogies with the complexities of architecture are many, not the least that semiotics (and the earlier structuralism) is evaluative, tending to operate postmortem, therefore only clumsily relevant to the processes inherent in creating architecture let alone to design methodology.

There is something strangely romantic in the architectonic application of those socioeconomic theories. Perhaps this reflects the continuing debate between rationalism and Romanticism, between the ongoing search for objective principles of design with universal application (regardless of complexity or culture, all functions are naturally similar throughout history), and the personal freedom that followed the collapse early in the century or generally agreed principles: witness Expressionism in the 1920s or sensualism in the 1950s or the independent Oscar Niemeyer and Frank O.Gehry.

The house in Riva San Vitalo, Italy (1972–73), by Mario Botta, should send shivers of joy through a rationalist because of its precisely extended square, obvious structure and responding use of materials, consistent vertical organization, functional expression, deceiving formality and careful proportions, all providing a modern clarification of Viollet-le-Duc's ideas, of Wright's organic song, and a sensible adaptation of Louis Kahn's functional geometry.

DONALD LESLIE JOHNSON

S*ee also* **Botta, Mario (Switzerland); Brutalism; Classicism; Constructivism; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Futurism; Giedion, Sigfried (Switzerland); Modernism; Kahn, Albert (United States); Kahn, Louis (United States); Mies van der Rohe, Ludwig (Germany); Notre Dame, Le Raincy; Perret, Auguste (France); Skyscraper; Structuralism; Sullivan, Louis (United States); Terragni, Giuseppe (Italy); Wright, Frank Lloyd (United States)**

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RAYMOND, ELEANOR 1887–1989

Architect, United States

Eleanor Raymond was one of a minority of women architects practicing in the United States in the early 20th century and was a significant figure in the history of American modernism. After several years of work in Boston's settlement houses, participation in the suffrage campaign, and an internship in the office of Boston landscape architect Fletcher Steele, Raymond entered the newly founded Cambridge School of Architecture and Landscape Architecture for Women in the summer of 1916. Directed by Harvard University professor and architect Henry Atherton Frost, the Cambridge School offered women a unique opportunity to master a Beaux-Arts-inspired curriculum within an allfemale environment. However, enduring discrimination in the architectural profession and the Cambridge School's lack of accreditation remained obstacles for many graduates. After Raymond's completion of the program in 1919, she was made a partner in Frost's Cambridge firm, where she remained until opening her own practice in Boston in 1935.

Trained solely in the practice of domestic architecture, Raymond completed nearly 100 houses in her 50 years as an architect. She is best known for several projects that reflect her early interest in European modernism; most notably, the Rachel Raymond House in Belmont, Massachusetts (1931), and a studio for Boston sculptor Amelia Peabody in

Dover, Massachusetts (1933). Much of Raymond's work, however, was firmly rooted in the still popular period styles of the Colonial Revival—a fact partially explained by the relatively conservative taste of New England clients and Raymond's own reservations about modernism.

Her early work was influenced in massing and in ornamental detail by the domestic architecture of colonial and early 19th-century New England. The planning of these houses, however, reflected a new concern for economy, efficiency, and the up-to-date amenities requested by her upper-middle-class suburban clients. In 1923, Raymond built her own house out of a partially demolished townhouse on Charles Street on Boston's Beacon Hill. Designed to be in keeping with the red brick Federal architecture of this historic neighborhood, 112 Charles Street (1923) was also home to several other single women involved in the design profession, including Raymond's longtime companion Ethel Power. Power, who served as editor of *House Beautiful* magazine from the early 1920s until the mid-1930s, was an important promoter of Raymond's work. The women of 112 Charles Street often collaborated on projects, creating a valuable network of female colleagues and clients.

During a 1928 trip to Paris and a 1930 trip to Germany, Raymond and Power viewed the work of European modernists such as Le Corbusier and Walter Gropius. The Rachel Raymond House in Belmont, Massachusetts (1931), designed for Raymond's sister, an interior decorator, reflected her interest in creating a regional modernism on her return to Boston. Built of a traditional wood frame with rough-sawed cedar cladding, the house differed in materials from the concrete and stucco monuments of the International Style. However, the house's rectilinearity and its flat roofs and upper-story terraces recall Gropius's housing for the faculty of the Bauhaus, which Raymond had visited in the fall of 1930. The interior continues these themes; an L-shaped, combined living room and dining room embodies the open planning principles of European modernism, whereas the retention of a central hall plan and the inclusion of decorative wood trim and antique Chinese hardware on the built-in cupboards disavow the machine age aesthetic. This merging of European and American sources significantly pre-dates the house that traditionally is credited with introducing modernism to the United States, Walter Gropius's house in Lincoln, Massachusetts (1937).

Raymond's clientele included a number of notable women who shared her professional aspirations and unmarried status. Most prominent was Amelia Peabody, a Boston sculptor and philanthropist who commissioned 16 projects between 1933 and 1972. Many of these commissions exemplified Raymond's interest in modernism and advanced building technologies. For example, the three-room studio that she designed for Peabody on her farm in Dover, Massachusetts (1933), featured easily cleaned cinder block walls, factory-ordered windows, a streamlined sitting room, and an experimental forced hot air system of heating. Raymond's Dover Sun House (1948), a house designed around Hungarian chemist Maria Telkes's pioneering solar heating system, was also funded by Peabody. The heat collectors, which ran along the length of the attic story of the southern facade, stored a five-day supply of solar heat for the small two-bedroom house. Internationally recognized, the Dover Sun House was listed as one of Raymond's greatest contributions to the development of domestic architecture in her successful nomination to the American Institute of Architects Fellowship in 1961.

Raymond's interest in preserving the building traditions of colonial New England is best represented by the compound that she designed in Gloucester, Massachusetts, for mining heiress Natalie Hays Hammond (1942). Perched on a dramatic shoreline site, the Hammond Compound consists of three residences and a central dining hall grouped around a central courtyard. The buildings' steeply pitched roofs, small-paned casement windows, and dark-stained clapboarding hearken back to the domestic architecture of 17th-century New England, reflecting Hammond's fascination with American and British history. Despite its conservative appearance, the Hammond Compound reflects progressive planning principles in its attention to the needs of three single professional women.

In addition to domestic projects, Raymond also designed several chapels, an addition to an airplane parts manufacturing plant, and numerous farm outbuildings. As is the case with many women architects, Raymond received relatively little critical attention during her lifetime, an omission attributed in part to the eclectic nature of her work, which defies the stylistic categories of conventional architectural history. The rise of the women's movement during the 1970s and 1980s brought with it several surveys and monographs that helped to recover Raymond's career; in 1981, Raymond was the subject of a one-woman exhibition at the Institute of Contemporary Art in Boston.

NANCY B.GRUSKIN

S*ee also* **Gropius House, Lincoln, Massachusetts; Gropius, Walter (Germany)**

Biography

Born in Cambridge, Massachusetts; first of three daughters to attend Wellesley College, graduated 1909. Died in Cambridge on 1989.

Selected Works

112 Charles Street, Boston, 1923
Rachel Raymond House, Belmont, Massachusetts, 1931
Amelia Peabody Studio, Dover, Massachusetts, 1933
Dover Sun House, Dover, Massachusetts, 1948
Hammond Compound, Gloucester, Massachusetts, 1942

Selected Publication

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REGIONAL PLANNING

Regional planning began from the idea that the essential basis for planning should be geography, not municipal jurisdictional lines. Although today this idea is easily accepted in principle, its history has been that of a reasonable proposition often ignored and frequently difficult to implement.

The beginning of regional planning in the United States is marked by the publication of Patrick Geddes' *Cities in Evolution* (1915), which first noted the tendency of large cities to disperse as they grew because of the influence of the automobile and industrial power. Although the idea of regional planning and governance had been considered as early as 1909, when the National Municipal League had its annual conference, Geddes recognized that the concept of a "city line" was being transformed by the growth of metropolitan regions, which no longer stopped at the end of municipal jurisdictions but were stretching into vast, spread-out areas that he termed "conurbations." Geddes observed the dispersed growth of areas such as Pittsburgh, Chicago, and the entire region between New York and Boston and predicted that such growth was the wave of the future, where "millions of people" would congregate in a way that ignored the significance of city boundaries.

Geddes, a Scotsman, had a significant influence on a small group of idealistic planners, especially Lewis Mumford, who nourished his ideas, elaborated on them with the help of other innovative planning founders, and eventually put them into practice in the early 1920s. However, it was Geddes who established the idea of the geographic region as the proper object of the planner's focus.

Geddes was an eccentric man who conducted masques and pageants to recapture past civic life. His was a large vision of not only how cities should be planned but also how the world must be transformed from the rule of technology and money into a new utopia. This transformation would take place, he maintained, by the creation of a "neotechnic" order that evolved through the public conservation of resources, eventually replacing the present of "more and more of worse and worse."

According to Geddes, the regional environment was the appropriate locale for this evolution because it contained the seeds for ideal human growth. Thus, his famous maxim “Survey before plan” meant that attention should be focused on the natural geographic characteristics of a region, such as its river basins, watersheds, and geology, and its social and cultural composition as well. Without naming it, he described urban sprawl as a dan-ger to community life (“Towns must now cease to spread like expanding ink stains and grease spots.”). Geddes was certain that the remedy could be found by understanding the varied organic composition of regional settlements and planning for growth by integrating nature into towns that grow “botanically.”

These ideas were a shock to the system of early 20th-century urban planners, most of whom were firm in the embrace of the City Beautiful movement, with the girded, formal, symmetrical orthodoxy it entailed. A diverse group of unconvinced planners and architects, however, sought a different direction. The group, which included Lewis Mumford, Clarence Stein, Benton Mackaye, and Charles Harris Whitaker, came under the influence of Geddes and concocted a scheme that led to the Regional Planning Association of America (RPAA).

In 1923, the RPAA published a five-part program that set forth the principles for regional planning that included the development of new garden city types of communities over the next few years. The group elaborated on the need for regional planning as an antidote to the type of cities such as New York, Chicago, Philadelphia, and Boston that were turning into “dinosaurs” because of the dispersed urbanization that was being created by the automobile. Mumford termed this development the “fourth migration,” the result of a technological revolution that was turning the movement of population centers outward for the first time. The goal of the RPAA was to lead it into “new channels” by developing a national plan that would define regions by unified geographic characteristics consisting generally of climate, soil, vegetation, industry, and culture.

Part of the RPAA’s argument was economic. Stuart Chase contended that regional planning could achieve vast improvements over the inefficiencies of transport and energy that existed without it. Another part of the argument was based on the conservation of resources (“Regional planning is the new conservation,” said Mumford), recognizing that a regional focus can treat “people, industry and the land” as single unit so that the population is distributed in a way that is compatible to its resources. Finally, the argument rested on the issue of attaining a “fuller quality of life” through regional planning by developing new communities that harmonized with the natural environment. These communities were not suburban housing tracts but rather “garden cities” that took their influence from Ebeneezer Howard and strengthened “indigenous America” against the tide of disbursed, thoughtless development.

The RPAA’s diagnosis of the direction of urbanization in the United States was nearly prophetic. Much of its interpretation of the endemic problems of what Mumford described as the fourth migration is heard from contemporary urban planners who are daily confounded by the effects and consequences of urban sprawl. Moreover, most of the current remedies that are proposed to combat sprawl are contained, at least in concept, within the proposals originally described by the RPAA. In terms of policy implementation, however, the RPAA’s influence remains solidly within the realm of good ideas. The two major experimental communities directly linked to the RPAA—

Sunnyside Gardens in Queens, New York, and Radburn, New Jersey—exist mainly as curiosities on the road to suburbanization, which in the years following the RPAA developed as such a powerful tide that regional planning, as envisioned by Mumford, Stein, and the rest of RPAA, was essentially pushed out of the picture.

If the RPAA comprised the formative idealists of regional planning, the planners who first conceived of the Regional Plan of New York in 1923 were sober pragmatists. The group, headed by Thomas Adams and brought together by the Russell Sage Foundation, set out to create a regional plan for New York that was rooted in achieving economic efficiencies for a growing concentration of economic activities in the New York area through a scheme of "recentralization" of business and industry.

The plan, which encompassed an area of more than 5000 square miles, proved to be widely influential in the evolution of the New York metropolitan area, mainly because of its congeniality to business investment and its grasp of emerging trends in population movement and industrial development. Many of its suggestions for highways, bridges, and tunnels were eventually brought to realization by the power broker Robert Moses. Distinctly nonutopian in outlook, the plan called for new roads, parks, and beaches at the same time that it designated the last significant open space near Manhattan—Hackensack Meadows in New Jersey—for commercial development and omitted any consideration of public housing. In addition, although it steered away from consideration of garden cities and ideal communities, it nevertheless included a section by Clarence Perry that described the development of "neighborhood units," which offered a significant alternative to the model of the suburban single-family house and a source for ideas on clustered development planning years afterward.

The Regional Plan of New York was the first attempt to address the needs of a metropolitan area outside its municipal boundaries. Without any regulatory power of enforcement, such as zoning, it relied on the power of good planning ideas to achieve its goals, which could ill afford to antagonize those engaged in business and investment. To Mumford, however, the plan was dreadfully misconceived. His criticisms of the plan and Thomas Adams's defense of it constituted one of the most famous dialogues in American planning history: Mumford proselytizing for the ideal, Adams for the obtainable.

One of the significant participants in the Regional Plan of New York was Frederic Delano, the uncle of Franklin Delano Roosevelt, who was receptive to the idea of regional planning well before he became president of the United States. While governor of New York, he proposed a state commission ("cooperative planning for the common good") in rural homes and frequently spoke supportively of regional planning as a means to relieve congestion in the cities and redistribute population and industry more equitably and responsibly. At about the same time (1930), the National Municipal League described municipal boundaries as "obsolete" and called for expanded jurisdictional lines to "give reality to the work of planning principles."

In June 1933, shortly after taking office, President Roosevelt pushed a $25 public works bill through Congress that included funds to establish a resettlement administration, which was set up to plan a series of experimental greenbelt towns on the periphery of large metropolitan areas. However, the Resettlement Administration's creator, Rexford G.Tugwell, soon came into conflict with Congress, which considered this effort at regional planning by the federal government the bulwark of socialism.

Within months, Tugwell and the Resettlement Administration were put out of business, although three greenbelt towns were eventually built (Greenbelt, Maryland, near Washington, D.C.; Greenhills, near Louisville, Kentucky; and Greendale, Wisconsin, near Milwaukee).

The most shining symbol of New Deal regional planning was the Tennessee Valley Authority (TVA), which was the last direct federal involvement by the federal government before World War II. President Roosevelt described the project as an exercise in regional planning, but it was actually much more, as it included a massive flood control project on the 650-mile-long Tennessee River basin and a huge power-producing operation that by 1944 was generating half the nation's power. Originally, it was intended also as an armaments production facility, a proposal that President Roosevelt was successful at eliminating.

The period immediately following World War II saw a resurgence of interest in the idea of regional planning as the idea of reshaping local governments into regional jurisdictions was frequently debated. In 1950, Atlanta adopted its plan for improvement, which integrated the relationship of the City of Atlanta to Fulton County. In 1953, the Ontario Parliament approved the federated municipality of Metropolitan Toronto, reflecting what seemed to be the current tide of good planning. Numerous reports and studies in the early 1950s called for "intergovernmentalizing" services and frequently petitioned for new interjurisdictional initiatives to better coordinate policies and planning. Fueled by a surge in federal spending, these efforts generally sought to make capital planning on the municipal level more efficient and to coordinate the federal government's spending programs. When Congress passed the Housing Act of 1954, for example, it included direct federal assistance to regional and metropolitan planning agencies. Shortly thereafter, the National Municipal League responded by developing a so-called model state and regional planning law. In 1955, the Commission on Intergovernmental Relations, known as the Kestnbaum Commission, emphasized that metropolitan areas were the most critical "focal points" for dealing with urban needs.

Despite the increased attention to jurisdictional reform, local governments were reluctant to disturb traditional lines of authority. Efforts at metropolitan reorganization in, for example, Cleveland and St. Louis were ineffective. By 1959, the Advisory Commission on Intergovernmental Relations was forced to conclude that metropolitan reorganization, whether through consolidation or internal restructuring, faced an uphill battle because of strong local resistance. When voters were faced with public referendums, they were either indifferent or opposed. Jurisdictional reform held little appeal outside Washington, D.C., or among urban planners focusing on regional matters. By the early 1960s, the idea of jurisdictional reform—and with it regional planning and governance—had lost much momentum. The continued expansion of federal funding and the mounting complexity of urban problems, however, required that some new structural solution be found. The answer, for the most part inadvertently created, was the development of new area-wide organizations of locally elected officials, which soon came to be referred to as Councils of Governments (COGs).

A veritable nationwide COGs movement soon developed, nurtured by federal funds. It began with the creation of the Detroit-area Inter-County Supervisor's Committee in 1956, and by 1960 more than one half of 212 metropolitan areas had created new COGs.

Areawide planning was gaining ground all across the nation. COGs provided a means to effectively address metropolitan problems, satisfying federal priorities for increased coordination of planning functions within the metropolitan region while avoiding the issue of jurisdictional reform. The federal preference for such planning was unambiguous. In the 1960s and 1970s, federal aid programs for highways, mass transit, and open space insisted on metropolitan planning as a funding requirement. By 1979, 39 separate federal programs required regional or metropolitan planning as a requirement for local participation.

Regional planning had found its home within the arms of COGs. Sustained by federal financial assistance in the form of Section 701 comprehensive planning grants, regional planning at long last gained institutional credibility as COGs joined with the National Association of Regional Councils. Regional planning commissions proliferated as never before by becoming COGs. At the same time, however, because of their voluntary nature, regional planning functions were separated from the idea of regional governance. The Miami Valley Regional Planning Commission, the Association of Bay Area Governments, and the Metropolitan Washington (D.C.) Council of Governments were examples of this type of structure. Although countless regional plans were developed, few were implemented in any meaningful way, and many suffered from overly general recommendations. Whatever their virtues, most of these plans had the problem of being politely ignored by local jurisdictions. The regional planning COGS settled into a comfortable existence of clearinghouses for federal grants, including those for water-quality planning, air-quality planning, solid-waste management, and the A-95 review process. Many were limited to information exchange, coordination, technical assistance, and the provision of some services.

In speaking about regional planning in the 1930s, the National Municipal League had warned that “to be of value plans must be executed.” In the early 1960s, this advice seemed particularly relevant as the goals of regional planning became separated from regional governance through the establishment of COGs that had no real ability to implement their plans.

Although the COGS structure of regional planning has become the dominant one, there are significant exceptions. Since 1967, the Twin Cities Metropolitan Council has been a prime model for regional planning in a major metropolitan area that effectively combines planning, policies, and implementation. Significantly, it came into being as an action by the State of Minnesota, not a local referendum. It is distinctive because its role in making regional policy is authoritative rather than advisory. With its own political base, it has enjoyed a relatively productive history working with local municipalities within a seven-county area, particularly since passage of the Land Planning Act of 1976, an important effort in regional growth management.

Similarly, the Portland (Oregon) Metropolitan Area developed a regional approach to planning. Its evolution encapsulates both the weaknesses and the strengths of regional planning. In the early 1960s, Portland, like many metropolitan areas, established a voluntary association of governments to address areawide planning needs. The Columbia Region Association of Governments (CRAG) originally encompassed an area of four counties and 14 cities. CRAG emphasized intergovernmental cooperation to combat a number of regional problems, such as loss of farmland and the escalating public cost of spread-out development.

By the early 1970s, however, it became clear that CRAG's advisory influence was powerless to overcome conflicts among member jurisdictions. In 1973, in response to heightened environmental concern, the Oregon State Legislature passed a bill that significantly strengthened CRAG's role. It made local membership in CRAG mandatory and gave it authority to overrule local development plans within 27 participating jurisdictions that did not conform to the regional comprehensive plan. This bill, in conjunction with the passage of a state land use development law, eventually led to the Metropolitan Service District (METRO), a directly elected regional government with wide responsibilities. With strong land use powers, METRO became the rare bird of regional planning, an organization that came into being from broad public consensus that is able to address regional land use policies effectively.

Although the federal government retracted many programs fostering regional planning in the early 1980s, such as Section 701 comprehensive planning grants, other federal programs brought about new regional planning responsibilities. The most significant was the Coastal Zone Management Act of 1972, which provided grants to states to develop comprehensive programs for preserving coastal resources. The result was the establishment of state-run coastal programs in 18 coastal states that assumed regional planning responsibility and varying levels of land use control in waterfront areas.

However, the most significant helping hand that regional planning has received came about on the state level as a result of heightened interest in growth management programs. Numerous states have passed some sort of growth management (or "smart development") controls in the last two decades. Usually, state growth management strategies have relied on regional planning agencies that came out of COGs, strengthened with additional funding and new authority. In general, these regional planning agencies implement state growth management goals by identifying valuable regional resources and developing regional growth management plans. In Florida, for example, eleven regional planning councils were established to develop plans and review local jurisdiction plans for consistency. Even states in which regional councils do not exist within a strict government framework with regulatory authority, such as Florida, Georgia, Vermont, and Maine, nonetheless have regional statutory authority over local plans.

Most growth management strategies are concerned with directing development to appropriate regions within a regional environment—to limit urban sprawl in favor of preserving open space and balancing service capacities. In Oregon, this effort has relied on the establishment of regionally drawn urban service boundaries, which attempt to attain a regional balance between compact development and protection of natural resources. In all cases, regional planning councils are concerned with identifying the greater-than-local planning issues that must be dealt with through an integrated growth policy. Increasingly, the recognition that a problem such as urban sprawl requires a comprehensive area-wide solution has reinvigorated the role of regional planning.

RICK ADAMS

S*ee also* **Mumford, Lewis (United States)**

Further Reading

Further readings on Regional Planning begin with its roots in English Utopian Planning and extend through its appeal to urban theorists such as Lewis Mumford and more recent ecological planners. The distance between these theories and actual implementation of regional plans rounds out one of the most influential planning stories in the 20th century.

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REGIONALISM

Regionalism in architecture is the desire to shape buildings according to the particular characteristics of a specific place. Regionalism aims to obtain a visual harmony between the building and its geographical setting, to connect with the culture and architectural traditions of the local area, and to manage the local climate as naturally and as efficiently as possible. Because regional buildings in a particular place respond to a similar set of local characteristics, they will possess a similar look that can often be described as a style like “Southwestern” or “Cape Cod,” and as these characteristics vary from place to place, buildings in different regions will have distinctly different appearances relative to each other.

Regionalism is the oldest and most pervasive of all building ideas. In the prehistoric world, and in vernacular settlements throughout the world, builders used local materials because they were conveniently at hand. They also adapted their forms to the local climate in order to moderate temperature swings and to manage precipitation for comfort and survival. For example, buildings in hot, dry climates are often constructed of thick adobe walls, which first absorb heat during the hot days, providing a cool interior, and then radiate the heat into the building during the colder nights. Buildings in the wet climate of Northern Europe evolved steep roofs to shed rain and snow. Most regions of the world have similarly developed vernacular traditions of building that are well adapted to their particular geographical circumstances. Distinctive regional vernacular traditions include Greek fishing villages, Italian hill towns, and the adobe of Santa Fe. Even today, a great deal of the mass-produced built environment may be seen as regional in character. Houses in the suburbs of London look different from those in Switzerland, which look different from those in Thailand. When builders are not self-conscious about style or fashion, regional tendencies are most likely to emerge because they make practical sense and derive from successful traditions in the area.

In the world of high-style or high-status architecture, however, the concept of regionalism has had a more complex history. For buildings like temples, public monuments, palaces, and corporate headquarters, clients and their designers often seek to express power, status, or philosophical outlooks that are not about the practical realities of dealing with the local climate or geography. These statements are usually about abstractions and are often meant to apply more universally than to a particular location. For example, ancient temples were designed as appropriate homes for deities whose powers transcended a local place and time. These buildings therefore employed a rigorous orthogonal geometry that was thought to be more universal and time-less in character than the more casual geometries that adapted themselves to the peculiarities of the local site. More recently, proponents of the International Modernist movement between the World Wars used a similar palette of industrial forms and materials for buildings in widely diverse geographical areas, because they wanted to express a universal view of modern life and industrialization that transcended individual places.

These two ideas—regionalism and the universal—are not necessarily mutually exclusive. One might express a universal sense of beauty while still accommodating local conditions and traditions, for example. But many times in the history of Western architecture, the one has been pursued at the expense of the other and vice versa. Builders sensitive to regional practicalities may scoff at higher aesthetic concerns and meanings, whereas high-fashion designers may disparage regional concerns as parochial or inconsequential in relation to bigger philosophical issues. From the Renaissance on, for example, many architects transplanted ancient Roman Classical forms to other regions to express their connection with the high civilization of Rome, even

Phoebe Apperson Hearst Administration Building, Asilomar, designed by Julia Morgan

Photo © Mary Ann Sullivan

though the shallow roofs that were originally designed for the Italian climate did not work as well in the wetter climates of northern Europe or the east coast of America.

To understand the history of regionalism in high-status Western architecture in the 20th century, one must look back to the end of the 18th century. Until then, high-status architecture was dominated by various versions of Roman Classical architecture applied irrespective of the local conditions. But several broad cultural movements in Europe and America led to a renewed appreciation of different regions and their possibilities for design. Namely, the Romantic movement in the arts drew attention to the raw and varied beauty of nature and to picturesque vernacular villages and cottages that appeared to live in harmony with nature. Second, as people began to identify more with their cultural groups than with the kingships that had often transcended cultural boundaries, they began to look for the special qualities of their own nationality and place, including the indigenous architectural traditions that they could claim as their own. Third, the rapidly expanding Industrial Revolution created manufactured goods of such variable quality that many began to call for a revival of handcraft by skilled craftspeople. Crafts were distinctly regional in character, which encouraged a renewed look at local traditions.

House in Aspen, Colorado, designed by Harry Teague (1997)

Photograph © Robert Millman

All of these combined in the Gothic Revival movement in the first decades of the 19th century, which in turn led to the Arts and Crafts Movement in the latter half of the 19th century and the first decades of the 20th. The Arts and Crafts architects in Britain revived the medieval vernacular traditions of building in their local regions, which they believed fitted the local culture and climate while embodying good craftsmanship. Charles Rennie

Macintosh derived a number of his forms from Scottish Baronial castles, Sir Edwin Lutyens drew on medieval house forms in the southern English county of Surrey, and Charles Annesley Voysey stripped down medieval house forms to their underlying essences, leading to some of the first simplified modernist architectural forms that nonetheless still exuded a regional sense of place.

This new focus on regionalism invaded the École des Beaux Arts, the school of architecture and art in Paris that had become the world center for teaching the principles of ancient Roman Classicism. The professor of theory at the École at the turn of the century, Julien Guadet, taught that a building in the city should be different from one in the country, just as one at the seaside must be different from one in the mountains. This helped inspire a movement later named Academic Eclecticism by the historian Richard Longstreth, which among other things attempted to fuse the regional with the universal. These architects derived their ideas from traditional architectural styles that they believed embodied timeless and universal principles of design, but at the same time they chose their precedents to fit the particular geographical setting.

The Arts and Crafts tradition and aspects of Academic Eclecticism influenced Frank Lloyd Wright, who became America's most influential spokesperson for the regionalist idea. Borrowing the phrase "organic architecture" from Louis Sullivan and drawing on Japanese design sensibilities, Wright insisted that buildings should harmonize with nature and sensitively address the local geology and site conditions. While living in Chicago in the first decades of the 20th century, he developed the Prairie School, whose low, horizontal lines he said captured the essence of America's Midwestern plains. The buildings that he later designed for the Arizona desert looked distinctly different from the ones he designed in Wisconsin, as each responded to the particular local characteristics.

Wright's contemporary, Bernard Maybeck, also pursued the regionalist implications of Academic Eclecticism and the Arts and Crafts movement. After moving to the Bay Area of San Francisco before the turn of the century, he began to develop a distinctive style for the area that was based in part on medieval vernacular German forms and in part on the Shingle Style that had enjoyed a brief popularity in the northeast seacoast resort towns several decades earlier. Despite these disparate and remote sources, Maybeck fused them into an organic whole that inspired other architects, including Julia Morgan, and that still defines much of the special character of the East Bay area today.

In the first two decades of the 20th century, many other builders and architects followed this pattern of adapting and combining various architectural traditions to fit a particular location. The Greene brothers Henry and Charles combined Arts and Crafts and Japanese traditions for their distinctive version of the Craftsman style in Pasadena. Their shallow roofs, open sleeping porches, and casual assymetric forms suited well the moderate climate and emerging southern California culture.

Regionalism faded in popularity for high-status buildings after the Second World War. The mood in America and Europe had changed to favor an international outlook and a positive view of industrialization, and these were best expressed with the ahistorical, technological, and non-regional forms of Modernism. In the 1970s, however, the mood changed again. As the world economy became more pervasively global in character and universal in taste, and as generic office buildings and chain retail stores began to make London look like Los Angeles or Houston, many people began to seek again a special quality in their particular place. Out of this grew the Historic Preservation movement, which sought to save historic buildings and districts for their local character, rather than risk another blandly generic redevelopment.

A number of architects have sought regional expressions from the 1980s, including Robert Venturi in Philadelphia, Robert Stern in New York, Antoine Predock in New Mexico, Harry Teague in Colorado, and Glenn Murcutt in Australia. Like their regionalist predecessors before World War II, most of these new regionalists have explored aspects of the traditional styles and vernacular forms that might provide clues to appropriate design qualities in their region; but in most cases, their Modernist roots have led them to find fresher or more contemporary expressions of the traditional ideas.

For example, a traditional Colorado barn form inspired Harry Teague's design for a vacation home in Aspen, Colorado. This sensitively expresses the forms of the landscape and the traditions of the area, whereas the uninterrupted space within supports the casual life-style of living in one large great-room. On closer inspection, however, one can see that the architect has stripped away the outer skin on part of the façade to reveal the inner structure and a recessed wall of windows that carefully frames external views. The modifications to the traditional form are Modernist in spirit, and the materials, massing, siting, and connections between inside and outside unmistakably link this building to its local context.

MARK GELERNTER AND VIRGINIA DUBRUCQ

S*ee also* **Arts and Crafts Movement; Contextualism; Craftsman Style; Environmental Issues; Greene, Henry M. and Charles S. (United States); Historicism; Historic Preservation; Lutyens, Edwin (England); Mackintosh, Charles Rennie (Scotland); Maybeck, Bernard (United States); Morgan, Julia (United States); Prairie School; Stern, Robert A.M. (United States); Sullivan, Louis (United States); Sustainability and Sustainable Architecture; Voysey, Charles F.A. (England); Wright, Frank Lloyd (United States)**

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REICHSTAG, BERLIN

Initially designed by Paul Wallot, completed 1894; redesigned by Sir Norman Foster, completed 1999 Berlin, Germany

Built at the end of the war-ravaged 20th century, the new German Parliament building is significant for the refurbishing of a tarnished image—not of the Reichstag itself, but of German national identity. The conversion of the Reichstag by Sir Norman Foster, completed in 1999, was the building's most optimistic incarnation of its troubled history. The Reichstag always had symbolized a democratic German forum, although it was not until 1999 that a fairly elected democratic body convened within its chambers.

In 1871 the German Parliament, operating under the strict control of Kaiser Wilhelm and Chancellor Bismarck, had very limited power. Traditionally convened at the convenience of the emperor, the appointed parliament was finally allowed to have a meeting place of its own in 1882. After two competitions, the design was awarded to Paul Wallot, a little-known German architect. The neo-Renaissance building was constructed between 1884 and 1894 after many design compromises negotiated between the Kaiser, Bismarck, and the parliamentarians.

The building was a gift from the Kaiser to his people, but he actively hated it—reluctantly inscribing *Dem Deutschen Volke* ("to the German people") over the entry in 1916, while privately referring to it as *Reichsaffenhaus* ("the imperial monkey house").

The seating arrangement reflected the emperor's power—his ministers and officials sat on a raised rostrum at the end of the room, presiding over the members. Members could only address the body formally; interruptions and debate were rare.

A fire, rumored to be an act of arson by the Nazis, devastated the building in 1933. The scarred building was then shelled and vandalized by the Russian army in 1945, leaving it a ruin. A poorly executed partial renovation in 1961 restored the building's functionality, but parliamentary sessions were not held due to political opposition by Russia and England—two of the four occupying forces in then-divided Berlin. Existing in the shadow

Reichstag building showing Wallot's Facade and Norman Foster's dome

Photo © Dennis Gilbert/VIEW

of the Berlin Wall, the Reichstag was the backdrop of several historic takeovers, protests, speeches, and concerts.

In 1991, two years after the fall of the Berlin Wall and reunification of West and East Germany, the Bundestag narrowly approved a move of the capitol from Bonn back to Berlin. It was a controversial decision; the wrecked and ill-regarded Reichstag was chosen over the popular provisional Parliament Building then nearing completion.

A competition for converting the Reichstag was held in 1992. In the second stage of the competition, Foster and Associates were awarded the commission. Reconstruction began in 1995 after a dramatic wrapping of the building by the environmental artists Christo and Jean-Claude. Work was completed in 1999, and the first parliamentary session was held on 19 April 1999.

The competition's winning scheme called for a light steel and glass roof hovering over the entire Reichstag. This proposal could be seen as similar in spirit to the elegant wrapper Foster designed for the Carré d'Art in Nimes (1984–93). As the design of the master plan of the surrounding area evolved, the huge glass cover was eliminated. Design emphasis was shifted to a new dome that would become a lantern for the building.

From the exterior, the renovation was restrained. The sleek interiors of metal and glass were visible behind the old masonry colonnade. The gigantic dome, mostly glass and striated by spi-

Reichstag, interior of the dome

Photo © Nigel Young/Foster and Partners

raling ramps, was the most visible change to the 19th-century facade.

Internally, the old and new materials were clearly separated and placed in dialogue. Exposing layers of history found during the renovation became part of the design strategy. Marks of the masons, 19th-century decorative moldings, Russian bullet holes, and graffiti all were framed by fresh plaster walls.

The main organization of the original building was preserved—a central parliament chamber flanked by two exterior courts. The chamber was semi-circular and gently raked with a concentric public viewing gallery cantilevered from the second floor. In a notable departure from the 19th-century room, the ceiling of the chamber followed the geometry of the dome above. Light was distributed evenly through a series of mirrors and filters. A central reflective element formed the hub of a bicycle-wheel cable system anchored at the spring point of the dome. Light and airy, the room’s focus was an enormous eagle, an icon moved from Bonn.

Circulation in the building was organized to reflect a genuine democracy. Citizens, lawmakers, and visitors all entered through the same portal and used the grand stair. The formality of the original plan was restored, removing the many small revisions from the 1960s renovation that had obscured the secondary axes. Most of the massive masonry walls were retained, but a new transparency was gained through skillful manipulation of natural and artificial light.

At the end of the public sequence was the spectacular glass dome with intertwining double helical ramps. The structure of the 40-meter dome, along with ramps and central mirror, all are hung from the original masonry walls. This required the construction of a significant temporary structure and the use of a 40-meter crane (one of only four in Europe at the time).

From the dome, visitors gained a panoramic view of the city as well as a limited view down to the parliamentary chamber illuminated beneath. In the middle of the dome was a mirrored sculptural element that had multiple functions: it directed light, which was diffused by a shade, to the chamber below; it reflected focused artificial light beams across the city at night; and it acted as a heat chimney, exhausting hot air from the chamber below.

Appropriate to Germany's innovative environmental legislation in the latter part of the 20th century, the Reichstag followed many sustainable building practices. The building adapted the original 19th-century heating and cooling strategy, relying on two existing aquifers. These underground lakes were used to store heated or cooled water, which then flowed into radiators in the floors or ceilings. Power was generated by burning vegetable and seed oils, renewable resources that burned with minimal waste.

RENÉE CHENG

S*ee also* **Foster, Norman (England); Berlin, Germany; Berlin Wall, Berlin; Memorial**

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REINFORCED CONCRETE

Several European engineers, working independently, developed reinforced concrete throughout the 19th century. Francios Hennebique of France was one of many to patent his experimental work (1887), and in the last two decades of the 19th century, he devised a coherent system of reinforced concrete. By 1917, Hennebique's international firm had completed a staggering 17,000 contracts, forging a worldwide industry. Although the use of this type of construction was widespread in Europe, North Africa, and North America at the turn of the century, most builders were interested in its fireproofing characteristics, and few understood the tensile potential inherent in the reinforcing. The notion that steel and concrete could function monolithically had already been demonstrated on paper and in practice by many engineers, but the structural ramifications of that fact required time to disseminate. Some early experiments erroneously failed to demonstrate that iron embedded in concrete could withstand a greater load than iron without concrete.

Swiss engineer Robert Maillart was one of the first designers to break from the masonry past by using steel-reinforced concrete in forms and configurations appropriate to its technical properties. The monolithic potential of this new material offered great advantages in weight and labor, and with new theories of structural analysis emergent in the early 20th century, standards for both the design and the construction of reinforced concrete were adopted in several countries as early as 1902. These standards were ultimately invested with quasi-legal status, incorporated into building codes later in the century.

Reinforced concrete is the union of two materials: concrete, which is strong in compression, and steel, which is strong in tension. Without reinforcing, concrete's tensile strength is typically only 10 per cent of its compressive strength. This tensile strength is so minimal, in fact, that it is typically omitted from structural calculations. Steel comes in the form of bars ranging from 3/8 inch to nearly 3 inches in diameter. Placed into formwork before the concrete is poured, the steel reinforcing bars, or rebars, are typically located where engineers expect stress due to tension to be greatest, referred to as the tensile zone (in the case of a simply supported beam, the tensile zone occupies the bottom half of the beam). Because steel is also strong in compression, rebars are employed even when tension is not expected to be severe, such as in axially loaded columns. One of the advantages of reinforced concrete is that the concrete insulates the steel during a fire. Another is that concrete and reinforcing steel expand at approximately the same rate during fluctuations of temperature. This is important because if the embedded steel were to expand at a greater rate than the surrounding concrete, stress and possible failure may result.

The embedment of the rebar requires care, however, because several factors can spoil the advantages of its use. Proper concrete mixes are required so that the steel and the concrete bond and thus work as one unit. Also, the concrete must protect the rebar from corrosion, although corrosion in limited quantity actually increases bonding. Pouring the concrete also presents opportunity for error because efforts to force the wet concrete and its aggregates to fill the formwork can dislocate rebars from their intended position.

This is also true for wire-mesh reinforcement, which is often used instead of rebar in slab-on-grade applications, such as sidewalks, driveways, and floor slabs. Welded strands of steel formed in a gridlike mesh are often used to resist light tensile stress or to prevent concrete from cracking because of temperature changes. This form of reinforcing is sometimes used to resist more severe stresses, such as the conical shaped wire mesh used in the columns of Frank Lloyd Wright's Johnson Wax Company Administration Building (1939) in Racine, Wisconsin. Twenty-two-foot-tall columns were supported by a base only 9 inches in diameter, tapering lotuslike at the ceiling. When a test column was axially loaded on the site, the concrete and its welded wiremesh reinforcing supported 60 tons, five times the anticipated load.

Generally, there are two ways that a reinforced-concrete structure can fail, namely, excessive compressive stress or tensile stress. Engineers typically design reinforced concrete to fail in tension rather than compression by underdesigning the rebar. Most codes require this because steel fails gradually by yielding before reaching its ultimate capacity. When a reinforced-concrete structure fails because of tensile yielding, deflection gradually increases and becomes visually detectable. Compressive failure, on the other hand, is often sudden and sometimes drastic and even explosive.

Because concrete is poured rather than cut, rolled, or extruded, designers sometimes can afford the liberty of shaping structural elements to take special advantage of reinforced concrete's inherent properties. Roof slabs, for instance, can be made 6 inches thick and folded or curved in dynamic forms. Rebar can be stretched taut in its forms before the concrete is poured, thus prestressing the structural member and allowing for lighter and thinner and thus more efficient structural elements. Reinforcing tenons may also be stretched after concrete has set, in a system called post-tensioning, which also increases the reinforced concrete's ability to carry loads. As analytical and mathematical sophistication has increased, engineers can often anticipate where the most severe lines of stress are likely to develop in a given structure. The pattern of reinforcing can therefore be superimposed over those same lines, called isostatic lines, which is exactly how Italian engineer Pier Luigi Nervi devised his dramatic scheme for a factory in Rome (Gatti Wool Factory, 1951). The underside of the factory's floor slabs were articulated with an irregular grid of reinforced beams radiating out from columns and crisscrossed by circles of beams concentrically ringing out from those same columns. This irregular, nearly curvilinear waffle pattern is a classic example of what advocates would call beauty derived from pure structure. However, it was a structural solution that may have been efficient in its use of concrete and reinforcing, but the irregularity of the grid pattern required ex-tremely elaborate formwork, thus reducing the solution's cost-effectiveness. For this reason, as well as the analytical complexity of determining the pattern of stress, Nervi's isostatic-inspired slabs were rarely emulated. Waffle stab systems, however, where reinforced beams intersect one another at right angles, forming square voids rather than irregular voids and thus becoming more amenable to repetitive formwork, have been widely used.

JERRY WHITE

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RENAULT DISTRIBUTION CENTRE

Designed by Sir Norman Foster; completed 1983 Swindon, England

Foster and Partners designed the Renault Distribution Centre in Swindon, England, on a 16-acre sloping site at the western edge of the town. Renault needed a distribution facility for spare parts for the car dealers in England, office space, exhibition space, and a cafeteria. Being a fairly rural area, the town planners and Renault were concerned with making a visually interesting building that would enhance the surroundings.

With its sea of yellow steel masts, the Distribution Centre has come to embody the essence of the work of the often-called High-Tech architecture, which, although it explores new materials and their highly technological capacities, is also an “appropriate technology,” with its lightweight and flexible metal structure, for the automotive industry.

As an alternative to the ubiquitous “big box” or factory-in-ashed—as are many of Richard Foster’s buildings, such as the Willis Faber and Dumas offices (1975) in Suffolk—the Centre is inventive and expressive of a second machine age of architecture. The unique suspension structure is exposed as a bridge, and it exemplifies the collaboration between architect and engineer in fabricating nonstandardized parts for a building rather than employing off-the-shelf products. Although the metal parts are produced with the help of the computer, they are customized to the specific structure of the building. The architects, with the engineers Ove Arup and Partners, developed a repeatable single-story module to be built over the site with a lightweight roof suspended from a mast structure with an interior filled with natural light. It successfully continues the idea of modular construction and the machine aesthetic as exemplified in the Reliance Controls Center (1967), also in Swindon, designed by Team 4, and Foster’s Modern Art Glass Factory (1973) in Kent.

Foster’s design began with a building module 24 square meters, 7.5 meters high at the edges, and up to 9.5 meters at the center, suspended from a 16-meter-high tubular steel mast to create an open network. Forty-two of these modules were then erected in a 9-by-4-meter grid with 36 modules housing the warehouse space laid out in a two-directional grid for easy access to the parts and equipment. Six additional modules comprise the distribution and office spaces, a car showroom, a training school, workshops, seminar rooms, and a cafeteria. The entrance is composed of one module left open at the sides like a canopy. The building can be expanded by continuing the same modular system.

The modules are constructed of diverse metal components in a portal frame. Steel beams faceted into an arch are supported from the top of the prestressed circular rolled hollow steel masts by thin steel tension rods at 45-degree angles. The tension rods reach the beams and continue beneath the roof and with supports from below to join with the next beam. The beam-and-mast system creates an umbrella shape that supports each other, and the steel ties at each mast provide the moment connection. The steel beams have holes to reduce the weight but also to provide an aesthetic lightness that is clearly visible in the way the circular holes are lined up from roofline to roofline.

Tubeworkers Limited developed the rods and their bolts and pin joints in a custom-made system originally developed for sailing rigging, but here in a spheroidal graphite cast iron, which has a low melting point for shaping and the tensile properties of cast steel. This was the first time the product was used for a building.

The facades are a combination of steel panels and glass. A Pilkington system of 10-millimeter-thick flatbed armor-plated glass in 4-by-2-meter sheets is suspended on bolts countersunk into the glass and held in place with special steel spider legs. Lightweight steel transoms span between the mullions with the same spider-leg fastener.

The insulated steel wall panels are custom made by a caravan company with a 4-meter-long horizontal span between the steel mullions, placed on edge fastened by flanges at the back. The few interior wall divisions are the same lightweight steel panels or glass for visibility between spaces. The exterior walls are recessed from the roofline, bringing the structure to the fore. The end modules, each with a corner mast, are tied down with tension rods and stabilized on concrete foundations.

The roof is one PVC membrane with insulation secured by metal disks that seal the openings from the penetrations of the masts and vents. Twenty-seven trapezoidal-shaped roof lights at the point of each module are held in place by 6-millimeter bolts at the top of each plate. The roof lights, recalling early 20th-century factories, provide views, natural sunlight, and smoke ventilation.

A fascia seals the wall and the roof connection with a flexible neoprene-coated nylon fabric often used for hovercraft skirts, and the fastenings are those used for truck trailer covers. Foster also designed office furniture for the complex that he had used in other Renault projects.

The Distribution Centre is a flexible building, not a static monument, but one that reflects the ever-changing automotive technologies. The building bespeaks customized standard sys-tems for its own construction, specific to its own needs yet is fully adaptable, a feature that is also visible in Foster’s Hong-kong and Shanghai Bank Headquarters (1986). The vertical yellow masts on the horizontal landscape have been compared to sailing ships or umbrellas basking in the sun, and the building has become an identifiable trademark for Renault in England.

NINA RAPPAPORT

S*ee also* **Arup, Ove (England); Foster, Norman (England)**

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REPRESENTATION

"At the End of the Century: One Hundred Years of Architecture," the traveling exhibition organized by the Museum of Contemporary Art in Los Angeles, offered a vast array of architectural representation, from the 1914 Sant'Elia Italian futurist drawings to the working model of Gehry's 1997 Bilbao Guggenheim Museum. Although the futurists did not produce any built work, Sant'Elia's depictions of an imagined architecture befitting the new machine age have become part of the canon of modern architecture; eloquent and seductive, the drawings constitute the most radical architectural proposition that gave expression to a modern city driven by agile transportation systems. Whereas in Sant'Elia's work the drawings became the architecture, in Gehry's Guggenheim new means of representation begot a new architecture. The building's insistence on irregular forms challenged the traditional orthogonal architectural drawing conventions of plans and sections, and both design and construction had to rely greatly on the latest computer-modeling technology.

Architectural representation provides the visualizing context in which architects think through a design. Drawings, models, sketches, cross sections, axiometric views, and most recently computer-generated walk-throughs are where architecture is initially conceived and displayed. If developments in materials and technology make possible new construction methods, it is through the different means and uses of representation that architects configure the idea and desire for the new building's iterations; representation ceases to be merely the communication of design and becomes instead an architectural manifestation as potent and valid as the built results. In some cases, as with the Italian futurists, there is no built outcome, yet the visualization of a dynamic new architecture in Sant'Elia's drawings that posited itself firmly against the historicism of the 19th century was an influential reference for modern architects. In others, as in Gehry's Guggenheim, new ways of building are directly reliant on means of representation that allow the visualization of new formal configurations. To many theorists, critics, and architects, architecture rests as much in representation as it does in the built form itself.

Differences in the means of representation are often indicative of the biases of the architecture. The importance of the plan in the works of Frank Lloyd Wright, Ludwig Mies van der Rohe, and Le Corbusier was in part what pitted modern architecture against the historicism that preceded it. The new plans proposed a radically new arrangement and delineation of rooms, but more important, positing the plan as the building's critical generator implied that its corresponding elevation, or what the building might look like, was directly borne out of it and not arbitrarily applied as one might have applied architectural styles in the 19th century. The elevation regained importance later in the Postmodern architecture of Robert Venturi, Michael Graves, Charles Moore, Robert Stern, and others, whose designs relied substantially on the representation of architectural signs and languages. Reacting against simplistic interpretations of modern architecture principles after World War II, they imbued their work with allusive, recognizable imagery and symbolism, calling on and reinterpreting classical or vernacular forms. Although plans and elevations are two-dimensional drawings, architects see their three-dimensional buildings through them.

In their 1978 classic, *Collage City,* Colin Rowe and Fred Koetter used not a particular drawing but rather a manner of making as a metaphor for an urban-planning idea. As modern architecture developed in the first decades of the 20th century, the Cubists probed the nature of painting and two-dimensional representation by breaking with perspectival conventions in place since the Renaissance. Instead, they created innovative paintings that simultaneously represented three dimensions and called attention to the two-dimensionality of the canvas. One work by Picasso, *Still Life with Chair Caning* (1911–12), was used in the book to illustrate a composite approach to the design of urban environments. Rowe and Koetter proposed treating the found urban fabric minutiae of old cities and the newly made sweeping urban-renewal schemes of modern architecture as the colliding pieces with which to compose a multivalent collage city, much like Picasso had used the found-chair-caning print and applied paint strokes to make a harmonious composition. There is wit, they argued, in finding linkages between two seemingly unlike pieces by virtue of their carefully orchestrated adjacency, and collage was proposed as a way of thinking in the design of architecture and cities. A comparison to painting also calls attention to the dual nature of cities as two-dimensional entities as seen from airplanes and on architects' boards and as three-dimensional environments.

The ability to think about a building through its representation does not end at its construction. Photography, as it represents and conjures architecture, offers additional ways to understand and interpret built forms, and this ultimately affects one's understanding of it. The early acknowledged master in the eloquent use of photography to convey architectural ideas is Le Corbusier, who composed the photographic representations of his buildings as carefully as if the photographs were the buildings themselves. Since the last decades of the 20th century, the dominance of glossy pictures in magazines and books as the purveyors of architecture has raised the objection of some pundits, who fear that this reliance on the photograph for one's understanding of a building is not conducive to great architecture. It is true that carefully framed photographs can raise expectations about a building not fulfilled at the site visit and that the great architectural spaces of Louis Kahn are notoriously difficult to photograph. Ultimately, however, we must remember Susan Sontag's important 1977 book, *On Photography,* in which she argues that the photograph is too malleable a medium to be merely a record of reality but that it becomes instead a reality all its own, as valid as its unmediated counterpart.

Advances in digital media have cast anew the question of what constitutes a truthful depiction of reality, architectural or otherwise. It has become increasingly facile to simulate the continuous sequence of views through an environment generated entirely in a computer. These immersive environments are reminiscent of Walt Disney in their promise of habitation, albeit mediated, in an imaginary world. Theme parks are fictions, the way in which a painting and a film are fictions or something like full-scale representations of an idealized world. They are three-dimensional theatrical sets with which one interacts as both spectator and participant. For both, their potency lies not in how closely they approximate reality but in the believability of their illusory reality. As with other forms of representation, some architecture today remains exclusively in digital form. As such, it is reduced to a system of three-dimensional coordinates inside the computer and is infinitely malleable. However, even when it becomes manifest in physical reality, the medium radically changes the nature of the architecture, as in Gehry's previously mentioned Guggenheim project, in which a direct connection between digital configurations and manufacturing processes allowed formal configurations that had proved impossible to visualize through traditional drawing methods.

MARIA SIEIRA

S*ee also* **Guggenheim Museum, Bilbao**

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RESEARCH CENTER

A research center consists of a building or complex of buildings devoted to the service of scientific inquiry that include astronomical observatories and biological, chemical, medical, and physical laboratories as well as buildings for related demands. As a modern building type, these facilities share their appearance with the institutionalization of Western science that occurred during the 17th and 18th centuries but that took a recognizable form only after the middle of the 19th century. As the value of science began to make itself felt on the progress of technology during the last half of the 19th century, and as a career in the sciences was seen as the best hope of improving the life of the common individual, distinctive buildings devoted to teaching and the development of each scientific discipline emerged.

At the beginning of the 20th century, the dominant location of research centers was to be found on university campuses. Of the various scientific disciplines, buildings for chemistry generally presented the largest capital investment and the most difficult architectural problems. Laboratory siting was commonly downwind of the campus center because of the increased production of unhealthy fumes, corrosive chemicals, water pollution, and occasional mishaps. Daylighting and natural ventilation strategies were paramount in the development of plans and building massing of which the Chandler Chemical Laboratory (1884) at Lehigh University in South Bethlehem, Pennsylvania, by Addison Hutton, was perhaps the dominant model of this period. Solid construction and excellent materials typify these facilities.

At the beginning of the 1920s, powered ventilation systems were introduced to this type. One of the first laboratories to solely employ powered systems was the Sterling Chemistry Building (1923) at Yale University in New Haven, Connecticut, by Delano and Aldrich. Located on the northern edge of the campus, the building was finished in a Collegiate Gothic style with engaged pilasters and ornamented terra-cotta chimney flues. More important, however, the building was massed as a block. Using the crawl space beneath the main floor of the building as a flue, similar to a Roman hypocaust (an underground furnace system), the building was to be continuously flushed with fresh air with a single motorized fan.

In contrast, industrial laboratories begin to appear during the 1930s and were usually sited adjacent to their manufacturing counterpart. Freed from the architecturally sensitive environment of university settings, laboratory designs were either a singly or a double-loaded corridor type and usually limited to three stories in height because of the efficiency of the mechanical systems. Their construction was typical of industrial buildings.

The most striking and progressive design of this era appeared in 1938, when Russian-born and British-educated architect Serge Chermayeff was commissioned to design a laboratory for the Dyestuff s Division of the Imperial Chemical Industries in Blackley, England. The building form was massed as a series of long, narrow fingers several hundred feet in length and roughly 24 feet in width. The form was a result of a rationalized examination of ergonomic and physical factors to achieve the maximum daylight penetration for bench-top experiments and the most effective mechanical ventilation system layout. The confidence in the mechanical system at this time permitted the laboratory ceilings to be lowered, reducing total building volume, cost, and equipment size. Fusing scientific research with a futuristic image, this is perhaps the earliest example in which the design of the building structure became a secondary consideration to the mechanical and related building systems. This new approach to laboratory design of systems first and structure second came to be the recommended approach for this building type by the end of the 1950s. Typical examples from this era include the Chemistry Laboratory (1947) of the Illinois Institute of Technology in Chicago by Mies van der Rohe and the Science and

Hysolar Research Institute, University of Stuttgart, designed by Gunter Behnisch (1987)

Pharmacy buildings (1947) at Drake University in Des Moines, Iowa, by Saarinen, Swanson and Saarinen. The form has remained a cost-effective approach into the 21st century.

Recent efforts at trying to provide an improved research facility have led to several striking laboratory designs. The Patscenter (1982) in Princeton, New Jersey, by Peter Rice of Ove Arup and Partners, resulted in a masted tensile structure supporting a rigid roof with an externally exposed mechanical system in an effort to integrate the mechanical systems with building structure and produce a clean interior environment. Similarly, the Schlumberger Cambridge Research Center (1985) in Cambridge, England, by Michael and Patty Hopkins, was based on a masted tensile structure with a Teflon-coated fabric membrane. However, relying on the use of advanced structural systems that produce a high-tech expression has not resulted in an innovation to laboratory design that has been widely accepted.

In the decade following World War II, the representational question posed by scientists to architects became the promotion of a humanistic face for science. New laboratories were expected to improve the negative social image of science that producing weapons of mass destruction had in part created. The new labs were to also provide creative environments in which scientists were encouraged to interact and remain sensitive to the larger human condition. Notable examples based on these ideas are the Richards Medical Research Center (1962) at the University of Pennsylvania in Philadelphia and the Salk Institute (1967) in La Jolla, California, both by Louis Kahn. Of the two projects, however, it is the Salk Institute, with its romantic siting, full-height interstitial service spaces above each laboratory for maximized flexibility, and the originally intended housing and conference support facilities, that has proven to be an inspiring model for an institutional research community.

Although Kahn's approach proved more costly, the extra flexibility to meet changing demands is a more effective solution in the long run for medical and biochemical research centers. Prominent examples of this type are the E.R.Squibb and Sons, Inc., World Headquarters (1972) in Princeton, New Jersey, by Hellmuth, Obata and Kassabaum, which has remained the preeminent corporate research complex. Comprised of interconnected modules with labs and offices at the perimeter and support instruments at the plan core, it has become a well-accepted solution. Another excellent example of the interstitial approach arranged as an urban campus is the Fred Hutchinson Cancer Research Center (1993) in Seattle, Washington, by Zimmer Gunsul Frasca Partnership, with laboratory planner McLellan and Copenhagen, Inc. Although these designs were approached from differing architectural points of view, they managed to succeed in balancing the difficult technical, social, and representational demands that accompany this building type.

Large-scale government team research methods contributed greatly to global transformation initiated by science in the last half of the 20th century. Resulting from the lessons learned in two world wars, plus the ever-growing cost and scale of research complexity, by the end of the century research centers came to be dominated by government programs and corporate facilities. National laboratories, such as Argonne, Los Alamos, and Oak Ridge, date from World War II and are small-scale cities in their own right. Large-scale corporate research complexes, such as those of IBM, Kodak, and Microsoft, now serve every major industry. Typically removed from an industrial environment, these facilities can occur in a pastoral setting coupled to an administrative center to form a corporate headquarters that announces a global presence. The most prominent at midcentury was the General Motors Technical Center (1946–54) in Michigan by Eero Saarinen and Associates. Recent prominent examples include the Panasonic Information and Communications Systems Center (1992) in Tokyo by Nikken Sekkei, and the Max Planck Institute for Chemical Ecology and Biogeochemistry (2000) on the Beutenberg Campus in Jena, Germany, by Ottow, Marx, Bachmann. Conflicting issues of security, seclusion, and public and environmental safety versus unbounded exploration, complex technical demands, and maximum building flexibility remain key factors that impact this building and campus form.

RANDY SWANSON

S*ee also* **Hopkins, Michael and Patty (England); Kahn, Louis (United States); Saarinen, Eero (Finland); Saarinen, Eliel (Finland); Salk Institute, La Jolla, California; Schlumberger Cambridge Research Centre, England**

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RESORT HOTEL

The resort hotel is an outgrowth of its 19th-century counterparts, including the spas and seaside resorts of Great Britain and the United States and the mountain resorts of Switzerland. The importance of the natural setting makes the relationship between architecture and site a key component of resort hotel development that continues throughout the 20th century. The hotel building grouped with associated recreational facilities and out-buildings seeks to enhance the experience of natural landscape features, such as mountains and bodies of water. For instance, the Suvretta House (1912, Karl Koller) in St. Moritz, Switzerland, is closely linked to the adjacent ski slopes, while Hotel Negresco (1910–13, Edouard-Jean Niermans) in Nice, France, features water-based activities. In comparison to urban commercial hotels, resort hotel architecture emphasizes linking interior spaces with the outdoors using balconies, verandas, and courtyards. This emphasis descends from the horizontal forms and rambling porches of 19th-century resort hotels.

Otherwise, resort hotel architecture addresses many of the functional needs that other hotels do. The architect must carefully blend elegant public spaces, efficient service spaces such as kitchens and laundries, and comfortable guest rooms. With the expansion of tourism in the 20th century, many new resort hotels are constructed in places such as the Caribbean, the South Pacific, and southern and western portions of the United States, making these landscapes newly accessible to tourists traveling by bus, automobile, airplane, or train.

Improved railroad transportation during the late 19th and early 20th centuries encouraged tourism and the development of resort hotels. Railroad companies built and operated many resort hotels to encourage travel to western Canada or the southwestern United States from eastern locations. At the time, these resorts offered the only modern facilities in ruggedly beautiful locations, thereby providing a tamed adventure for travelers. These ventures could be highly profitable but also risky. Resort hotels linked to the railroads failed when newer, competing resorts opened nearby; when transportation patterns changed to favor the automobile; or when other locations became more fashionable.

With the growth of tourism in the early 20th century, particularly in the United States during the boom years of the 1920s, resort hotels became accessible to a wider economic range of guests. Many famous resorts, such as the Greenbrier in White Sulphur Springs, West Virginia, remain exclusively upper-class playgrounds, but places such as Coney Island, Atlantic City, the Poconos, and the Catskills offer resort facilities for middle- and prosperous working-class urban residents. This proliferation of resorts in the 20th century represents the expansion of leisure culture across class lines.

Resort hotels often feature eclectic and evocative design motifs to attract guests. Creative adaptations of regional motifs and historic architectural features give resort hotels a distinctive ap-pearance and sense of place. A good example is Old Faithful Inn (1902–03, Robert C.Reamer), built by the Great Northern Railway at Yellowstone National Park. Materials such as boulders, logs, and peeled branches create an oversized, romantic version of a frontier cabin combined with a Swiss alpine resort. This theme is echoed in other park structures in the West, such as the Canyon Hotel (1910–11), also designed by Reamer for Yellowstone, or the Lake McDonald Lodge (1913–14, Cutter and Malgram) in Glacier National Park, Montana. Despite the rustic motifs, these examples are full-service resort hotels dedicated to guest comfort. In each case, the hotel is situated to provide guests with spectacular views of the natural landscape.

Another noteworthy resort idiom that developed during the first half of the 20th century was a modified Spanish mode popularized by the resorts of Florida, California, and the southwestern United States. The work of architect Addison Mizner in Palm Beach and Boca Raton typifies the use of fanciful Spanish motifs to create an exotic regional look promoting Florida as a tourist destination. Mizner’s Cloister Inn (1925–26) in Boca Raton is a prime example, featuring the pale pink stucco and red-tiled roof that was typical of Florida architecture and resort landscape. A carefully asymmetrical plan arranged around a series of courtyards deliberately invokes the history and incremental development of Old World buildings.

Resort hotels in the southwestern United States and California use another variation on Spanish motifs that emphasize the plainer tradition of Spanish Colonial missions in the region. The Mission Inn (1902–03, Arthur B.Benton) in Riverside, California, is an important early example that combines artistic use of white stucco and red tile with selective copying from extant missions. Resort hotel architecture frequently promotes a romanticized sense of place for visitors while providing modern accommodations and comforts.

After the upheaval of World War II, tourism resurged in the 1950s, inspiring the construction of a new generation of resort hotels. A key figure during this period is Morris Lapidus, a set designer turned architect who created the most influential resort hotels of the 1950s. Lapidus’s Fontainebleau Hotel (1953) in Miami Beach was wildly popular among the public and criticized by the architectural profession for its hybrid of International Style and updated French Renaissance motifs. The sleek elegance of Lapidus's high-rise resort hotels influenced resort hotel design in many of the newly developing resort locations, such as Hawaii, Tahiti, Mexico, and South America. Inexpensive air travel allowed increasingly large numbers of tourists from around the world to reach faraway vacation places.

In the second half of the 20th century, the resort setting became secondary to the theatricality of the architecture itself, as signaled by Lapidus's hotels. This new trend is most evident in places such as Las Vegas and Orlando, where the location is virtually unimportant compared to the grandiose stage set of the resort hotel. The element of fantasy and play inherent in resort architecture is exaggerated as hotels using a variety of regional and historical themes coexist in their competitive efforts to attract guests. In the late 20th century, the resort hotel employs a wide variety of forms while still sharing a set of functional purposes. These trends and variations reinforce the creativity and luxury inherent to the best resort hotel development throughout the 20th century.

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S*ee also* **Disney Theme Parks; Hotel; Lapidus, Morris (United States)**

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RESTAURANT

Of all the structures, signs, and symbols that stream by the automobile window, none appears more suggestive than the orange roofs, golden arches, and smiling faces of the contemporary restaurant-scape. Here, the designs suggest, is a secret code revealing Americans' most basic desires and needs. As Americans have become more and more reliant on their automobiles, the early tendency of eating a meal of convenience in a luncheonette has grown into a consistent alternative to eating at home. Initially, though, the desire for restaurants needed no automobile.

Eat-and-run cuisine took shape following the Civil War. The Civil War encampment, the chuck wagon of the American West, and the railroad dining car each helped to introduce Americans to fast cooking and fast eating. Industrial workers, with a bit of discretionary income and very limited time, became some of the first consumers of meals—particularly lunch—at establishments called beaneries, greasy spoons, and stool lunches. By the end of the 19th century, the expansion of commercial cities into white-collar labor combined with mass transportation's creation of the commuter to further American interest in eating out. Cafeterias designed specifically for the luncher on a timetable allowed customers to move along a line while selecting from a display of daily items. Delicatessens provided sandwiches, and stores such as Woolworth's installed lunch counters.

Between 1910 and 1927, the estimated number of restaurants grew by 40 percent. In New York City, the number of eating establishments grew from 7500 in 1915 to 17,000 in 1925. Scholars suggest many factors for this change in American behavior: a greater number of men and women working a way from home, a decline in the use of domestic help to prepare meals, and Prohibition, which eliminated bars and the social life that accompanied them. There were also technological advances that facilitated this type of food preparation, including, refrigeration, shipping, storing, packing, and so forth. At this point, the propensity to eat out met its mate for the rest of the 20th century: the automobile.

As the automobile became more familiar in everyday American life after 1920, planners and developers formalized refueling stations for the human drivers. Tearooms were one of the earliest way stations designed to support family travel. The term conjured an obviously safe establishment during the era of the speakeasy. With a limited menu, based around afternoon tea, ice cream, cold drinks, and standard lunches or dinners, packaging was critical for the first time in the industry. Owners used quaint names such as Copper Kettle, Wishing Well, Pine Cone, or Silver Spring to reinforce their family image. Most often, such establishments could be found along major tourist routes to resorts. This was the model followed by one of the industry great entrepreneurs.

Beginning in 1925, Howard D.Johnson took the form of the tearoom to develop the nation's first great restaurant chain. During his family's own travels, Johnson realized that the new highways of the Northeast were almost entirely without food services for the traveler. After opening a few restaurants, Johnson expanded his operation in 1935 by permitting individual investors (called agents rather than franchisees) to build their own Howard Johnson's. The restaurants combined all the aspects of the tearoom with the first recognizable, roadside architectural form: the orange roof combined with a colonial motif. In doing so, Johnson married the familiar with striking oddity. By 1940, the chain included 125 restaurants, and Johnson had secured exclusive access to the nation's greatest expressway: the Pennsylvania Turnpike. Details from colonial architecture were used by Johnson as well as by the Dutchland Farms chain to add dignity to restaurants.

Along the highway, such restaurants loomed like a colonial mansion, often with trappings of farm or country life added as well. After World War II, Howard Johnson's and other similar restaurants would abandon colonial detail to become bastions of modernist design. In many ways, such restaurant design defines the postmodern landscape that we call the "strip."

No structure reflected the connection between modern design and eating-out like the American diner. First manufactured as lunch-cars in the early 1900s, the metal, self-contained diner could be set down and wired up almost anywhere. Offering low cost and instant gratification for purchasers, the diner quickly became a standardized form on the American roadway. This provided owners with a bit of recognition without the central control demanded from Johnson and other chains. After World War II, many diners could not compete with the newer fast-food chains. The survivors often exaggerated their Modern detail, abandoning the resemblance to a rail car for a wider form—still pre-fabricated steel—that could seat family diners. The competitors, however, were not slowing down.

From the earliest days of auto travel, food stands informally provided refreshment in rapid, accessible fashion with no thought toward image or ambience. Convenience defined such locations, though there was variation within the fast-food form. White Castle hamburgers (1921) combined the food stand with the restaurant to create a restaurant that could be put almost anywhere. Drive-in restaurants would evolve around the idea of quick service, often allowing drivers to remain in their automobile. Fast food as a concept, of course, derives specifically from Ray Kroc and the McDonald's concept that he marketed out of California (1952). Clearly the idea of providing service to automobile drivers had created an entire offshoot of the restaurant industry.

The design of such establishments quickly became part of the attraction. Most important, each of these types accentuated its contemporariness by incorporating modern design, including heavy use of glass, metal, and neon lighting. Kroc was one of the first restaurateurs to understand the importance of the physical structure. He required each franchise to duplicate the standard building design—the now-famous structure with its overhanging slanted roof, visual front, wall panels decorated in striped tile, and flanking golden arches. The form would, of course, change with consumption patterns. For instance, restaurants would eventually incorporate drive-through windows into the overall design. The standardization of such structures defined American eating patterns along the "strip" through the end of the 20th century.

Although each restaurant and shopping mall bore its own design and architecture, planners and developers synched the entire composite into a design referred to as the commercial strip. Restaurants led the way from Main Street and downtown into the suburban regions. The trend toward automobility demanded a new organization to the landscape and restaurants had already pointed toward planned areas outside of urban or town centers. Fast food became the anchor of such "strips," with McDonald's or Burger King generally acting as the first wave of commercial development. Design has followed this trend while adding a dash of the amusement park: postmodern designs such as those of Taco Bell cartoon bone fide architectural styles such as Mission to distinguish themselves from the rest of the strip. Although diners have largely been squeezed out of the market, new family dining restaurants such as TGIFridays have created a homogenized form that is somewhere between fast food and a "sit-down" restaurant. The strip is the home for each, as it is for most contemporary restaurants.

In urban areas, the restaurant landscape has continually evolved to meet the demands of changing tastes and needs. Although dining rooms for the wealthy established themselves by the middle of the 19th century, these were often luncheonettes or inns and taverns. Demographic trends (including residential patterns in ethnicity and economic class) significantly influenced the overall development of restaurants for other classes of patrons. In urban areas, restaurants, with department stores, theaters, and hotels, were made more viable and widely available by the introduction of electricity during the 1890s. Entire shopping and eating districts could now be open into the evening; most important, restaurants were no longer stifled by the limitations of midday meals or overnight patronage. This new opportunity was seized by many entrepreneurs.

Between 1910 and 1930, Americans began to consider eating out a much more viable option. Most important, many more men and women were working away from home and required the convenience of available dining. This trend coincided with a drop in available domestic helpers to assist in making meals and Prohibition, which eliminated barrooms between 1919 and 1933. This, of course, created a social void for many Americans. Finally, technological developments such as refrigeration and food packing and shipping made it much more conceivable to produce meals for many customers at once.

In the early 1900s, efforts to differentiate restaurants as well as the growing diversity of American population stimulated the growth of ethnic eateries. In urban areas, ethnic cuisine became a way of sharing cultural enclaves with patrons from other ethnic groups. For instance, Chinatowns became well defined at least partly through the restaurateur. This diversity has only grown more obvious. From barbecue pits in the Southeast and beef houses in the Great Plains to fish houses in the Pacific Northwest, regional cuisines have become a terrific indicator of cultural plurality, which the U.S. began to achieve after 1980. Although mass communications has flattened out much of the dining experience nationally, diverse opportunities in dining allow Americans in many urban areas to choose from as many as 100 different cuisines.

Although ethnicity continues to be a driving force in the distribution and selection of restaurants, other patterns are also observable in the demographics of the restaurant business. Technologies such as the automobile allowed restaurants to move outside of urban areas. This trend placed a priority on modern design elements such as signage and the use of windows, each of which suggested the streamlining trend of modern design.

BRIAN BLACK

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REVELL, VILJO GABRIEL (also Rewell) 1910–1964

Architect, Finland

When Viljo Revell was born in 1910 in the Finnish coastal town of Vaasa, his homeland was nearing the end of almost eight centuries of its being a pawn in the political and economic struggles between Sweden and Russia. The 20th century would prove to be one of Finland's most tumultuous, and the political and economic climate of the country had an irrefutable impact on the design and construction industry during the period when Viljo Revell practiced architecture.

During the Napoleonic Wars, Russia successfully invaded Finland in 1809 and to appease the Finns established the Grand Duchy of Finland, leaving intact the traditions of the subject nation. Early in the 20th century, attempts to "Russify" Finland resulted in the formation of numerous resistance movements. Furthermore, the unstable political situation in Russia and Europe indirectly deflated the resource and agrarian economy of the entire region. Even though Russia finally accorded to Finland its independence late in 1917, competing domestic interests manifested themselves in the Red and White Armies, which embarked upon a brutal, class-based civil war.

The 1920s saw the brief emergence of an architecture that responded to Finland's independence, a national romanticism characterized by a prevalence of wooden materials used in Finnish vernacular building. Classicism inspired the symmetrical floor plans and exterior elevations, as well as the building ornament—garlands, medallions, columns, and arched porticoes. However, this style was quickly superseded by the practical economies of the functionalist movement, which was evolving in continental architecture and city planning. Stressing that purpose and function should determine form, these buildings were characterized by a spartan simplicity and utilitarian decoration. By the mid-1920s, Scandinavian journals reviewed the concepts proposed by Le Corbusier, a proponent of this new design philosophy, and innovative young architects visited the Continent to see concrete examples. Admired for its vitality and honesty, its airiness, light, and soundness, functionalism appeared in Finland and Sweden during the late 1920s, just as Viljo Revell was embarking on his architectural education at Helsinki's Institute of Technology, where he studied until 1937.

Finland's slow recovery from the repercussions of World War I and the ensuing Civil War was further hampered by the effects of the depressed world economy of the 1930s. Nonetheless, Viljo Revell's first building was constructed during this period on the site of an abandoned Russian military barracks building in central Helsinki. Initially conceived in 1933 by a five-student team as a temporary bazaar structure, the design was expanded to include a bus coach station and a commercial building with a cinema, restaurants, and shops. To the astonishment of the local architectural community, the city council supported Revell's proposed new design over that of the city's own architect. The final project design for the Lasipalatsi Building (1936), or Glass Palace, was completed by a trio of students: Viljo Revell, Niilo Kokko, and Heimo Riihimäki.

The Lasipalatsi Building was definitely outside the bounds of the prevailing classically inspired or Jugend style buildings, and it initially aroused public criticism. A swath of large windows extended along the entire two-story street frontage, wrapping around the curved corners and lending to the white-plastered structure a modern quality that heralded future architectural innovations. Above the main entrance a multistoried glass wall canted out over the street. The state-of-the-art Bio-Rex Cinema was housed in a large cubic form, set well back from the street behind a one-story section with a roof terrace. The complex also contained the HOK restaurant, its 700-person capacity making it the country's largest public dining facility. Lasipalatsi was constructed according to functionalist precepts: bright and light open spaces with attention given to hygienically smooth textures of the finishing materials. Technical ingenuity was evident in the ferroconcrete structure and in the latest kitchen equipment and cinema projection systems. Brightly colored blinds controlled the sunlight, and neon lights advertised the businesses within. Artisans coordinated the interior decor with the overall building architecture. Separate from the building and to the rear, near the bus loading area, was an iconographic smokestack, clock, and light tower marking the underground heating and power plant for the complex. Designed for a ten-year life span, the Lasipalatsi Building has survived in the hub of the capital city, and it was recently restored in 1998 to reflect the structural, functional, and ideological intentions of its original designers.

The international conflict precipitated by Germany in 1939 resulted in strategically situated Finland being caught in the midst of a battle between the Soviets and Germany. Unwilling to transfer any territories to the Soviets, the Finnish mounted a valiant resistance to their invading troops along the Mannerheim Line. The resultant peace agreement in March 1940 ceded or leased substantial territory to the Soviet Union, forcing the expulsion of all Finnish occupants and land owners. In order to regain these lands, the Finnish government permitted Germany to use Finland as a military staging base for attacks on Norway and the Soviet Union. When the Soviets retaliated in June 1941, Finland felt justified in declaring war on this Western ally. Ensuing diplomatic negotiations proved fruitless, and in 1944 the Soviets regained much of the territory previously lost to Finnish and German troops.

In 1936, Revell had worked briefly in the office of Alvar Aalto, assisting with the Finnish Pavilion for the 1937 Paris International Exhibition. He then designed a small commercial building for his hometown of Vaasa, but the outbreak of war halted the construction industry until the Finnish Association of Architects established a Bureau for Reconstruction in 1942. Revell was named to head this institution, and for the next seven years his energies were devoted to conducting research into the development of standards for new construction materials and techniques, the modular systematization of buildings, and methods for prefabrication. Revell's first large-scale project did come out of this era, nonetheless. The Romantic style of his vocational school for the Liperi Rehabilitation Centre for War Consumptives (1948) was indicative of the nostalgia that briefly developed after World War II, as Finland renounced modernism and reverted to the

Romantic Nationalism that had dominated the early decades of the century.

After entering private practice, Revell's first successful competition entry was for the Industrial Centre and Teollisuuskeskus Building, also known as the Palace Hotel (1952), overlooking the Helsinki harbor and market. Designed in collaboration with Keijo Petäjä, the Palace Hotel was one of many design projects in which Revell was quite content to share the limelight with others, even those with less experience than himself. His unprejudiced attitudes and his ability to encourage innovative design solutions became a trademark of Revell's approach to architectural practice, and because of this, he attracted young and talented newcomers to his studio.

The floor plan for the Palace Hotel forms an asymmetrical "H," with the rooms opening off corridors whose widths corresponded with anticipated circulation loads. In a Le Corbusian manner, the mass of the building was elevated on two-story-tall columns, or pilotis. Revell's logical approach to design was evident in the hotel's clearly articulated circulation patterns and floor plans. His attention to details, particularly noticeable in the fashionable Grill Restaurant, was evident throughout.

Postwar conditions had a tremendous impact on the Finnish economy, and beginning in the 1950s, the government's policy of reconciliation and declared state of neutrality saw Finland precariously balanced between the Soviet Union and Western Europe. Revell's Reconstruction Agency was just one aspect of the social-welfare system that Finland adopted to care for war survivors and to establish a thriving industrial sector in what had previously been an agricultural economy. With the 1953 Housing Production Act, the government embarked on two decades of intensive construction programs to provide subsidized housing for the over 400,000 refugees who had arrived from the Soviet territories. Severely restricted funding often resulted in sterile and boring apartment blocks and row houses, suburban developments, and new towns. Occasionally, some were internationally recognized for the excellent quality of their design, but more often they became bleak dormitory villages for newly uprooted migrants, isolated far from essential services and lifestyle amenities. Revell's architectural commissions attempted to find suitable solutions for these issues, and his systematic approach enabled him to become a master of conservative, yet innovative, use of space, materials, and energy resources.

In 1952 construction began on Tapiola, the internationally admired garden-city suburb of Helsinki. Revell's office designed five standardized apartment buildings and a school during the community's first and second development phases. Typical of government-supported projects of this era, the apartment sizes were strictly limited, and whenever these were exceeded, Revell had to compensate by making other apartments even smaller. For these projects, Revell experimented with using prefabricated elements, at the time a novel application for residential construction in Finland.

Revell was also able to apply his rational approach to smaller scale housing, such as the Kärjensivu Rowhouse (1955), sited on a rocky hillside fronting a bay near Helsinki. To minimize costs and maximize comfort, he selected the row house form, putting all living spaces on the upper level and utility rooms, garage, sauna, and entrance on the ground floor. Movable partitions and modular cupboards enabled occupants to customize the interiors. Radiant floor heating provided evenly distributed warmth at minimum cost. Energy expenses were also addressed by constructing the entire wall overlooking the bay of fixed triple-glazed windows, thus creating Finland's first glass-walled building.

In conjunction with community and residential projects, Revell's office applied the systematic process to the design of several schools. The Meilahti Primary School (1953) in Helsinki was designed with Osmo Sipari. Classrooms were arrayed in a sinuous line, part of which curved protectively around an outdoor play area, sheltering the students from the winds and reflecting the sun's warmth. The school's design was adapted to the landscape, its plan being clearly separated into distinct functional modules, which along with the outdoor play areas stepped up the sloping terrain.

The postwar peace treaty negotiated between Finland and the Soviet Union also included reparations in the form of "goods in kind" to be paid to the Soviet Union until 1952, and in order to meet these obligations, Finland undertook industrial development on a massive scale. Many architectural practices designed factories with workers' accommodations, and the competition for the Hyvon-Kudeneule hosiery factory and employee housing (1955) near Hanko was won by Viljo Revell and Osmo Lappo. Primary attention was given to planning an efficient assembly process, minimizing energy consumption, and reducing operational costs. Revell specified a combination of prefabricated and cast-in-place reinforced concrete elements, as well as corrugated anodized aluminum sheets for finishing the exterior walls. To visually unify the complex, all buildings contained a limited variety of materials and structural forms. The designs of such industrial complexes were a natural expression of Revell's functional design talent.

Revell's work was not confmed to utilitarian projects, however. In 1958, he completed a private commission for the Danish-born entrepreneur and art collector Gunnar Didrichsen—a villa on the Helsinki island of Kuusisaari. Revell used the hilltop site to advantage, creating a two-story wall of triple-glazed windows overlooking the water. The flat roof with its thick parapet extended out over the window walls, but the central portion of the roof was raised, and clerestory windows let natural light flood the central portion of the house. Revell also designed the built-in furnishings and architectural hardware. In the wooded surroundings the Didrichsens installed a sculpture garden that included, at Revell's request, the Archer by Henry Moore. To house their growing art collection, a new wing was added in 1965, and the villa now functions as the Didrichsen Art Museum, Viljo Revell's architecture being a major theme.

Given the international renown of Finnish architects Alvar Aalto and Eero Saarinen and the provocative urban development projects, the outside world began to take note of this small northern country. In 1958, Revell was prompted to enter the competition for a new city hall in Toronto, Canada, and from among a field of over 500, the jury selected his proposal. Revell worked in association with the large Canadian modernist firm of John B. Parkin Associates. His design for the Toronto City Hall (1965) included two towers of unequal height rising facing each other above a multistoried plinth. Between the towers, the saucer-shaped council chamber was a discrete element supported on slender piers. The elliptically shaped floor slabs of the office towers cantilevered out from the massive rear walls, creating open floor areas that would provide maximum flexibility for interior layouts. The building group created by these three elements was fronted by an open plaza (Nathan Phillips Square) containing a large reflecting pool spanned by elliptical arches, an elevated walkway around the perimeter, and a massive rendition of Henry Moore's sculpture, the Archer. As with many publicly funded projects, the issue of cost overruns soon came to the fore, and Revell was constantly forced to compromise his unique design, even after construction was well underway. Massive columns soon interrupted the open interior spaces, the council chamber was supported on an immense concrete cylinder that overwhelmed the interior spaces below, and building finishes were frequently modified. In the view of several critics of the day, Revell's bold and innovative concept was altered to such a degree that construction of the City Hall should not have proceeded. In spite of the controversy, the Toronto City Hall became a well-loved nexus for the city's inhabitants, and as an international landmark of Modern architecture, it garnered an international reputation for Viljo Revell. Unfortunately, Revell's health seriously declined during this period, and close friends ascribed his premature death to the turmoil surrounding this project.

While living in North America, Revell designed a lakeside cottage (1960) for the H.F.Johnsons in northern Wisconsin. The cottage, with its sauna overhanging the water's edge, was built using traditional, load-bearing timber construction methods. The horizontal emphasis and open planning concepts of modernism provide a counterpoint to the natural materials.

When the World Health Organization held a competition for the design of their new Geneva Administrative Headquarters in 1960, Revell was one of the 15 architects invited to participate. The collaborative entry, submitted by Revell and three other Finnish colleagues, garnered an Honourable Mention. They adhered to modernist principles, elevating the low-rise building above a broad terrace. Recognizing that employees would be from many countries, the designers minimized the use of long, isolating office corridors. They created a triangular-shaped central volume containing an open hall, council chamber, and museum, which connected the three projecting wings.

In 1962, Revell worked on his final project submission with a team of Finnish architects and engineers. Although never constructed, the design of the office tower for Peugeot in Buenos Aires displayed an innovative use of concrete and steel technology. The competition drawings described a pedestrian plaza and massive underground parking garage at the base of the building, surmounted by a skyscraper, which was subdivided into three groups of 12 to 14 floors. Each group was separated by three-story-high concave beams spanning between tapering pairs of structural piers located at each corner of the tower. Each cluster of concrete floor slabs was supported by internal prestressed cables and exterior cable nets, suspended from the centrally located services core and the massive tie beams.

In hindsight, the architectural community has realized that Finland produced several talented designers during the postwar decades although they were, at the time, eclipsed by the greater reputations of Aalto and Saarinen. In achieving national and international recognition, Viljo Revell is considered a leader of this group. Revell did not limit his modernist ideals to a particular genre of architecture, and his designs covered the architectural spectrum from customized luxury homes to mass housing projects, industrial plants, commercial centers, and educational and institutional buildings. Revell's untimely death in midcareer terminated the ascent of a talented modern architect.

RHODA BELLAMY

S*ee also* **Aalto, Alvar (Finland); Bauhaus; Blomstedt, Aulis (Finland); Concrete;**

Helsinki, Finland; Toronto City Hall

Further Reading

Recently published English-language resources devoted to Viljo Revell are limited, so the following list includes an older survey of his work, edited by Ålander Kyösti, and still available in libraries. The more recent work, *Heroism and the Everyday, Building Finland in the 1950s,* edited by Nikula Riitta, was published as a catalogue for an exhibition describing the work of several architects whose designs contributed to the emergence of Finland's international architectural reputation—naturally, Viljo Revell is among them. Furthermore, Revell's work and the manner in which it contributed to the development of Finland is frequently discussed in general surveys of the modernist tradition in the Scandinavian countries. Such historical overviews, as well as discussions of the legacy of earlier 20th-century architectural styles, assist us in understanding the environmental context for Revell's designs and the contribution that he made toward the architectural landscape that is particular to Finland.

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REWAL, RAJ 1934–

Architect, India

Despite his rigorous education and training in modernist design aesthetics, Raj Rewal remains rooted in the culture of his native India. As Rewal himself noted, "Our generation has been trying to discover the common thread in which the fabric of Indian architecture has been woven in the past and its significance for our times."

Rewal's concern is with understanding the architectural history of India (especially of the Mughal period) and forms such as the *haveli* (or urban courtyard house) of the Rajasthan region; the attention to materials and climatic design mark each of his projects. Most of the architect's buildings have been erected in the public sector, mainly institutional complexes and low- to middle-income housing. Most of his buildings are in

New Delhi, the Indian capital, although since the 1980s he has built more widely, including outside the country.

Rewal's early project for the French Embassy Staff Residences (1967–69) reveals his preoccupation with concrete as a structural material with brick-and-stone in-fill. The clustering of the lowrise units and their orientation to the sun and wind are a proto-type for his later, larger housing schemes. This is taken to much greater heights in his Permanent Exhibition Complex (1970–74) at Delhi's trade fairgrounds, consisting of the Hall of Nations and the Hall of Industries—large single-volume spaces—the largest of which spans 78 meters and is 34 meters high. The structures are articulated as precast-concrete space frames. This experimentation, with the engineer Mahendra Raj, translates the use of steel and concrete, adapting the technology for local conditions and labor-intensive building skills.

Rewal's consistent use of concrete structure with block in-fill, usually clad in the beige and red sandstone used in many historic buildings, gives his architecture a signature quality. The sense of stability and mass in his works are, to some extent, offset by their verticality and cantilevering of forms, as is evident in his office building, Engineers India House (1979–83) and Standing Conference of Public Enterprises (SCOPE) office building (1980–89), both in New Delhi. In the latter project, the fragmentation of volumes and the series of interlocking polygonal structures with their deep recessed opening and sunscreens help to modulate his "metabolic Brutalism." This form of expression was continually refined until he produced his elegant World Bank Building (1993), built around a central square courtyard.

In another of Rewal's preoccupations—that of housing—he tries, usually successfully, to reconcile a rationalist sense of function, structure, and fabrication with typologies abstracted from the past. His Sheikh Serai Housing (1970–82), with its cruciform site plan and large central public square connected by pathways, keeps parking in central areas surrounded by housing clusters. The notion of pedestrian streets and the grouping of low-rise units was further developed in the elegant Asian Games Village (1980–82). Comprised of 500 units, the Village is clustered in groups around courtyards, separated by "gateways" and connected internally by a series of open spaces and paths reserved for pedestrians. It provides an insight into his strategy for dense low-rise (up to four stories) development.

Rewal's notion of the "living unit" as a combination of indoor and outdoor flexible space and patterns of growth that can be multiplied in numerous combinations is taken to new heights in his CIDCO mass-housing scheme (of which 1048 units were built by 2000) in Belapur, New Mumbai, as part of a much larger settlement. The units (each an average of 40 square meters) on a site of 19 acres achieve a density of 55 units per acre. The units are organized in seven neighborhoods, each defined by a system of peripheral roads built along contours of the site. Here, as in all his works, Rewal's attention to open landscaped (planted and hard) areas is an integral part of his conception of space and movement through the project.

Rewal is perhaps best known for his institutional projects. These complexes respond to the hot, dry climate and urban environment, providing interlocking spaces, streets, pavilions, terraces, and gardens surrounded by buildings. As the architectural critic Razia Grover noted," [They] are meshed in a system that responds to climate as well as the pragmatic requirements of each scheme." For example, the National Institute of Immunology (1983–90) uses the rocky site and central courtyard around which to organize the building. Again in the Central Institute of Educational Technology (CIET; 1986–89), the courtyard generates the spatial complexity of the building.

With the Parliament Library (1989–2001) and the World Bank Building (1990–93), both in New Delhi, and the Ismaili Centre in Lisbon, there is a shift in Rewal's architecture to a concern with what one might term a "symbolic ethos" that reflects the essence of culture in building. Rewal's term for this is *rasa* (literally, "the juice of the core"). The Library, won through a major competition, forms part of Lutyn's Capitol Complex in Delhi. In response to the built surroundings and the climate, the building is essentially depressed under a plaza forming its roof, with parts visible above this plane. This formal contextual gesture is a success. The World Bank also reveals a similar introspective stance and attention to detail with a resolution seldom found in contemporary Indian buildings. This synthesis of classicism with modern sensibilities evokes a feeling that the architect has been able to draw on what the anthropologist Claude Lévi-Strauss called the "deep structure" of society without having to resort to using imagery of the past.

A departure from Rewal's more familiar imagery, materials, and technology was made in a social and religious complex, the Lisbon Ismaili Center (1995–99). The garden court is surrounded by an expressive steel structure, clad in stone, marble, and more steel, in a more fragmented and Western version of his buildings in India. Here, too, there is a concerted effort to come to terms with the local climate, culture, and built environment.

The vocabulary of interlocking spaces, expression of structure, use of materials and technology, attention to detail, and craftsmanship define the contemporary sensibility that identifies Rewal's buildings as his work. His work is like a tectonic puzzle that, once solved, reveals the nature and essence of time and place to the people who experience it.

HANSAN U.KHAN

Biography

Born in Hoshiarpur in the Punjab, India, 1934; studied architecture in New Delhi (1951–54) and Brixton School of Building (1955–61) in London. Worked in Paris for Michel Ecochard (1962–64); married in 1962; returned to New Delhi to set up his own practice (1964–72). Opened a second office in Tehran,

Central Institute of Educational Technology, Main courtyard for open-air studios and performances (1987)

Photo by Ram Rahman © Aga Khan Award for Architecture

Iran (1974); in 1985 founded the Architectural Research Cell with Ram Sharma; curated "The Traditional Architecture of India" for Festival of India, Paris (1986). Received the Gold Medal of the Indian Institute of Architects and the Sir Robert Mathew Award from the Commonwealth Association of Architects (both in 1989); awarded by the Indian Institute of Engineers for the Housing at Belapur, Mumbai, and the J.-K. Trust's Great Masters Award for Lifetime Contribution to Architecture in the Post-independence Era (1995). Associate of the Royal Institute of British Architecture (RIBA), Indian Institute of Architects (IIA); made an Honorary Member of the Mexican Association of Architects (1993). Lives and works in New Delhi.

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RICOLA STORAGE BUILDING, LAUFEN, SWITZERLAND

Designed by Herzog and de Meuron, completed 1987

Designed and constructed in 1986–87, the Ricola Storage Building in Laufen, Switzerland, is an important example of Jacques Herzog and Pierre de Meuron's architectural work. Their effect has been felt by theoreticians and practitioners in equal measure, in large part because of the essential idea that lies behind the Herzog and de Meuron's views on the discipline of architecture. This idea, what the architects refer to as *Architektur Denkform,* supports the notion that the discipline of architecture cannot be split neatly into the two poles of theory and practice but is instead based on the recognition that architecture constitutes a seamless whole in which theory and practice are reconciled and inclusive of each other. This approach is an idea that translates roughly as "architecture as built thought," "architecture as a form of thought," or, even more reductively, "architecture as thought." This approach is consistent with a long-standing search for alternatives to Enlightenment ideals in architecture, a search that in the 20th century resulted in the adaptation of phenomenological ideals to architecture-philosophical ideals that Herzog and De Meuron, in both building and codifying their idea of *Architektur Denkform,* attempt to carry to a logical conclusion in works such as the Ricola Storage Building.

The Storage Building, an addition to Ricola's existing administrative and factory offices, is located in a former limestone quarry and functions as the area for products and materials used in the manufacture of herbal sweets. Like many of Herzog and De Meuron's projects, the circumstances and conditions of the site and program provide the initial foundation for the architectural idea, an idea that is quickly modified according to a suggested use of materials, structure, and the mechanics of the construction process. As a result, the building is understood as "a part of the sequence of events, of a dynamic process and not a static one" (Wang, 1992). Site and program, coupled with materials, structure, and constructional means, provide the visual and intellectual organization.

The final result is an exceptionally rigorous project that, although encapsulating the architects' highly reflexive approach to architecture, deserves further elaboration. The Storage Building is constructed of simple building components: a steel-frame structure surrounded by a cladding assembly. The external envelope comprises a system of interwoven horizontal and vertical elements made of wooden battens, wood-cement *(Eternit)* panels, and sheet metal. In maintaining the identity of each component part, the building details express the nature and process of construction, exposing the "thinking" of the building process. The *Eternit panels,* their width expanding as they ascend the facade, are largest at the top of the cladding system. Furthering the sense of identity accorded each building component, each vertical member is supported by numerous individual foundations. A kind of "constructed parapet," the cantilevering timber construction projecting from the top, serves to expose the building's internal constructional system, thereby suggesting the qualities associated with an assemblage.

Accordingly, the building's internal system, a galvanized sheet-metal box that serves as an inner liner or container, is again revealed externally on the inner facade at the connection to the original administration building, where it is detailed with extraordinary precision. According to Wang, the use of exposed timber construction, coupled with the delineated exposure of the cladding materials, "enables visual references to the stacking of sawn timber boards around the numerous saw mills in the area as well as to the limestone quarry in which the building sits." Thus, the building is known for only what it is: a building for storage. Herzog and De Meuron's recognition of the mechanics of the building's construction as a significant aspect of the architectural form—enunciated by the formal and material nature of the various systems—creates a woven tapestry of resonating, highly reflexive relationships. These relationships, arrayed through the multiple elements provided by the processes and materials of site, construction, function (use), and materials, embody a "unified field theory of architecture," a Zenlike restfulness.

Herzog and De Meuron consistently abide by their self-described ideology of *Architektur Denkform* in all aspects of their architectural production, a conceptual apparatus that deserves further explanation. Unlike traditional methods of design, the architects do not begin with a formal idea (what is sometimes referred to as a *parti* or, in contemporary terms, diagram); rather, the "beginning" of architecture is actually a series of beginnings, each re-informing the others in turn. By revealing particular facets of design, the mixed media record of sketches, drawings, photographs, and models assume a heightened level of importance as well, as much for the results yielded by the various techniques as for the information gathered for further study. Hence, the elements of design and building, garnered through the activity of design process, are not isolated from other components of the building process; rather, they act as equivalent elements within a field of elements, all of which are informed and adjusted by their consequent relations to one another. As has been the case with most if not all of their architectural projects over the past two decades, *Architektur Denkform* aptly describes Herzog and De Meuron's approach to the design and construction of the Ricola Storage Building. Decisions regarding the use of materials and structure, the means of construction, and the circumstances of the project's siting provide the complex primary ground for the design, a process that bears all of the building's attributes at all stages of the design process. "Materialized thought," the resulting architecture is a constructed gestalt, a unified entity or work of art that requires no explanation other than or beyond itself.

ELIZABETH BURNS GAMARD

S*ee also* **Factory; Herzog, Jacques, and Pierre de Meuron (Switzerland)**

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RIETVELD, GERRIT THOMAS 1888–1964

Architect and furniture designer, the Netherlands

Gerrit Thomas Rietveld was a prolific designer of furniture and architecture whose two most famous works, the Red-Blue Chair (1918) and the Schröder-Schräder House (1924), are considered icons of early modern architecture and design. Rietveld's career spanned more than 40 years and included numerous designs for buildings and furniture as well as a number of published articles. An important figure in the De Stijl movement, Rietveld was concerned primarily with the experience of architectural space. Through the articulation of component parts, scale, and structure, he created designs that, although not monumental, provided a setting that elevated the life of the occupant.

Born on 24 June 1888 in Utrecht, Rietveld left school at age 11 to work in his father's furniture maker's shop. He left his father's shop in 1906 to work as a draftsman in the jewelry studio of C.J.Begeer in Utrecht, simultaneously pursuing architecture and drawing courses in the evening. In 1911, Rietveld established his own furniture maker's shop in Utrecht and continued his evening architectural studies under the architect P.Houtzagers. During this time, he designed several shops and a collection of furniture commissioned by H.G.J.Schelling, an architect for Dutch Rail.

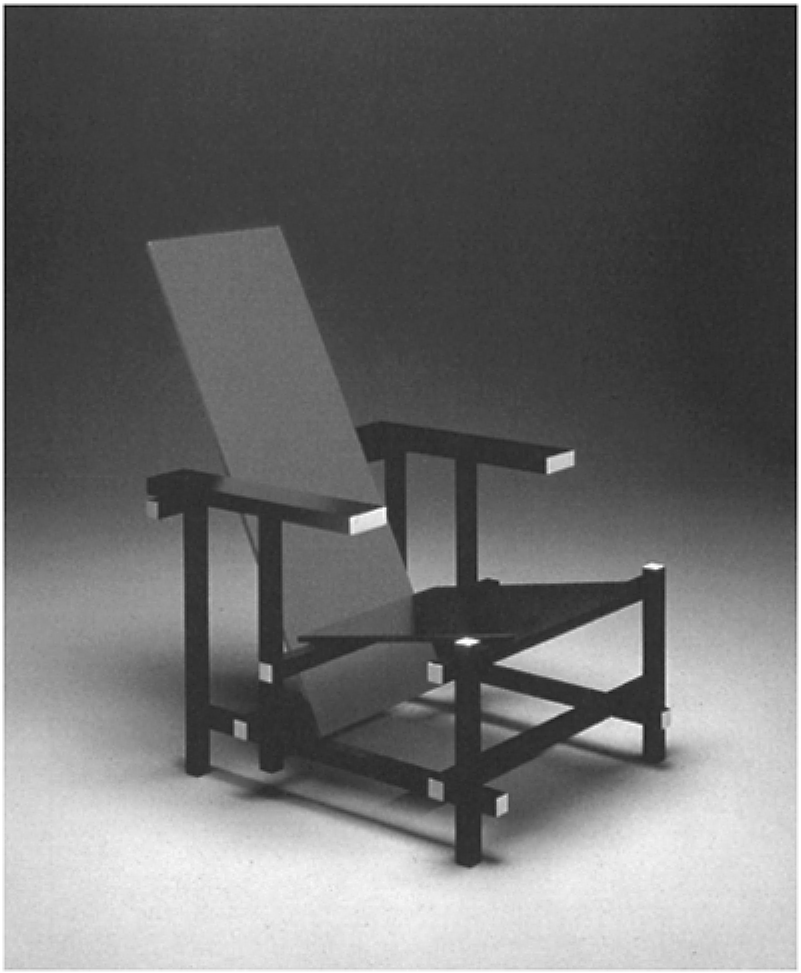
The first design for which Rietveld received recognition was the Red-Blue Chair. Originally of unfinished wood, Rietveld added the color to articulate the individual components. Two planes set at an angle to each other create the seat and back and rest on a composition of horizontal and vertical rails. Extension of the wooden rails and planes beyond their intersection points accents the open quality of the composition. An early version of the chair had side panels that were later removed to create a greater feeling of openness. The cross section of the rail, emphasized with the bright yellow paint, establishes a modular system for the chair. The Red-Blue Chair was followed by other pieces of furniture, including a buffet, in a similar style of horizontal and vertical rails.

In 1921, Truus Schröder-Schräder commissioned Rietveld to design a study in the house she shared with her husband and three children. This small commission was the beginning of a collaboration and friendship that continued for many years and resulted in his most famous design: the Schröder-Schräder House. Considered to be the preeminent architectural manifestation of the De Stijl movement, the house is the creation of a total living environment based on Mrs. Schröder-Schräder's ideas about modern living and Rietveld's spatial explorations. Rietveld saw in De Stijl an alignment with his own interest in the study of new definition of architectural space. Both the Red-Blue Chair and the Schröder-Schräder House were prominently featured in the publication *De Stijl,* edited by Theo van Doesburg.

In 1928, Rietveld was a founding member of the first CIAM (Congrès Internationaux d'Architecture Moderne) in Switzerland and was a deputy delegate in the 1930 CIAM in Frankfurt with Mart Stam. Rietveld's interest in modernism included the role of industrialization and mass production in architecture and design. In 1929, he proposed the "core" house in which vertical circulation, plumbing, and heating were condensed into a prefabricated core around which the house would be built. Presented in a 1929 exhibition in Utrecht, the concept was well received, but none was ever built. Rietveld designed a number of housing projects, many in conjunction with Truus Schröder-Schräder, including a series of row houses across from the Schröder-Schräder House. In 1930, Rietveld designed, on invitation, five row houses for the 1930–32 Werkbund Siedlung in Vienna.

This interest in industrialization can also be seen in a series of designs for economical furniture by Rietveld and produced by Metz & Co. These included a line of "crate" furniture (1934), easily assembled from precut parts, and the famous Zig-Zag Chair (1934), a single bent plane of wood. Industrialization for Rietveld provided a means by which good design could be made accessible as well as having the ability to eliminate the repetition of tasks required in hand production. Although economy was key in terms of both cost and manufacture, Rietveld was equally concerned with the function and flexibility of an item.

Despite his early successes, however, it was not until the 1950s that Rietveld began to receive larger commissions. Prior to that time, he had produced small commercial and residential designs, some in a distinctly vernacular character. In 1954, Rietveld received the commission for the Netherlands Pavilion for the Venice Biennale, where he used the architecture to create a distinct yet subdued exhibition space through the integration of natural light. Also in 1954, and initially intended as a temporary



Gerrit T.Rietveld, Red and Blue Armchair, designed 1918

structure, was the Sonsbeek Pavilion in Arnhem, which was later reconstructed in Otterlo. As in the Schröder-Schräder House, Rietveld explored the layering of spaces through the dissolution of boundaries. The Pavilion is a composition of seemingly independent horizontal and vertical planes creating a series of spaces that are simultaneously redefined by glass walls. Rietveld manipulated economical materials, such as concrete block stacked on its side so that the holes are visible, wood, and glass, to create an interpenetration of space similar to the work of Mies van der Rohe's Barcelona Pavilion.

Rietveld began designs for two prominent art academies, as well as for the De Ploeg

Textile Factory (1956), that exemplify his later works. In 1961, he entered into a successful partnership with the architects Johan van Dillen and Johan van Tricht and received a number of larger commissions, some of which, such as the Rijksmuseum Vincent van Gogh (1963–72) in Amsterdam, were completed by the partners after Rietveld's death.

Rietveld received a number of awards and honors during his life, including the Crown Order of Belgium, the Order of Oranje-Nassau, and the Sikkens Prize. He was recognized by his peers with the Bond van Netherlandse Architecten and an honorary degree from the Technische Hogeschool in Delft. Although Rietveld did ultimately receive recognition for his contribution to modern architecture, no single other work was to have the impact of his early designs: the Red-Blue Chair and the Schröder-Schräder House.

KATHERINE WHEELER BORUM

Biography

Born in Utrecht, 24 June 1888; son of a cabinetmaker. Studied drawing at the Municipal Evening School, Utrecht 1906–08; studied architectural drawing with P.Houtzagers, Utrecht 1908–11; studied architecture with P.J.Klaarhamer, Utrecht 1911–15. Worked in father's business, Utrecht 1899–1906; draftsman, C.J.Begeer's Jewelry Studio, Utrecht 1906–11. In private practice as a cabinetmaker, Utrecht 1911–19; private architectural practice, Utrecht 1919–60; collaborated with Mrs. Truus Schröder-Schräder, Utrecht from 1921; partner, Rietveld, van Dillen, and van Tricht from 1960. Instructor in industrial and architectural design, Academie voor Bëeldende Kunsten, Rotterdam and the Hague and the Academie voor Baukunst, Amsterdam 1942–58. Member, De Stijl 1919–31; founding member, CIAM 1928; Dutch delegate, CIAM conference, Frankfurt 1929; honorary member, Bond van Nederlandse Architecten 1963. Died in Utrecht, 25 June 1964.

Selected Works

Red-Blue Chair, 1918

C.Begeer Shop, Utrecht, 1920

Hartog House Interior, Maarssen, 1920

Hanging Lamp, 1920

G.Z.C. Jewelry Store, Amsterdam, 1922

Berlin Chair, 1923

Wessels Shop, Utrecht, 1924

Schröder-Schräder House, Utrecht, 1924

Van Huffel Chemist's Shop, The Hague, 1924

P.Ketting Study, Interior, Utrecht, 1925

Dr. Muller Nursery, Utrecht, 1925

Dr. Harenstein Living Room, Interior (with Truus Schröder-Schräder), Amsterdam, 1926

Weteringschans Bedroom, Interior (with Truus Schröder-Schräder), Amsterdam, 1926
Lommen House, Wassenaar, 1927
Birza House Interiors, Utrecht (with Truus Schröder-Schräder), 1927
Normaal Housing (with Truus Schröder-Schräder), 1927
One-Piece Moulded Chair, 1927
Garage and Chauffeur's Quarters, Utrecht, 1928
Zaudy Shop, Weisel, Germany, 1928
Klep House, Breda, 1931
Row Houses, Werkbund Seidlung, Vienna, 1932
Row Houses, Robert Schumannstraat, Utrecht, 1932
House and Music School, Zeist, 1932
Metz and Company Shop, The Hague (with W. Penaat), 1933
Row Houses, Erasmuslaan (with Truus Schröder-Schräder), 1934
Szekley House, Santpoort, 1934
Zig-Zag Chair, 1934
Hondius Crone House Interiors, Bloemendaal, 1935
Hillebrand House, Blaricum, 1935
Vreeburg Cinema, Utrecht (with Truus Schröder-Schräder), 1936
Smedes House, Den Dolder, 1936
Mees House, The Hague, 1936
Hypothecair Crediet Bank, The Hague, 1939
Brandt-Corstius Vacation House, Petten, 1939
Verrijn-Stuart Summer House, Breukelerveen, 1941 One-Piece Stamped Chair, 1942
Smit House, Kinderdijk (unbuilt), 1949
Van Ommeren House, Elst, 1949
Stoop House, Velp, 1951
Home for Children, Curacao, 1951
Klausen House, Den Dolder, 1952
Bicycle Shed, 1953
Netherlands Pavilion, Biennale, Venice, 1954
Sonsbeek Park Sculpture Pavilion, Arnhem, 1954; rebuilt Otterlo, 1965
Van Ravensteijn-Hintzen House, Laren, 1954
Driessen House, Arnhem, 1954
Juliana Hall and Entrance, Trade Fair, Utrecht, 1956
Visser House, Bergeyk (with H.Schröder), 1956
De Ploeg Textile Factory, Bergeyk, Netherlands, 1956
Blaha House, Best, 1957 Housing, Hoograven (with H.Schröder and van Grunsven), 1957
Van Daalen House, Bergeyk, 1957
UNESCO Press Room, Paris, 1957
Schrale Breton Offices, Zwolle, 1958
Gerrit Reitveld Exhibition at the Centraal Museum, Utrecht, 1958
Housing, Utrecht, 1959
Van Doel House, Ilpendam, 1959
Ket Shop, Leeuwarden, 1959

Gemeentelijk Lyceum School, Doetinchem (with van Tricht), 1959
De Zonnehof Exhibition Hall, Amersfoort, 1960
Koot House, The Hague, 1960
Design Center Showroom, Amsterdam, 1962
Mado Shop, Utrecht, 1963
Academie voor Beeldende Kunst, Arnhem, 1963
Van Sloobe House, Heerlen, 1964
Miners' Housing, Limburg, 1964
Primary School, Badhoevedorp, 1964
Savings Bank, Dedemsvaart, 1965
Church, Uithoorn (with van Tricht), 1965
Hoofdorp Cemetery Auditorium, 1966
Steltman Jewelery Shop Interior, The Hague, 1967
Engelhard House, Amstelveen, 1967
Instituut voor Kunstnijverheidsonderwijs (now known as Gerrit Rietveld Academy), Amsterdam, 1968
Rijksmuseum Vincent van Gogh, Amsterdam, 1972
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RIO DE JANEIRO, BRAZIL

The city of Rio de Janeiro was founded on the margins of Guanabara Bay in 1556 and remained a small village until the 17th century, when it developed into an important commercial port. In 1763, Rio became the capital of Brazil, and in 1808 it was named the capital of the whole Portuguese Empire when the king and the nobility moved there, fleeing Napoleon. The city remained the capital of the Brazilian Empire after independence in 1822 and entered the 20th century as the capital of the Brazilian Republic (proclaimed in 1889) until the federal government moved to Brasilia in 1960. From 1930 to 1960, Rio was the core of Brazilian modernism while *carioca* (native of Rio) architects reshaped the whole country. Fortunately, inspired by the fantastic natural beauty of the city, this generation of modernist architects was able to give Rio some of the finest buildings of the 20th century.

Brazilians entered the 20th century under strong influence of positivism and sanitary engineering, and the city of Rio de Janeiro, being the capital of the republic and the intellectual center of the country, was dominated by such ideas. The republic adopted French eclecticism as the appropriate language to affirm its power and convey technological advancement. The 1900s would be marked in Rio by the urban reformations of Pereira Passos, with avenues being opened and slums being displaced with civic buildings in French neoclassical style taking their place (Teatro Nacional, 1906). A few years later, another plan by French urbanist Alfred Agache (1927) would be the structure for Rio's main transformations of the first half of the century. Still, in the second decade of the century, Rio would experiment with issues of local identity and their relationship to interna-tional images, with the arrival of Art Deco on one hand and the development of neo-Colonial styles on the other. The Deco tradition left landmarks such as the Cristo Redentor statue over Corcovado hill, and the neo-Colonial movement, led by José Mariano Filho, would battle against the modernist avant-garde ideas throughout the 1920s and 1930s. In 1929, the high points of this debate would be a series of conferences by Le Corbusier when, visiting Rio for the first time, he produced the famous sketches of an elevated highway along the shore.

In 1930, in what would be one of the key moments of Brazilian architecture, Lúcio Costa was named director of Rio's ENBA (National School of Beaux-Arts). As soon as he was named, Costa began a radical reformation of the art and architecture curriculum, based on the Bauhaus pedagogy and Le Corbusier's ideas. The strong reaction against these proposed changes led to Costa's substitution, but the ideas that he installed flourished with a generation of students known later as the *carioca* school: Oscar Niemeyer, Roberto Burle Marx, Affonso Raidy, Jorge Moreira, Milton Roberto, and Luis Nunes, among others.

Also in the 1930s, young architects such as the Roberto brothers (Milton and Marcelo) built the ABI building (Brazilian Press Association headquarters, 1935) and the Santos Dumont Airport (completed 1944). Atílio Correa Lima designed the Seaplane station (1940), and Niemeyer designed a nursery (Obra do Berço, 1937) and his own house (1939) at Lagoa.

In 1936, Le Corbusier was invited as a supportive consultant for the team of architects commissioned to design the new building for the Brazilian Ministry of Education and Health (MES). The invitation of Le Corbusier served as a support for canceling the previous competition, as the government considered the winning design incompatible with the modern image that they were trying to establish. The MES building would inspire a whole generation of young architects and artists with the murals by Candido Portinari, sculptures by Bruno Giorgi, and gardens by Burle Marx around the architecture developed by Lucio Costa, Carlos Leão, Jorge Moreira, and Oscar Niemeyer, all a result of Le Corbusier's visit.

During the 1940s, many important modernist buildings were developed and designed by the *carioca* generation. The Roberto brothers were using precast concrete in industrial projects, Niemeyer designed the Boavista Bank (1946), and Jorge Moreira was designing the University Campus at Ilha do Fundão (1949). Meanwhile, Afonso Reidy completed the Pedregulho residential complex (1947), a curvilinear apartment building that reflected the terrain's contours.

The architecture of the 1950s is still considered a high point in Brazilian modernism. For example, Affonso Raidy's Museum of Modern Art (1952) is an exposed-concrete structure disposed horizontally at the Flamengo seashore in order not to disturb the landscape. Burle Marx was responsible for the gardens that surround the museum and the whole Flamengo park shore. The 1950s would also witness fascinating buildings by Sergio Bernardes (House for Lota M.Soares and Elizabeth Bishop, 1952), Henrique Mindlin (Avenida Central building, 1957), and Francisco Bolonha (Joseph Bloch school, 1960). In a time of accelerating industrialization and urbanization, housing lies at the core of the 1950s debate and practice, led by Carmen Portinho at the municipal office. One of the best apartment buildings of this time is the Parque Guinle complex (Bristol and Caledônia buildings, 1950) by Lucio Costa.

After the 1950s boom, Rio de Janeiro would suffer with the transfer of the federal government to Brasilia in 1960. A general loss of investments and decreasing construction activities led not only to fewer buildings but also to problematic changes in the municipal codes that would allow faster construction to bring profits. The quality of the 1950s was lost, and after the military coup in 1964, few interesting buildings or projects appeared in Rio.

The military regime exiled architects such as Niemeyer and repressed schools of architecture that were a focus of cultural and political discussion on the 1960s. The 1970s experienced accelerating wealth disparity, with architecture losing its social commitment in favor of apartment buildings, hotels, and financial institutions for the wealthy classes. The Petrobras building (state oil company, 1968) by Gandelfi and Assad and the CocaCola headquarters (1972) by Edison and Edmundo Musa represent the paradigm of those times. Costly apartment buildings with security devices dominated the architectural scene at Barra da Tijuca, Lagoa, and Ipanema. The major public buildings of the military period in Rio include the State University Complex (1968) by Luis Paulo Conde and the Copacabana sidewalks (1970) by Roberto Burle Marx.

With the redemocratization of the 1980s, a series of public buildings by Oscar Niemeyer was built in Rio. The CIEPSs, a full-time school program built in modulate precast concrete, were scattered around the peripheral areas of the city, serving the needy communities. In downtown Rio, the Sambódromo, a half-mile-long open walkway for the samba schools' carnival parades, ends in a elegant plaza dominated by a sculpture designed by Niemeyer. Across the bay in Niterói, the Museum of Contemporary Art (1996) was also designed by the 90-year-old Niemeyer.

In the 1990s, an extensive project of urban design, public facilities, and renovation was put forward by architect Luis Paulo Conde, first as municipal secretary of urbanism (1992–96) and then as mayor (1996–2000). Rio Cidade (downtown urban design renovations) and Favela-bairro (improvements and infrastructure at the shanty hills) are among the successful cases of good architecture serving the public at the end of the century, reshaping and improving the already astonishing landscape of Rio de Janeiro.

FERNANDO LARA

See also **Bò Bardi, Lina (Brazil); Brasilia, Brazil; Brazil; Burle Marx, Roberto (Brazil); Costa, Lúcio (Brazil); Favela;** Nie**meyer, Oscar (Brazil); Pampulha Buildings, Belo Horizonte, Brazil**

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RIYADH, SAUDI ARABIA

The city of Riyadh (plural of *rawdhah,* oasis) was founded on the ruins of several communities around 1740. Although it was chosen as the capital of the second Saudi state in 1824, it came to prominence only after its independent governor, Abdulaziz Al-Saud, began a campaign to consolidate modern Saudi Arabia in 1902. The speed and scale of Riyadh's transformation since, particularly during the 1970s, has had few parallels. From a walled city of less than 1 square kilometer in 1920, it has grown into a sprawling modern capital of 1,500 square kilometers. Its population has increased from an estimated 14,000 in 1902, to 666,480 in 1974, to more than 2.8 million in 1992, to an estimated 3.5 million by 1998.

The physical transformation of Riyadh began in the mid1930s with King Abdulaziz's decision to build a large palace and administrative complex two kilometers north of the existing city. Known as al-Murabba', it covered an area of 16 hectares and was linked to the town by a paved stone road. The complex was complemented in the late 1940s by a new residential quarter, al-Futah, to the west of the road, where palatial mansions were built for the king's younger sons. Abdulaziz's building program had several lasting impacts on the form of the city: it stretched its size, it set a northerly direction for its future growth, it showed that the old walls could no longer be considered a barrier to growth, and it introduced a new means of transportation—the private motor vehicle. Architecturally, the buildings of al-Murabba' relied on traditional processes, techniques, and materials adapted by local craftsmen to a new scale and new requirements. The result was a magnificent Najdi style.

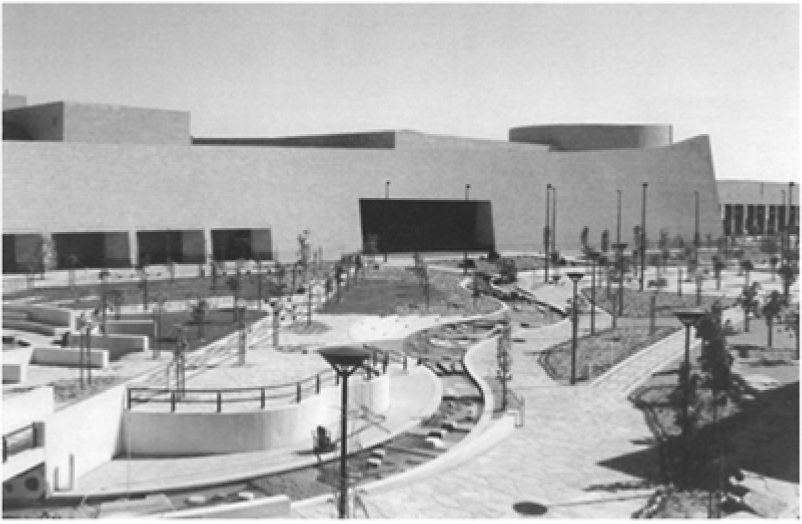
Transformation of the city continued after World War II with construction of an airport and a railway. Railroad tracks were laid between Riyadh and the Persian Gulf city of Dammam, with a station built 4 kilometers east of the old city in 1951. In 1952, a terminal building and mosque were constructed 7 kilometers north of the city at a landing strip that had been in use since 1946. In 1951, Crown Prince Saud also built a palace at the garden plot of Nasiriyyah northwest of the city. These three projects necessitated the city's first major road-building program. Nasiriyyah was linked to Murabba' Palace and the town, with a branch leading to the railway station. Another road was built connecting the airport to the city center. The early 1950s also brought the end of the old city as an intact physical entity. Its walls were removed, the old governor's palace and main mosque were rebuilt, and streets were widened to provide access for motor vehicles.

After succeeding to the throne in 1953, King Saud made three decisions directly bearing on the future of Riyadh. He transferred all government agencies from Mecca and began a program of building new ministries to the west of the airport road; he ordered construction of al-Malaz, a new suburb 4 kilometers northeast of the city, to house transferred government employees; and he expanded and rebuilt his palace at Nasiriyyah. By 1957, seven ministry buildings, designed by the Egyptian architect Sayid Krayim, were complete. Nasiriyyah had been expanded to cover 250 hectares, employing a grid pattern of boulevards, gardens, and modern structures, and al-Malaz was well on the way toward a goal of providing 750 villas, 180 apartment units, buildings for a new university, and support facilities. These projects brought new conceptions of space, street patterns, building types, and materials to the city, and together they came to be known as New Riyadh (although al-Malaz, in particular, acquired this name). Al-Malaz would have a particularly important impact because it introduced the grid as a street pattern and the villa as a house type, forms that would become pervasive in the future development not only of Riyadh but also of every city and town in Saudi Arabia.

As Riyadh continued growing through the 1950s and into the early 1960s, other neighborhoods were built, and apartment buildings appeared along al-Thumairi, al-Wazir, and al-Khazan Streets. Distinct among these were the Fahd bin Moh'd building (late 1950s), the Moh'd bin Saud building (1959), the al-Riyadh building (1960), and the Zahrat al-Riyadh building (1968). Two larger noteworthy projects were also initiated in the late 1960s. These were the Riyadh Intercontinental Hotel and Conference Center (1971) by Trevord Dannat, which avoided the faceless style typical of the time by adopting indigenous architectural elements, and the King Faisal Specialist Hospital (1974), designed by Hospital Design Partnership.

A new phase of Riyadh's urban growth arrived in the late 1960s, when the Saudi government contracted with Doxiadis Associates of Athens to prepare a master plan for the capital city. The plan, approved in 1973, called for a supergrid of boulevards 2 kilometers apart, a major commercial and civic spine extending north to south with an administrative area perpendicular to it, and residential districts extending on both sides of the spine. Among other important effects, the plan confirmed the role of the private automobile as the primary mode of transportation in the city. To implement the plan, the government created a technical committee chaired by the Riyadh governor that would later form the nucleus for the Arriyadh Development Authority (ADA). Since its inception in 1974, this government authority has guided Riyadh's development and carried out large-scale building and renovation projects in the city center, the alMurabba' district, and elsewhere in the metropolitan area.

Great changes arrived in Riyadh following the oil boom of the early 1970s, leading some critics to describe the city as the biggest construction site in human history. In terms of design excellence, three major projects stand out from the late 1970s: the General Organization for Social Insurance (GOSI) Headquarters (1978), the Saudi Arabian Monetary Agency Towers (1978), and the Saudi Fund for Development (SFD) Headquarters (1980). The GOSI Headquarters, designed by Nabil Fanous and Basim Al-Shihabi, is a graceful modern composition of interlocking Cubistic volumes reminiscent of the Boston City Hall. Its 1987 extension, also by Al-Shihabi (Omrania: Architects, Planners and Engineers), today provides a stark contrast to the original design by using reflective glass on a six-story triangular block to mirror the older building. In his design for the Saudi Arabian Monetary Agency, Minoru Yamasaki employed two massive ten-story towers, identical in structure and facade. In the SFD Headquarters, Urban Coile International took a different



King Abdulaziz Historic Center (1998), Beeah Group Consultants and Rasem Badran

approach, attempting to create a modern office building with local roots. Its use of old Diriyyah buildings as a point of reference for exterior expression and its interior arrangements around a covered courtyard have since been emulated by a number of other projects.

Distinctive projects in the 1980s included al-Khairia Center (1982) by Kenzo Tange, the Institute of Public Administration (1982) by The Architects Collaborative and M. al-Sabiq, and the King Khalid International Airport Terminal Complex (1983) by HOK. Today, the twin, triangular 14-story office towers of al-Khairia Center provide a landmark for the northern areas of the city. By choosing a cylindrical shape for the dome of the center's mosque and an elegant square column for its minaret, Tange also introduced new forms into mosque architecture. The structure of the King Khalid Terminal, located 35 kilometers north of the city, consists of four equilateral triangles arranged in a linear form, providing the shortest possible walking distance from curbside or parking to departure and arrival gates. The triangular forms also provide an ample area for security controls while allowing open space to penetrate through to the arrival floor.

Another important 1980s addition to Riyadh was King Saud University (1984), designed and engineered by HOK+4 consortium. The master plan for this 20,000-student campus by United Planner Schwanzer GMBH Vienna called for individual buildings to be compactly clustered and interconnected by a system of "spines" serving both as pedestrian "streets" on the main level and as service ways at ground level. Courtyards were used on the upper level for climate control, and windows and other openings were kept small to minimize the intrusion of harsh sunlight.

Since the mid-1980s, local architects have assumed an increasingly important role in the design of the city, and individual buildings have attempted to become more sensitive to local tradition. These trends are especially evident in the work of two local design teams: Basim Al-Shihabi of Omrania, whose most impressive projects have been Tuwaiq Palace (1985), the General Organization for Social Insurance (GOSI) Headquarters Building (1978, 1987), and the Gulf Cooperation Council Headquarters (1987); and Ali Shuaibi and Abdulrahman Al-Hussaini (of Beeah Group Consultants), particularly their designs for al-Kindi Plaza (1986). International architects have also become more responsive to local conditions. One excellent example is King Fahad International Stadium (1987) by Ain Friezer and Partners, a masterpiece of tent architecture. Another is Imam Moh'd Bin Saud Islamic University (1988). The master plan and design for this 15,000-student campus was produced by Techni Beria using a compact organic plan and a system of courtyards repeated throughout the academic buildings to provide human scale and shorten walking distances.

Especially noteworthy designs in the 1990s have included the Ministry of Interior (1992) by Mousalli, Shaker, Mandily and Archi-System, whose inverted pyramid form produced an instant landmark; the Ministry of Municipal and Rural Affairs (1995) by Zuhair Fayez, which takes the form of an oasis in the middle of the city; the Al-Jazirah Newspaper Headquarters (1995) by Suter and Suter and al-Shathri; and the King Fahad Cultural Center (1991) by Widle Plan.

Since 1974, the ADA has also undertaken a number of large-scale building and renovation projects. One of the most important has been development of the Diplomatic Quarter (DQ). A 586-hectare site was allocated for this project 8 kilometers northwest of the city center after the Saudi government decided to transfer foreign diplomatic missions from Jeddah to Riyadh in 1975.

The master plan for the DQ was by Speerplan, Regional Und Stadtplaner GMBH; its central area urban design was by Beeah of Riyadh, and the layout of its residential districts was by Farahat Tashkandi. The DQ may one day hold as many as 120 embassies and 30,000 inhabitants. Today, more than 51 embassies and more than 40 other public or service-sector projects have been completed. Many of the embassies have been designed by well-known architects from their respective countries, including the Japanese Embassy (1985) by Kenzo Tange; the Canadian Embassy (1985) by Sanky Partnership; the Tunisian Embassy (1987) by Mimita, Bin Mahmoud and Faraj; and the French Embassy (1988) by Guy Naizot. Three other DQ projects have won international awards: Al-Kindi Plaza (1986) by Beeah; DQ Landscaping (1986) by Bödeker, Boyer, Wagenfeld and Partners; and Tuwaiq Palace (1985) by Atelie Otto, Büro Happold, and Omrania.

Four other ADA initiatives have been extremely important to the overall design of the city. One was the Ministry of Foreign Affairs (1984) by Henning Larsen and its attendant Staff Housing (1983) by Speerplan Regional Und Stadtplaner GMBH and CRS (with the involvement of Ali Shuaibi as ADA adviser). This successful housing project, employing dwelling clusters around cul-de-sacs with exterior access and an auto-free recreational spine, has now been emulated in the al-Hamra neighborhood (1994) of Riyadh, in Medina, and elsewhere in Saudi Arabia.

Also important has been ADA's rebuilding of Qasr al-Hukm, the Justice Palace District, including the entire old walled city and an additional area to its west. The first redevelopment plan here was by Franco Albini (1978); the second was by Beeah (1983), subsequently revised by ADA staff. Individual building projects have included the Governorate, Municipality, and Police Department buildings (1985) by Albini; the Great Mosque and Redevelopment of the Old City Center (1992) by Rasem Badran; the al-Migliyah Commercial Center (1992); the al-Ta'meer Center-1 (2000) by Dar Al-Mimar (Abdulhalim and Badran) with Arrow, Inc., and Site International; and the Riyadh Court Complex (2000) by M.Makkiyah and Saud Consult.

Finally, ADA has recently been involved in the redevelopment of al-Murabba', known as the King Abdulaziz Historic Center (1998). The urban design for this project was by Beeah and Rasem Badran, and it has subsequently involved the renovation or new construction of a series of buildings designed by several architects. This project represents a return to the city's roots. Located on the old Murabba' site, its completion marks the centennial of the beginning of the process that led to Saudi Arabia's unification. Its high-quality urban spaces, magnificent architecture, and well-thought-out linkages of traditional and modern forms create a complementary focal point to Qasr Al-Hukm in the center of the city.

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S*ee also* **Ministry of Foreign Affairs, Riyadh, Saudi Arabia; Mosque; Saudi Arabia**

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ROADSIDE ARCHITECTURE

Roadside architecture, the bastard offspring of the automobile, had a pervasive effect on the American landscape during the 20th century. Often denounced for crassness and monotony yet irresistibly convenient to a population getting around on four wheels, roadside architecture was both the bane of the aesthetically sensitive and a boon to motorists looking for food, fuel, and lodging.

When the century opened, the automobile had been in existence just seven years, and only 8000 sputtering, self-propelled vehicles plied the streets and roads. The promise of freedom of movement proved so compelling, however, that the number of registered automobiles reached 458,000 by 1910, surpassed eight million by 1920, and exceeded 23 million by 1930. New automobile-oriented building types, such as filling stations, motels, and drive-in movie theaters, arose. Older building types, such as restaurants, banks, and grocery stores, gradually changed form.

A mere seven per cent of the nation's roads were hard surfaced by 1904, but many organizations, such as the Lincoln Highway Association, were formed in the 1910s and 1920s to lobby localities, state governments, and federal authorities to construct reliable, all-weather roads. Filling stations dispensing motor oil and gasoline were among the first automobile-oriented facilities to crop up as the roads improved. In urban districts, it was not uncommon for a two-story or taller building containing stores, offices, and apartments to be razed so that its site could be occupied by a diminutive gas station, surrounded by pavement, Chester Liebs observes in *Main Street to Miracle Mile*. The traditional urban practice of placing buildings shoulder to shoulder, right up to the sidewalk, gave way to a looser, more discontinuous pattern, with each building standing alone, farther back from the street.

Because gas stations soon invaded settled residential districts and desirable business areas, petroleum companies felt pressure in the 1910s and 1920s to design stations whose appearance would be seen as an asset rather than an eyesore. In Indianapolis in 1927, for instance, the Ohio-based Pure Oil chain introduced an English cottage-style station that skillfully drew from the romantic house designs popular at the time. Scholars such as Liebs have viewed the styles employed by roadside businesses as "sales costumes," donned with salesmanship and appeasement of popular taste in mind. John A.Jakle and Keith A.Sculle, two leading scholars of roadside architecture, have attributed much of the character of roadside architecture to the concept of "place-product-packaging," in which all the physical aspects of an enterprise, including signs, logos, uniforms, architecture, lighting, and landscaping, are part of a carefully coordinated effort to establish a strong corporate identity. The consistent identity links all the units in a chain and reassures the customers, thereby helping the chain outsell local competitors.

However, the best roadside architecture sprang not only from hardheaded marketing calculations but also from imaginative and occasionally even idealistic impulses. Pure Oil adopted the English cottage-style station not only because it would ease the station's acceptance but also because the station's architect, Carl A.Petersen, regarded the design, with its "Romantic Suburb" connotations, as the most beautiful and appropriate choice, a judgment heartily shared by the company's president, Henry M. Dawes. Similarly, when Howard Johnson was establishing his Massachusetts-based restaurant chain in the latter 1930s and early 1940s, his chief architect, Joseph G.Morgan, produced balanced, dignified compositions that far surpassed the public's usual expectations for eating along the road. Morgan adapted the traditional architecture of New England churches and town halls to the visibility requirements of highway commerce—covering the roofs of Howard Johnson's outlets with conspicuous shiny orange tiles, just as Petersen had clad Pure Oil's roofs with fade-resistant blue tiles—but he gave the buildings pleasingly set-back wings, a carefully detailed row of dormers, a deftly proportioned rooftop lantern, and other touches that bespoke a concern for quality.

Diners, which evolved from lunch wagons that first appeared in Providence, Rhode Island, in 1872, were popular-priced restaurants that for many years resembled streetcars or railroad dining cars. By the end of the 1910s, a number of manufacturers were making diners in factories and shipping them to their sites, first in urban locations, later along outlying highways. Over the years, they increasingly adopted a machine aesthetic, refined through the extensive use of stainless steel. By 1940, the streamlined diner, a striking product of American industrial design, had made its debut.

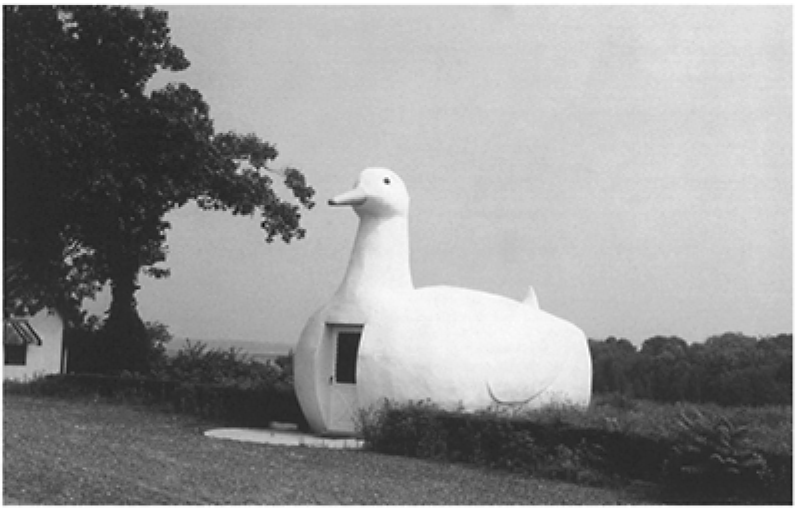
In the West, the California coffee shops of the 1940s and 1950s by Los Angeles designers such as John Lautner, Douglas Honnold, and Martin Stern wowed motorists with an energetic modernism characterized by large sculpted roofs, expansive walls of glass, and dramatic lighting effects. Some critics dismissed the coffee shops as excessively flamboyant, labeling them "googie," a put-down inspired by the Googie's restaurant that Lautner designed in West Hollywood (built in 1949). However, architectural historian Alan Hess has argued that the expressive modernism of southern California chains such as Biff's, Ship's, Norm's, and Tiny Naylor's—an approach spread nationwide in the 1950s and 1960s through designs by the Los Angeles firm of Armet and Davis for chains such as Denny's and Bob's Big Boy—represented an important instance of modernism becoming broadly popular, a kind of modernism for the common man. Because some designers of "googie," such as Lautner, produced houses and other buildings that commanded respect within the profession, Hess argued that no clear-cut boundary existed between serious architecture and many buildings that served everyday commercial purposes.

There had, of course, been a streak of amateurism and in some cases humorous literalism in some roadside buildings from the beginning of the century through the 1930s. In 1931, along Route 25 in Riverhead, New York, poultry grower Martin Maurer built "The Big Duck," a 20-foot-high, 30-foot-long structure of wood, galvanized wire, and cement, shaped to look like the Long Island Peking ducks that he sold inside it. Its eyes were taillights from a Model T Ford. Giant fish, hot dogs, teapots, chili bowls, root beer barrels, and other objects were common in the 1920s and 1930s. This was especially so in the Los Angeles area, where a Brown Derby restaurant was built in the shape of a hat in 1926, ice cream was dispensed from The Igloo beginning in 1928, the Zep Diner was built in the shape of a Zeppelin in 1930, and many other giant objects were created.

One of the most noted chains in that vein was Wigwam Villages, which began in Horse Cave, Kentucky, in 1933 and eventually grew to seven locations scattered from Orlando, Florida, to San Bernardino, California. Wigwam Villages featured lunchrooms and overnight lodging in buildings shaped like tepees.

A variety of new building types appeared as the car became central to American life. In 1933 in Camden, New Jersey, Richard M.Hollingshead, Jr., built the first drive-in theater, allowing people to watch movies while sitting in their cars. About 50 drive-in theaters were in operation throughout the country by the outbreak of World War II. After the war, their numbers grew rapidly, to more than 1700 by 1950, according to Liebs. The tall, wide tower supporting the drive-in's screen became a roadside landmark, sometimes interestingly stylized. The popularity of outdoor theaters peaked in 1958, after which came a long decline.

Drive-in restaurants started to appear in the early 1920s, beginning with the first Pig Stand drive-in, on the Dallas-Fort



"The Big Duck" (1931); originally on Route 25, Riverhead, Long Island, NY; moved in 1936 to Flanders, NY

© Philip Langdon

Worth Highway in Texas in 1921. Tray boys and tray girls, later known as carhops, brought food and beverages to customers, who ate in their cars. At many drive-ins, a canopy extended above the cars, supplying midday shade. For visual interest, the canopy could take a variety of shapes, from undulating to angular. Some drive-ins, especially in California, gained visual excitement by having a circular or octagonal central building from which a tall illuminated pylon rose. At round or octagonal drive-ins, the cars clustered, nose in, all the way around the building. Drive-ins flourished nationwide in the 1950s and began declining in the 1960s because of community reaction against their noise, trash, and rowdiness and because of growing competition from other kinds of restaurants, especially coffee shops, which were comfortable no matter what the weather, and fast-food establishments, whose self-service method got the food to the customers cheaply and more quickly.

By the 1920s, the demand for overnight lodging along the roads gave birth to the motel, which typically took the form of a continuous one-story structure with the rooms opening directly to the parking area, thereby eliminating the formal spaces and corridors associated with hotels. “Motel” was a contraction of “motor” and “hotel” and has been traced as far back as 1926, when Arthur Heineman opened the Milestone Mo-tel in San Luis Obispo, California. The generally modest buildings sometimes formed an “L” or a “C” around a central lawn or a swimming pool.

Roadside commercial buildings usually borrowed structural and stylistic ideas from other types of buildings; they were popularizers rather than pioneers. However, they were quick to adopt modern materials. The Wichita, Kansas-based White Castle System of Eating Houses in 1928 commissioned the first use of porcelain-enameled steel panels for the cladding of an entire building. The interchangeable steel panels were secured with a locking device that eliminated the use of rivets or bolts, thus making it easier to take the structure apart and move it. Superb for projecting an image of cleanliness, white porcelain-enameled panels became standard not only for the White Castle hamburger restaurants but for many companies’ gas stations in the 1940s and 1950s. The most famous gas station design using white panels on a crisp, boxlike building was Walter Dorwin Teague’s prototype for Texaco, introduced in the mid-1930s. The design integrated an office, rest rooms, and service bays into a sleek, flat-roofed structure clad in white panels that could be hosed down to restore their sparkle.

As retailers built new stores along suburban roads, they frequently used a facade with glass from floor to ceiling to put the interior on display, give a glimpse of their merchandise, and show that they were open. Although many retailers occupied stand-alone buildings, there was demand for collections of stores that could conveniently serve customers arriving by car. From this developed the shopping center, a linked series of storefronts that usually faced a parking area shared by all the center’s stores. Shopping centers, bringing architectural unity to a row of stores set back from the street, have been traced by Liebs all the way back to a development in Baltimore in 1907, when the customers came in carriages. Shopping centers proliferated in the 1920s and 1930s, serving people arriving by car. By the 1950s, these small centers were ubiquitous, and the next stage in the evolution of roadside retailing was at hand: the enclosed, inward-focused, climate-controlled shopping mall. The first complete example was the Southdale mall, designed by Victor Gruen and Associates and built in Minneapolis in 1956.

Commercial development of the American roadside periodically resulted in eruptions of hostility from a public fed up with billboards, bright lights, primary colors, and clashing architectural forms. Peter Blake’s 1964 jeremiad *God’s Own Junkyard,* which declared most highways to be “hideous scars on the face of this nation” (109), voiced repulsion at the crassness and ugliness that afflicted much of the roadside environment. Lady Bird Johnson led a campaign for roadside beautification in the mid-1960s, and municipalities increasingly used design control regulations to tranquilize roadside architecture—discouraging unusual forms, forbidding flashing lights and revolving signs, requiring landscaping, and generally insisting on a softer, more subdued look. Such regulation was rarely welcomed by avantgarde architects such as Robert Venturi, Denise Scott Brown, and Steven Izenour, whose 1972 book *Learning from Las Vegas* valiantly searched for virtue among the dross. The Big Duck, cited in *God's Own Junkyard* as an example of what is bad about roadside architecture, was celebrated by the Venturi group. However, by the 1970s the "vitality" of Las Vegas, where casinos were willing to invest in enormous outdoor displays, had little in common with most stretches of American road, which were dominated by aesthetic dullards such as McDonald's and Wendy's. The golden arches, which burst through the roof of the McDonald's prototype that Stanley C.Meston created for Richard McDonald in 1952, had been reduced to a sign and logo in front of a pseudo-mansard-roofed building that lacked the pleasurable detail and proportions exhibited by the prewar Howard Johnson's and also lacked the exuberance and spontaneity of the "googie" 1950s Big Boy.

In 1977, the Society for Commercial Archeology (SCA) was founded to document and preserve worthy examples of 20th-century commercial design, especially the nation's rapidly disappearing roadside sights. In the years since, pleas from organizations such as the SCA have averted the demolition of a number of buildings, including the oldest surviving McDonald's, which had been serving hamburgers and shakes beneath pulsating neon in Downey, California, since 1953. Roadside architecture in the final three decades of the century became soullessly formulaic. Motorists who hoped for something quirky and full of character looked to "blue highways" (minor roads, often colored blue on road maps) or sought out old thoroughfares, such as the National Road. There, remnants of history remained, testifying to the imagination of the automobile age.

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S*ee also* **Automobile; Gruen, Victor David (United States); Shopping Center; Suburban Planning**

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ROADWAY SYSTEMS

Although the road preceded the automobile, it was the invention of the motorcar that transformed meandering muddy paths into functional roadways. The first 20 years of the 20th century marked a transportation revolution that began with the automobile and that brought about a new national system of roadways. In 1905, only one in every 1078 Americans owned an automobile; by 1920, one in every 13 Americans had become proud owners of the century's most remarkable invention.

Although the automobile was a French invention dating to as early as the 1860s (witness such French words as *garage, chassis, chauffeur,* and of course, *automobile),* the North American adaptation of the motorcar in the early 20th century was distinctly non-European. Instead of expensive motorcars designed for the wealthy, American auto designers concentrated on affordable, mass-produced vehicles, such as Ransom E.Olds' 1900 horseless buggy. By 1910, more than two dozen companies were producing unpretentious low-cost vehicles, including Henry Ford's 1908 Model T. Their affordability countered the warning that Woodrow Wilson had made in 1906 when he cautioned that the popularity of the motorcar would lead to socialism by stirring dangerous envy of the rich.

As a practical vehicle for the average American, the automobile needed to be more than a curiosity for display. Its utility depended on reliable roadways. As the proud motorist ventured into the realm of travel, limited by a top speed of four miles per hour and requirements that he be preceded by a man with a red flag so as not to scare the horses, the need for improved roadways became strikingly apparent.

The first public organizations to get involved in road improvements were municipalities, many of which had grown weary of the problems of the automobile's predecessor: the horse. Horses cost cities large amounts of money to remove manure and haul away abandoned carcasses. Many municipalities welcomed the automobile as a cleaner, more trouble free alternative. Thus, the first decades of the 20th century marked a change in many cities from cobblestones to more even road surfaces, built at public expense. The cobblestones had kept horses from slipping since the Middle Ages, but for the automobile, new smooth and quiet road surfaces, such as macadam (a form of crushed stone), were required. As traffic increased, tougher surfaces were applied, such as asphalt and eventually concrete—all initiated before the 1920s.

By the middle of the 1920s, smooth road surfaces had significantly enhanced the utility of the automobile, speeding its way into the future at faster and faster speeds. Road building became a major function of local governments, which were prodded by a collection of pressure groups that included automobile manufacturing, oil companies, and tire manufacturers who lobbied intensely for new roadways. Others were also quick to see the economic dividends attached to highway building, such as real estate speculators who argued in front of city councils for new roads as a basis for increasing property tax revenues in new areas.

At a pace, new thoroughfares were built as an emblem of modernity and forward thinking. Following the lead of William K. Vanderbilt's Long Island Motor Parkway, the first limited-access thoroughfare opened in 1911, and roadways were built for higher speeds and greater efficiency. The Bronx River Parkway, in New York's Westchester County, featured limited access and landscaping when it was completed in 1923. The first thoroughfares accentuated the scenic qualities of the roadside. The use of "parkway" in their names implied their primary use for pleasure driving. The Hutchison River Parkway in 1928, the Saw Mill River Parkway in 1929, the Cross County Parkway in 1931, and the Henry Hudson Parkway along the West Side of Manhattan in 1934 all exemplified the scenic qualities of the new roadways. However, it was not long before this idea of roadways for recreation was replaced by the utility of commuter expressways.

By 1929, New Jersey began construction of a 13-mile expressway between Elizabeth and Jersey. In Boston, two new expressways were completed at opposite sides of the city. Chicago opened Wacker Drive, a new, elevated bilevel motorway that was designed for a daily commute of 60,000 vehicles. In Los Angeles, the Arroyo Silo Parkway was opened in 1940 after nearly 40 years of planning. Backed by downtown department stores, the new freeway became an instant success, but instead

Aerial view of George Washington Memorial Parkway, 1992

© Jack Boucher, Historic American Engineering Record)/Library of Congress

of funneling shoppers into the downtown area, it launched a massive suburban migration that powered the development of the nation's most elaborate freeway system.

From the beginning, public subsides advanced the development of new roadways. The Federal Road Act of 1916 founded new highway departments, and a 1921 reenactment created the Bureau of Public Roads and provided matching funds for more than 200,000 miles of roads. State gasoline taxes, starting in 1919, provided another source of road-building funds, enabling the value of highway construction projects to surpass $1 billion by 1925.

By 1943, the enormous economic potential of road building had become obvious not only to suburban land developers but also to a diverse group of oil and tire manufacturers, construction industrialists, and automobile manufacturers who united as the American Road Builders Association. Spearheaded by General Motors, the group's largest contributor, the association became exceedingly influential, second only to the munitions industry. Their influence, along with a campaign by Cold War scientists to attain "Defense Through Decentralization," led to the Interstate Highway Act of 1956, which called for a 42,000-mile system of federally funded limited-access thoroughfares at a cost of $26 billion.

The influence of the Interstate Highway Act has ranged broadly across American society, transforming it into a suburban nation. With this expansion, architects designed a range of building types suited to automobile commuters and travelers, including hotels, shopping malls, office campuses, and others. With the advent of air travel, architects designed large and distinctive airports, all linked to their nearby cities by expressways. With each completed link of the nationwide system of high-speed, limited-access roadways, the population has spread farther from abandoned urban cores to satellite cities and low-density suburbs. To be sure, other factors abetted this extraordinary migration, such as federal mortgage subsidies and home ownership tax credits, but the Interstate Highway Act paved the way. As the nation has been increasingly consumed by highways, traffic jams, and endless commutes, the conventional wisdom of highway building has been challenged. Led by numerous "freeway revolts" that began in California in the 1960s, opposition to "more and more of worse and worse" has mounted, sometimes halting highway construction projects or seriously modifying their size. Efforts to develop public transportation alternatives have increased, even in Los Angeles, where the freeway was once seen as the spine of life. Still, overall, no unanimously accepted alternative has gained precedence over the drive of highway expansion.

RICK ADAMS

S*ee also* **Automobile; Parkways; Suburban Planning; Urban Planning**

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ROBIE HOUSE

Designed by Frank Lloyd Wright; completed 1910 Chicago, Illinois

When Frederick Robie went to Frank Lloyd Wright in the winter of 1908 for a house on fashionable Woodlawn Avenue at the corner of Fifty-eighth Street in Chicago, Robie worked with his father, who among other things was a supplier of parts to the growing automobile industry. Like Wright, Robie was fascinated with the new machine and even planned to open his own automobile factory. This surely explains the three garages (and no stable) that Wright incorporated into Robie's house. Preliminary plans for Robie House were completed in November 1908, with working (or contract) drawings following in March 1909. Construction began in the spring of 1909 and ended in the early winter of 1910. The house was furnished between September 1909 and May 1910.

Because Wright turned his business over to architect Herman Von Holst in September 1909 and went to Europe for a year, completion of the house was left to Marion Mahony, long an associate of Wright, whom Von Holst had hired to complete Wright's unfinished commissions. It is likely that she designed the art glass of the house and iron gates of the auto court, as these had not been detailed before Wright left for Europe. George Niedecken, an interior architect from Milwaukee, already at work in the house before Wright's departure, continued to have furniture and furnishings made according to Wright's plans until they ran out, then designed additional furniture himself, mostly for the living room.

Wright's brick house for Frederick Robie is the most monumental of his Prairie houses having the main living space on the second floor. Although Wright wrote frequently in a rationalist vein about his distaste for dank basements and cluttered attics, his real reason for wanting to eliminate basements and attics was both visual and psychological. As a place of shelter and refuge, he felt that the home ought to be wedded visually to the earth, which to him meant relatively low structures spreading out horizontally, anchored by massive chimneys at the center and protected by overhanging hip roofs of low pitch. Typical 19th-century houses elevated above partially exposed basements with rooms Having high ceilings and crowned by massive hip or gable roofs were anathema to him. Early photographs of Robie House looking north show just such a house behind it.

Although in later years Robie thought that it was he who had inspired Wright to design for him a house with the visual and functional characteristics that mark Robie House, Wright had actually developed the design over a ten-year period for other clients with different tastes and requirements. The first house of this type was erected in Chicago in 1899 for Joseph Husser. Except for having many details of late 19th-century origin, the Husser house was remarkably like Robie House, even to having its entrance halfway down the left side, a common practice in Chicago for siting large houses on the deep but narrow lots of that city. For example, Robie House stands on a parcel 60 feet wide by 180 feet deep. The result of thus reviving for Robie House the plan of the Husser house, which was not built on a corner and had residential lots on either side of its narrow front, has been to cause both laypersons and academicians to suppose that the right side of Robie House facing on Fifty-eighth Street is actually its front rather than Woodlawn Avenue, which is its address. This confusion has fostered the myth that Wright intended when designing the house to lead the observer slowly and inevitably around the house from its Fifty-eighth Street side to the Woodlawn Avenue front, where at last he would discover the entrance door sequestered in shadow at the end of a long walk.

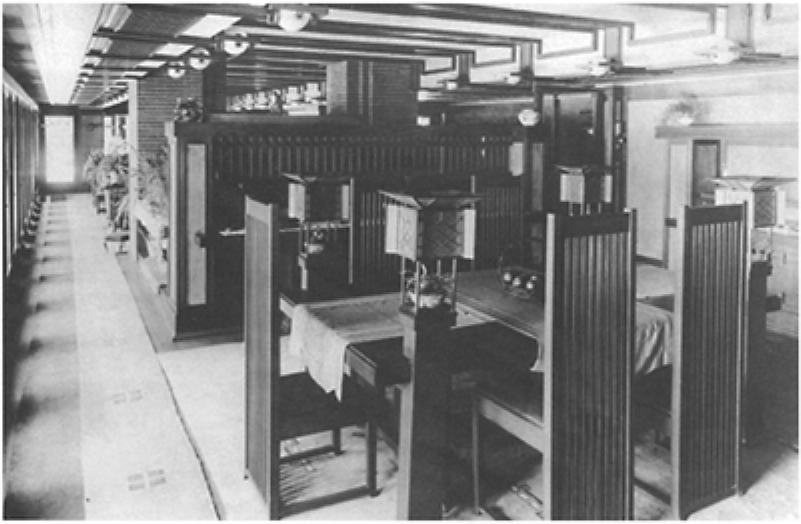
Another residence, designed in 1905 and built of stucco on frame in Riverside, Illinois, for Frederick Tomek, served as the intermediary for translating the late 19th-century forms of the Husser house into the mature Wrightian style of Robie House. In fact, Wright has stated that the Tomek house served as a model for Robie House. Originally, the entrance to the Tomek house was to have been halfway down its right side, just the reverse of the Husser and Robie houses. However, before construction began, the entrance was moved to its left side, which faced the street. Both the Tomek and the Robie house consist of a lower floor at grade with the main living floor above it. The latter is devoted primarily to a large living and dining room connected through a passageway illuminated by a continuous

Frederick C.Robie House, Chicago, designed by Frank Lloyd Wright (1910)

bank of windows, actually French doors at Robie House. The living room opens onto a porch. A partial third floor, looking something like a low tower or "belvedere," as Wright termed it, contains the bedrooms.

By 1905, when Wright designed the Tomek house, his style had become highly abstract and rectilinear in character. Almost invariably, he built his residences after 1902 of rectangular masses, piers, and panels. These were sometimes solid, as for walls and piers, and sometimes transparent, as for doors and windows, the latter always casements grouped in horizontal banks. When possible, Wright carried the geometry of the exterior into the interior, where he applied it with equal vigor to walls, piers, screens, furniture, and furnishings.

In fact, it is the slope of the hip roofs of Robie House that deny for it the logical and final next step in Wright's aesthetic development, complete rectilinearity, a goal already achieved by him through his use of the overhanging flat roof for Unity Temple and the Yahara Boat Club, both designed in 1905, and for the proposed Fireproof House of 1907. It was not until 1909, however, that Wright first built a residence in which he abandoned the hip in favor of the flat roof. This was the thoroughly rectilinear house that he erected for Laura Gale in Oak Park, Illinois. As a result, Robie House, despite its unrelenting rectilinear geometry and horizontal massing, remains a transitional work



Interior dining room, designed by Frank Lloyd Wright (1910)

along with Wright's great Coonley House of 1907 because of the dissonant angularity of its overspreading hip roofs.

Given the abstract geometry here and there in Wright's work from the Winslow house of 1894 onward, one might suppose that the European avant-garde was somehow affected by this aspect of his work. Certainly, Wright was aware of developments in Europe through European publications and from his visits to the St. Louis Exposition in 1904. Yet, except for a few European architects who passed through Chicago before 1910 and who might have returned with illustrations of Wright's work, the only important presentation of Wright's architecture did not appear until March 1908, when the *Architectural Record* featured his work. In it, Europeans would have seen the massive abstract geometries of the Larkin Building and Unity Temple along with those of the

Fireproof House. However, as Robie House was not completed until early 1910, its potential for effecting the evolution of European architecture had to wait until 1911, when it appeared in the German publications of Wright's work by Wasmuth. As a result, if Wright's abstract style did inspire European architects to move in that same direction, Robie House could not have played a part until after 1911.

Robie House does relate, however, to developments in European modernism going back to the 1890s and earlier. Certain aspects of Wright's style, especially his extensive use of casement windows, presumably derive from the English Victorian Gothic and probably more directly from the use of such windows by Voysey, Baillie Scott, and other English architects in the 1890s. Wright's continuing interest in creating artistic interiors for his houses whenever he found a pliable client with sufficient resources and in the art furniture with which he furnished those houses also surely goes back to the English Arts and Crafts movement of the 1860s to 1890s. That Wright also sought to devise a style of his own, one no longer derived from the historic styles, also served to align him with Europe's avant-garde architects.

Unfortunately, Robie got to live in his house for little more than a year. His wife left him in April 1911, and he sold the house to another family in December of that year. After the new owner died suddenly in 1912, the house passed to a third family, who occupied it until 1926, when they sold it to the Chicago Theological Seminary for use as a dormitory. In 1957, a preservation battle erupted when the seminary proposed demolishing the house. Fortunately, Robie House was saved by developer William Zeckendorf and eventually became the property of the University of Chicago. It is now being restored and maintained by the Frank Lloyd Wright Home and Studio Foundation and is a historic site of the National Trust for Historic Preservation.

PAUL SPRAGUE

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Nearly everything the reader will want to know about the Robie house is contained in two copiously illustrated books published in 1984, Connors and Hoffmann.

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ROCHE AND DINKELOO

Architecture firm, United States

Kevin Roche (1922–) and John Dinkeloo (1918–81) met in 1950 when they joined the office of Eero Saarinen and Associates at Bloomfield Hills, Michigan, where they worked for 11 years along with Robert Venturi, Chuck Bassett, Tony Lumsden, Gunnar Birketts, and Cesar Pelli. After Saarinen's sudden death in 1961, Roche and Dinkeloo formed a partnership in Hamden, Connecticut, to complete the projects that were under way at that time. The nascent partnership saw not only the successful completion of ten international projects but also went on to receive many other important commissions. Roche and Dinkeloo practiced together until 1981, and during that 20-year period they designed a number of outstanding buildings for a diverse group of corporate and institutional clients.

The ten buildings that Roche and Dinkeloo inherited from Saarinen were projects that they had been centrally involved in designing and included some of the most significant American buildings of the period, sharing innovative approaches to technology and new materials: the Gateway Arch, St. Louis, Missouri; the TWA Terminal, New York City; Dulles International Airport, Washington, D.C.; the Headquarters for John Deere and Company in Moline, Illinois; and the CBS Headquarters in New York.

The first project awarded to the new practice was the Oakland Museum (1961–68) in California. Eero Saarinen had been on the original list of architects being considered for the project, and Roche Dinkeloo, who asked to be considered after his death, was selected from a group of 35 architects. Their award-winning museum design included landscaped roofs that created a new park at the heart of the city. Over the next 20 years, the practice grew to become one of the most vital American offices of that era, designing a wide range of different building types for both civic and corporate clients.

The most significant buildings designed by Roche Dinkeloo include a series of university facilities, the office tower (1965–69) for the Knights of Columbus together with the neighboring Coliseum (1965–72) in New Haven, and arguably the most important, the Headquarters for the Ford Foundation (1963–68) in New York. These monumental buildings made innovative use of novel materials such as glass, advanced glazing systems, and self-rusting steel while at the same time exploiting the potential of structural forms as large-scale ordering systems. Projects such as the factories and offices for Cummins Engine in Darlington, England (1963–65), and later at Columbus, Indiana (1970–73), developed these ideas in ways that improved the industrial working environment, whereas a series of designs for corporate headquarters for Richardson-Merrell Inc. (1970–74), Union Carbide (1976–82), and General Foods (1977–82) explored the needs of large new office buildings sited in green-field sites by integrating offices and parking within the landscape.

In 1967, Roche Dinkeloo began work on the renovation and extension of the Metropolitan Museum of Art in New York, a project that would extend over more than 30 years. In addition to a new gallery wing and a bookshop, a series of glassy pavilions were designed for the Robert Lehman Collection in 1974 and subsequently for the Temple of Dendur.

Since Dinkeloo's death, Roche has directed the practice with a group of associates and continued the design for the Metropolitan Museum of Art, creating new galleries and restoring the existing building. The work of Roche's office has become increasingly preoccupied with formal issues and the development of a historicist eclecticism.

Roche and Dinkeloo were the recipients of numerous honors and awards. In 1974, they received the Architectural Firm Award from the American Institute of Architects (AIA), and eight years later Roche was awarded the Pritzker Architecture Prize. In

Knights of Columbus Headquarters, New Haven, Connecticut (1969)

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1995, the Ford Foundation Headquarters received the AIA's Twenty-Five-Year Award for an outstanding building of distinction.

BRIAN CARTER

See also **Brutalism; Dulles International Airport, Chantilly, Virginia; Gateway Arch, St. Louis, Missouri; Saarinen, Eero (Finland); TWA Airport Terminal, New York**

Biographies

Kevin Roche
Born in Dublin, 14 June 1922; emigrated to the United States 1948; naturalized 1964. Attended the National University of Ireland, Dublin 1940–45; bachelor's degree in architecture 1945; pursued postgraduate studies at the Illinois Institute of Technology, Chicago 1948–49. Designer with Michael Scott and Partners, Dublin 1945–46 and 1947–48; architect, the firm of Maxwell Fry and Jane Drew, London 1946; architect in the United Nations Planning Office, New York 1949; associate, Eero Saarinen and Associates, Bloomfield Hills and Birmingham, Michigan and Hamden, Connecticut 1950–66; principal associate in design 1954–61. Member, Board of Trustees, American Academy in Rome 1968–71; member, Woodrow Wilson International Center for Scholars, Smithsonian Institution, Washington, DC 1969–71; member, Commission of Fine Arts, Washington, DC from 1969; academician, National Academy of Design; member, Royal Institute of British Architects; member, Académie d'Architecture, France; member, Accademia Nazionale di San Luca, Italy; honorary fellow, Institute of Architects of Ireland. Kevin Roche, John Dinkeloo and Associates has continued under the direction of Roche.

John Gerard Dinkeloo
Born in Holland, Michigan, 28 February 1918. Attended Hope College, Holland 1936–39; studied at the University of Michigan School of Architecture, Ann Arbor 1939–42; bachelor's degree in architectural engineering 1942. Designer, 1942–43, chief of production 1946–50, the firm of Skidmore, Owings and Merrill, Chicago; head of production, Eero Saarinen and Associates, Bloomfield Hills, Michigan 1950–56; partner, Eero Saarinen and Associates, Bloomfield Hills and Birmingham, Michigan 1956–61 and Hamden, Connecticut 1961–66. Trustee, Hope College. Died in Fredericksburg, Virginia, 15 June 1981.

Roche and Dinkeloo
Partnership established in Hamden, Connecticut 1966 as Kevin Roche, John Dinkeloo and Associates; received the Grand Gold medal, French Academy of Architects 1977 and the Pritzker Prize 1982.

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Ford Foundation Headquarters, New York City, 1968

Knights of Columbus Headquarters, New Haven, Connecticut, 1969

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ROCKEFELLER CENTER, NEW YORK

Designed by Raymond Hood, completed 1940 New York City

Rockefeller Center is widely considered to be a handsome commercial building complex, and it has been the model for other groups of structures dedicated to a mix of business and entertainment. The Center comprises 30 buildings (although some are connected), with another being planned as of 1999. They extend from Fifth Avenue toward Seventh Avenue, between 48th and 52nd Streets, although the original and most famous structures were limited to most of the three blocks between 48th and 51st Streets, Fifth to Sixth Avenues.

The original group, planned and built from 1929 to 1940, was erected on land that belonged primarily to Columbia University. John D.Rockefeller, Jr., who leased the Columbia properties, bought several additional lots on Sixth Avenue as plans progressed. At first, the blocks were intended for bulky office towers on three sides of a large open square. A new Metropolitan Opera House was to occupy the fourth side, at the west, extending toward Sixth Avenue. When the stock market crash of 1929 made this plan unworkable, Rockefeller requested new plans for high and low commercial buildings around a smaller plaza. Most were to be office buildings with shops at ground level and along a subterranean concourse connected to a subway line that replaced a noisy elevated railway on Sixth Avenue. Other buildings, at the west end near the noise, were windowless, sound-proof theaters; of the two originally there, only Radio City Music Hall has survived. A cinema was introduced later in the middle of the north block. The leasing program was focused on broadcasting (later television) and film industry tenants, and on individually owned international shops. Travel and airline offices, foreign consulates, the U.S. passport agency, and auxiliary services such as passport photographers, restaurants, pharmacies, and a post office completed the primary rental program. The adaptability of the owner and his professional colleagues, the targeting of tenant groups, and the refined, varied design in handsome materials helped to ensure the project's eventual profitability and public esteem, although, in its early years, the project suffered financially as a result of the Depression.

Only the central one of the three original blocks was designed and executed according to a fixed plan. Here, twin low buildings flank a path adorned with plants, fountains, and small statues. The path leads to the central plaza, depressed so as to allow commercial premises around the perimeter. Zoning regulations made it impossible to build ground-level shops and restaurants, because just west of the plaza, a 66-story tower rises, taking up most of the bulk and height allowed under the zoning rules then in force. On the north block, Radio City Music Hall and an office building above it were determined at the start, whereas the high International Building along Fifth Avenue, with additional low wings for shops and offices, was added in the mid1930s. The south block contained the Center Theater along Sixth Avenue, now replaced by an office tower. Buildings for the Associated Press and Eastern Air Lines, among others, were

Rockefeller Center plaza, New York City

added as tenants appeared and as they could be fitted into the space permitted by zoning rules.

The appealing aspects of the Center include the plaza, which accommodates a restaurant in summer; an ice rink in winter; flying flags of the United Nations; statues, including Paul Manship's *Prometheus* overlooking the plaza and Lee Lawrie's *Atlas* on

Fifth Avenue; relief sculptures by Lawrie, Isamu Noguchi, and Carl Milles; landscaping; and public seating. Connoisseurs of architectural detailing admire the metalwork in the focal tower and the frames of the original shop windows. Urbanists praise the extra street added west of the plaza, the underground concourse with its subway access and connections among the Center's buildings, and the provision of public space in a private enclave. The combination of low and high structures shows that aesthetic considerations, and not exclusively financial ones, were present in the minds of the owner, John D.Rockefeller, Jr., the property developers he employed (Todd, Robertson and Todd), and the architects (Reinhard and Hofmeister; Corbett, Harrison and MacMurray; Hood, Godley, and Fouilhoux; of these, L.Andrew Reinhard, Harvey Wiley Corbett, Wallace K.Harrison, and Raymond Hood were the principal designers).

In the years between 1947 and 1973, several new buildings were added, primarily by Harrison and his later partner, Max Abramovitz. Most interesting are their buildings across Sixth Avenue, starting with the Time-Life Building (1957–60), an example of technological expression of supports and ducts. The three blocks south of this contain visually coordinated single towers, completed by 1973. The two central ones have large plazas, mandated by revised zoning rules but realized with more plants, seats, and other public amenities than were customary at the time. West of these buildings are additional small public parks. In these years and later as well, various architects remodeled some of the lobbies and other spaces that were not protected from change by the Center's designation as a city landmark in 1985.

In 1999, the Landmarks Preservation Commission permitted the new owners to enlarge windows on the facades of the four low buildings on Fifth Avenue and to make alterations in the central plaza. Less-controversial changes include the introduction of a facade for the Christie's auction house in the center of the original south block, and repaving of the original private street introduced into the project to increase the number of offices with street frontage.

Through assiduous maintenance, upgrading of technical features, and expert public relations, the Center has managed to retain its position as a premier location for business and as a popular tourist attraction in midtown, an area that the Center itself helped to establish as the heart of the city.

CAROL HERSELLE KRINSKY

S*ee also* **Harrison, Wallace K., and Max Abramovitz (United States); Hood, Raymond (United States); New York (NY), United States; Office Building; Plaza; Skyscraper**

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ROGERS, RICHARD 1933–

Architect, England

Richard Rogers was born in Florence in 1933 of British parents. He received his architectural education at the Architectural Association School in London and at Yale University, where he held a Fulbright Scholarship. At Yale, he heard lectures by Paul Rudolf and Louis Kahn and also met his British contemporaries, Norman Foster and James Stirling.

He began work by designing a family house at Creek Vean in Cornwall, with white walls and large windows, a house of impeccable modernity that still appears fresh after nearly half a century. His career took off when he designed a factory, in partnership with Sue Rogers and Norman and Wendy Foster, a double husband-and-wife group that set up under the name of "Team 4." The Reliance Controls Ltd. Factory at Swindon (1967) became well known as an example of industrial architecture that makes its impact from the visual quality of its structural system, in this case a clear succession of rectangular bays stiffened by tensioned diagonal braces.

Rogers has become increasingly devoted to the architecture produced by structural tours-de-force. Of these, the Pompidou Center in Paris (1971–77, with Renzo Piano) is the most famous. As with Reliance, the building is essentially a shed, and the main elevation is similarly marked by a clear succession of rectangular bays overlaid by diagonal tension cables. The designs for Lloyds in the City of London and for Inmos at Newport South Wales both continue to gain their principal effect from the display of structure and service elements on the exterior. Rogers (like Foster) has therefore become a principal proponent of a "true" functionalist architecture, going beyond Louis Kahn in the analysis of form and mechanism, in an attempt to eliminate the arbitrary and willful character of facade making.

Through this development, modernism was pushed closer to the machine, but also closer to sculpture: Rogers's work emerges from this conjunction. He was also influenced by Archigram, for whom expression was as important as technology. Disciples of the Archigram group, in fact, as employees of Piano and Rogers, realized the design development and working drawings for the Pompidou Center, so that it became the nearest thing we have to a completed Archigram building. But it is also the building that most completely expresses Rogers's attitude to architecture: for it has no hint in it, as has the Lloyds Building, of a conventional interior dominated by ancient tribal rituals, but is entirely the product of an intellectual movement toward the "real" sources of functional truth: the exposure of the bones and guts along with devotion to the principles of change and indeterminacy in use, of which the prophet was the Archigram guru, Reyner Banham.

From 1977 Rogers's work has had the benefit of a multidisciplined approach, with the formation of the Richard Rogers Partnership, bringing in the collaboration of John Young, Marco Goldschmied, and Mike Davies, and improved access to inhouse engineering services. With this improved organization, the firm has become something of an icon of the High-Tech aspect of modern architecture.

It is not that the High-Tech architect eschews beauty. But the beauty to be uncovered has to be identified with necessity, the result of applying reason along with engineering principles. The method of construction becomes an artistic strategy and hence an end in itself. In the Tokyo Forum Project of 1991, for example, the spaces of use are first enclosed in a gleaming semitransparent shell, then suspended from a metal armature, then approached by a complex of escalators. The object becomes a symbol of its own otherworldliness, a chapel to progress.

Lloyd's Bank Building, London (1984)

A more balanced approach is envisaged in the design for the European Court of Human Rights (1989–94) at Strasbourg. Here the elements into which the complex is broken down are not the service elements as such, but spaces of use; they stand on the ground, forming a composition that is less obsessively analytical and more expressive of human habitation and intercourse, whereas the building takes its scale and shape from its context on the curve of a river and from its situation within the city. This increased sensitivity toward the city is also evident in the very elegant project for the Alcazar, in Marseilles (1988). Within a seven-story height limit (surely a donné for the French city) he inserted a wedge-shaped volume closely into the texture of the adjoining blocks. Service elements are still lined up on one side, office space on the other, with between them, a "spine," which at ground level becomes a pedestrian route linking the frontage on the Cours Belsunce to the quiet contained space of the Place de la Providence. The way the building draws back to allow the space of this quiet square to be drawn into the scheme, the way it curves gently to make an entrance from the Cours Belsunce, show a distinct sensitivity not only to an analytical idea of urban form but also to the sense of civic propriety. In France, where Rogers has many projects under consideration, there are several that seem to open up a less machine-oriented perspective, such as the master plans for Dunkirk Neptune (1990) and Port Aupec (1990) and schemes for Bussy St. Georges (1989–) and Sextius Mirbeau (1990). In all of these there is a distinct element of contextual relevance.

Rogers has been accepted as a master of modern design, to judge by his creation as a Chevalier de l'Ordre National de la Légion d'Honneur in 1985 and in his own country, too, as is evident from his election to the Royal Academy in 1978, the award of the Royal Gold Medal of the RIBA in 1985, his knighthood of 1991 for services to architecture, and his peerage of 1996, the latter giving him a role that could strongly influence in political and therefore in practical terms the future of architecture within Britain. He will, of course, go down to posterity as the principle author of the Millennial Dome at Greenwich, a tour de force in which a tent suspended from steel gantries is given the spread and authority of an immense domed space. His designs continue to exploit the cutting edge of architectural technology, as with the Headquarters for the Lloyd's Register of Shipping and the new Terminal 5 at Heathrow Airport.

In 1995 Rogers was invited by the BBC to give the Reith Lectures, and he chose to build his lectures around the theme of the dense modern city. In his argument, although the city has in the past been a major pollutant, this is not necessarily so: It can be rethought scientifically so that it contributes to a sustainable environment while preserving the social vivacity that makes a society vital.

ROBERT MAXWELL

S*ee also* **Archigram; Foster, Norman (England); Kahn, Louis (United States); Piano, Renzo (Italy); Pompidou Center, Paris**

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ROMAÑACH, MARIO 1917–1984

Architect, Cuba

Mario Romañach excelled among the vanguard professionals of 1950s modern Cuban architecture, including Frank Martínez, Nicolás Quintana, Manuel Gutiérrez, Emilio del Junco, Joaquín Cristófol, Humberto Alonso, Nicolás Arroyo, Eduardo Montelieu, Alberto Beale, and Antonio Quintana. Although Romañach's work is still under studied, his oeuvre constituted a model of contemporary design adapted to the material and environmental conditions of the tropic, an example soon to be followed by the new generations of Caribbean architects. On graduation from the University of Havana in 1945, Romañach designed collaboratively with Silverio Bosch until 1955, when he began to work independently.

He collaborated with Antonio Quintana in the competition for the main building of the College of Architects (1943) and the Havana Regulatory Plan (1944). Afterward, Romañach, Quintana, and Pedro Martínez Inclán received the commission to design the Workers' Neighborhood of Luyanó (*Barrio Obrero de Luyanó,* 1944–48), the first Cuban structure to use modern blocks for residential housing. Concurrently, he developed friendships with Walter Gropius, Richard Neutra, and José Luis Sert, who visited the School of Architecture in Havana, where Romañach was a professor from 1951 to 1952. His introverted character kept him at the margins of the student political struggles that grew in reaction to Fulgencio Batista's dictatorship (1952–58). Nonetheless, Romañach defended the progress of the Modern movement; he participated in ATEC (Tectonic Group for Contemporary Expression) and ARCA (Renovating Association of the College of Architects). Between 1945 and 1955, he designed and built 58 works including private homes, apartments, and various public buildings. Early in his career, Romañach's houses possessed a commercial and functionalist character, fulfilling the aesthetic requirements of the traditionalist Cuban middle class. Despite its relative conservatism, the Julia Cueto de Noval House (1948) in Havana achieved a clear and volumetric organization. However, the innovative residence built for the son, José Noval Cueto (1949), was less well received. This house marked the apex of Cuban and perhaps Antillean rationalism, integrating precise compositional structure, smooth white façades, the articulation of functional spaces, and structural regularity. Organized within a rectangular box supported by beams and divided into two blocks joined by open circulation galleries (after the model of Marcel Breuer's bipolar house) the house's interior included a pool and a tropical garden. Thus, through a system of transparencies, double façades (real and virtual), and shaded spaces, Romañach adapted the formal models of Mies van der Rohe, Walter Gropius, and Le Corbusier, issuing from Europe and the United States to the tropical environment.

Works built in the 1950s express Romañach's experimentation with the individual and collective dwelling and arrive at a particular type that is defined as Cuban "modern regionalism," an elaboration of the influences of Richard Neutra and traditional Japanese architecture. The Havana house of Luis H.Vidaña (1953), the residence of Ana Carolina Font (1956), and the mansion of Rufino Álvarez (1957) mark Romañach's maturation. In these innovative works, he designed walls of refracting colored bricks cement blocks, created a system of canopy ceilings that appear almost suspended in air, explored the use of natural wood, and achieved sophisticated spatial articulations with the organization of transparent and shaded environments.

The buildings for the Territorial Company of La Sierra in Miramar (1956) and the Company for the Investment of Private Goods and Bonds (1958) display the innovative and illuminating spatial treatments found in Romañach's apartment buildings and private homes. These effects achieve a monumental dimension in the "Las Palmas" Presidential Palace (1956) that he designed with José Luis Sert and Gabriela Menéndez for the dictator Fulgencio Batista as part of a governmental commission that also hired Wiener, Sert, and Schulz, Town Planning Associates.

As Chief of the Havana Plan of the National Planning Group (1955), Romañach developed several urban projects that were never executed in La Coronela, La Habana del Este, and the proposed Satellite City of Columbia, intended to house 10,000 inhabitants. With the arrival of Fidel Castro's government (1959), Romañach immigrated to the United States to teach at Harvard University at the invitation of Sert. He developed innumerable public and private projects in his Philadelphia office. Even though some of his works received significant prizes (such as Chatam Towers in New York City, 1967) they were lacking, along with the work of other architects who had emigrated from Cuba, the poetic depth and creativity that characterized his works in Havana.

ROBERTO SEGRE

S*ee also* **Breuer, Marcel (United States); Corbusier, Le (Jeanneret, Charles-Édouard) (France); Mies van der Rohe, Ludwig (Germany); Sert, Josep Lluís (United States); Regionalism; Urban Planning**

Biography

Born in Havana, in 1917 (date unknown); son of a local architect; graduated from the School of Architecture, University of Havana (1945). Collaborated with Antonio Quintana for the competition for Cuban Society of Architects building (1943); employed by the Ministry of Public Works, Havana (1944). Received the Gold Medal from the Cuban National Society of Architects (1949); taught at the Havana School of Architecture (1951–52); joined ATEC (Tectonic Group for Contemporary Expression), ARCA (Renovating Association of the College of Architects); became chief of the Havana Master Plan (JNP, National Planning Group) working with Eduardo Montelieu, Nicolás Quintana, Jorge Mantilla, and José Luis Sert (1955). Immigrated to the United States in 1960 with his family; established architecture practice (Perkins and Romanach) in Philadelphia (1960); collaborated with his daughter, architect María Cristina Romañach. Visiting professor, School of Architecture at Harvard University (1959), Yale and Columbia Universities (1961–73); associate professor, Cornell University (1960–67), and chairman (1971–74) and full professor (1963–84), University of Pennsylvania, Philadelphia. Honorary degree (University of Pennsylvania, 1971); Fellow, American Institute of Architects, 1978; member, National Academy of Design, 1980. Died in Philadelphia on 3 March 1984.

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ROMANIA

At the beginning of 20th century, Romania was much indebted to Western European architectural currents. The recently created national style had only a feeble impact on the public.

Foreign architecture, mainly Neoclassicism and Romanticism, was progressively introduced in the principalities of Wallachia and Moldavia during the 19th century as a consequence of the process of opening up to Western European civilization. The two principalities, vassals of the Ottoman Empire, sought a model for emancipation and also political assistance, aspiring to create an independent unified state. After this state was founded in 1859, and particularly after it obtained its independence in 1878, its first institutions embraced foreign architectural currents as a sign of modernization. At this time, the most widespread was the ecclecticism of the École des Beaux-Arts in Paris, which eventually became the official style of the Romanian kingdom. French architecture was practiced not only by French nationals but also by the first Romanian architects, who were themselves trained at the École.

Some of these young architects trained in France, where they came in contact with the theories of E.E.Viollet-le-Duc, the French archaeological school, and the innovative concepts of Guadet. Once home, they relentlessly worked to create a new Romanian architecture based on the local tradition. Among them, the most fervent was Ion Mincu, the father of this new style called either "national" or "Romanian," which mirrored the national ideology that animated the Romanian intelligentsia of the time.

Yet the first decade of 20th century was still strongly dominated by French ecclecticism, which maintained its status of official architecture and was also very in vogue for the rich residencies. The Beaux-Arts style was displayed in a variety of forms, going from classic solemnity (the Palace of the Chamber of Deputies, 1907, by Dimitrie Maimarolu in Bucharest) to a light elegance (the Casino, 1913, by Petre Antonescu in Sinaia) or to flamboyant fantasies (the town hall of Iasi, 1907–26, by loan D.Berindey). If the Beaux-Arts style was perfectly assimilated, Romanian architects were less familiar with other currents, such as Art Nouveau, one of the rare examples of which is the Casino in Constanta (1910) by Daniel Renard. In contrast, Art Nouveau was very popular in Transylvania, where it radiated from Central Europe. A province of the Austro-Hungarian Empire until 1918, Transylvania adopted the multiple facets that the inventive vocabulary of Art Nouveau developed on the vast territory of the empire: the aesthetic of Lechner's Art Nouveau, as in several works of Jakab Deszö and Marcel Komor, including the "Black Eagle building," 1907–09, in Oradea and the Palace of Culture, 1913, in Tîrgu-Mures; the researches of a new Hungarian national image of the "Young Architects," including the Museum, 1911, by Karoly Kos, in Sfintul Gheorghe; and compositions inspired by Sezession and Jugendstil, including the work of E. Thoroczkai-Wigand in Tîrgu-Mures.

Starting in 1906, the date of the General National Exposition in Bucharest (Stefan

Burcus and Victor Stefanescu), which celebrated 40 years of reign of King Carol I, the national style gained an important place on the architectural scene of Romanian kingdom. The exposition, with its multitude of pavilions, brought recognition for this style. In their quest for an expression of the Romanian specificity, the exponents of the national style sought relevant examples in local tradition that they referred to as both major art history monuments and folk art. Among the chief promoters of the national style were Petre Antonescu, Paul Smarandescu, Statie Ciortan, Toma T.Socolescu, and Nicolae Ghika-Budesti.

As its doctrine responded perfectly to the aspirations of national unity and as its aesthetic satisfied the taste for picturesque dispositions, the new style was progressively embraced in several architectural programs. First adopted in residential architecture, it spread progressively to administrative buildings, schools, and post offices, some of the most significant examples of this period being the Prefecture of Galati (1906) by Ion Mincu, the Prefecture of Craiova (1912–13) by Petre Antonescu, and the town hall of Constanta (1913) by Victor Stefanescu. At the creation of greater Romania, by the unification of the ancient kingdom with Transylvania, Bessarabia, and Bukovina at the end of World War I, the national style was unsurprisingly appropriated as an official architecture. The establishment of the new state generated a period of prosperity and of economic as well as cultural effervescence, which explains the unprecedented growth of architecture. The sustained building campaign obviously benefited the national style, which now covered all the architectural programs and all the territory of Romania. To mention the huge operation of rising orthodox churches in Transylvania, the construction of oversize churches, called "cathedrals," was a symbolic act of recuperating a territory released from Catholicism.

Whereas the national style responded to the new context of the acknowledged national spirituality, modernism expressed the opening toward European culture and the efforts of synchronizing Romanian culture with European tendencies. The architect and artist Marcel Iancu played an important role in the introduction and assimilation of the principles of Modern architecture. He contributed to the initiation to modernism through a sustained publishing campaign, writing numerous articles in the style of the avant-garde manifestos in the magazine *Contimporanul* from 1924 to 1930. The diffusion of modernism was encouraged by the commands of the intellectual milieu, opened not only to the new architectural trends, but also by the prosperous members of the middle classes as well as by several societies, institutions, and industries that appropriated Modern architecture as the emblem of their efficiency. After 1930, the period of early modernism in Romania, the incontestable center of new trends was Bucharest. However, several examples, remarkable by their perfect adherence to the formal vocabulary of modernism, were erected in other areas of the country. These examples belong less to the housing program (except for the villas executed by I. Boceanu in Cîmpina or the villa Tataru in Cluj, designed in Gio Ponti's studio) than to the field of public buildings. It was an architecture that advanced the idea of autonomy from the geographic environment—such as the sanatoriums in the mountain zones (Toria, 1933–34, by Grigore Ionescu in Ciuc and Bucegi, 1934, by Marcel Iancu in Predeal) and the hotels in the seaside resorts (Belona, 1933, by G.M.Cantacuzino in Eforie)—and that underscored the expressive potential of the reinforced-concrete structure—such as the Central Market in Ploiesti

(1931–33) by Toma T.Socolescu. The industrial buildings of the 1930s exclusively adopted the vocabulary of modernism, employing vigorous structures with large openings in reinforced concrete (the IAR Industries building, 1933, by G.M. Cantacuzino in Brasov) and emphasizing the expressiveness of the volumes and the materials, particularly brick (the Banloc Plants, 1937–38, by O.Doicescu and the Astra Plants, 1936–37, by Costinescu in Brasov).

Parallel to the boom of modern architecture and obviously influenced by its principles, the national style developed a new expression that adopted the formal simplicity and functionality of modernism. Not only was this new image a transgression of a clear decline of the style (the result of an epigonic production), but it also brought a change of vision. Instead of the historic examples, sometimes quoted in a historicist manner, tradition was now understood as the essence of Romanian spirituality through the perspective of folk art values. The new expression found adepts among the old exponents of the national style (Andrei Saguna Orthodox College, 1938–39, by George Cristinel in Sibiu), but it was particularly popular with young architects (the Military Club by C.Iotzu in Brasov and the numerous villas designed by H.Delavrancea-Gibory at the seaside).

The State Circus (1960), Bucharest, Romania. Designed by Nicolae Porumbescu and Constantin Rulea.

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The second half of the 1930s was a time of increased authoritarian politics, which culminated in the dictatorship of King Carol II and was followed at the beginning of the 1940s by the creation of the military state. The adoption of the new classicism perfectly mirrored this shift in the state politics. Frequently called “the style Carol II,” this tendency became the symbol of the official architecture and was developed mainly in the capital.

The important political changes that followed World War II and that culminated in the installation of the Communist regime on 30 December 1947 brought a radical transformation for the development of architecture. The state established almost total control over architecture and urbanism, which became dependent on the strictly centralized economic and social politics. The evolution of postwar architecture was decisively conditioned by the dominance of standardized plans and of serialized industrial methods of construction, by the reduction in investment costs, and by the replacement of theoretical and critical discourse with the authoritarian intervention of the party ideology. However, this pattern was transgressed in particular cases, as when requested by the importance of representation. This representation emphasized either the regime itself or its ideology, either the urban role of the building or the uniqueness of its function—in the city or in the whole country.

The regime exercised a progressive control over architecture that was reflected in each phase of this period. The first part of 1950s was marked by the so-called realist-socialist architecture of Soviet influence. In these years, housing developments were built in numerous cities in Romania, as were plants and the infrastructure for the International Youth Festival, which took place in 1953 in Bucharest. The utmost symbol of this architecture remains Casa Scînteii (House of the Spark, 1950–51, by architects H.Maicu, L.Staadecker, M.Alifanti, N.Badescu, and others in Bucharest), a local reproduction of the Soviet models, where the forms, mainly classical, were adorned with details inspired partly by national tradition. Parallel to that, the old generation of architects continued to use the vocabulary of the interwar rationalism that was present in Romanian architecture until the end of the decade. The most relevant examples are the Clothing Industries APACA building (1948) by M.Alifanti, I.Ghica Budesti, and others and the Palace of the National Broadcasting (1960) by T.Ricci, L.Garcia, and M.Ricci, both in Bucharest.

The most interesting period of evolution in Romanian architecture started in the 1960s and lasted until the mid-1970s against the background of an apparent ideological liberalization. Functionalist architecture became official, and the urbanist prin-ciples of the Athens Charter were conclusively adopted. The dormitory districts built in almost all Romanian cities, with their impersonal architecture and huge dimensions (up to hundreds of thousands of inhabitants), were erected according to these principles of the Athens Charter. Starting at the end of the 1960s, the Black Sea littoral became the experimental ground for both New Urbanism and Modern architecture. The necessity of modern public equipment in the cities brought the opportunity for various architectures, some of them of an incontestable value, to be employed. Among the most significant buildings of this period are a series of hotels (particularly at the Black Sea in the resorts Neptun, Olimp, and Aurora and in the mountain resorts, such as Poiana Brasov), theaters (the National Theater, 1972–74, by Al. Iotzu in Craiova), cultural centers (such as those built in 1968 by N.Porumbescu in Suceava and in 1975 in Baia Mare, where he employed a stylized interpretation of the traditional decorative patterns), and higher-education institutions and administrative centers (the Administrative Center 1972, by M.Alifanti in Baia Mare is considered one of the most valuable works of the period). The Catholic church (1976) by I.Fackelman in Orsova is unique in the whole postwar period.

The years following the devastating earthquake of 1977 coincided with the emphasis of the totalitarian and nationalistic ideology of the Communist regime. This mutation in the official ideology had dramatic consequences for architecture. Although numerous cities were affected by rapid degradation because of the demolitions of their historical downtowns (increasing the damage caused by the earthquake), the tentative decision to rebuild urbanlike villages, according to controlled planning, threatened to destroy the environment of traditional life. The architectural structures that replaced the demolished edifices, often reorganized as new civic centers, reflected the strict application of the regime ideology, resulting in a schematic and simplistic vocabulary. The control over architecture harshened, and a reduction in the quality of architecture became evident. Official architecture clearly was oriented to a rhetoric of monumentality that was specific to dictatorships, the most significant example being the Pharaonic complex of the House of the People in Bucharest by Anca Petrescu and collective. This enormous architectural complex concentrated the most important part of the state investments, a fact that drastically diminished the construction activity, and only a few buildings succeeded in escaping the anonymity of a common architecture. This explains why the Postmodernism of the 1980s did not produce noteworthy experiments.

Starting in 1990, after the fall of the Communist regime, Romanian architecture entered a new period of intense researches and the rediscovery of former local marks and of integration in the contemporaneous international movement. Unlike previous periods, Bucharest is no longer the only center of architectural experiments. Several other cities have developed such experiences, the most significant example being the city of Timisoara for the refined architecture of Serban Sturdza, I. Andreescu and V. Gaivoronschi, R. Mihailescu, and others.

CARMEN POPESCU AND NICOLAE LASCU

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ROME, ITALY

In the history of the city of Rome, it was not just the Church that appropriated and used art and architecture for political or propagandistic purposes. From the city's annexation to the kingdom of Italy in 1870, Rome became a space of contest in which the contrasting discourses of the classical Roman Empire, the papacy of a universal Church, and the secular Savoyard monarchy were articulated. Such discourses affected and often reshaped the urban landscape. One of the best examples is constituted by the Vittorio Emanuele II monument (or Vittoriano), built between 1885 and 1911 to honor the memory of the first king of united Italy. Some 80 meters high, it irrevocably changed the cityscape, throwing out of scale the capitol itself. The architect, Giuseppe Sacconi, winning an international competition, employed a dazzling white "bottocino" marble from Brescia that further emphasized the monument with respect (or disrespect) to its surroundings. The Vittoriano was constructed in the Beaux Arts architectural style, which was popular at the time as appropriately "imperial" for urban monuments throughout all the major European capitals. Interestingly, both Liberal and Fascist governments between the wars emphasized the Vittoriano's centrality within the city's space and Italian territory. Mussolini in particular used the monument to promote an imperial spatiality through his performative rhetoric, which often unfolded while facing the monument in the adjacent Piazza Venezia.

The advent of Fascism had quite an effect on the architectural history of Rome. In the early 1930s, the population of Rome had grown from 244,000 to over a million. The practical necessity to provide a modern infrastructure in terms of public transport and utilities and to boost the regime's image in Italy and abroad threatened to put Fascism on a conflicting course both with the papacy (some 18 churches and Church buildings were destroyed from 1928 to 1939) and with the city's own classical heritage (many archaeological sites were disrupted to build those grand avenues that had to host the regime's parades and other mass events). It soon appeared evident that the key issues of planning in the city had to deal with finding a feasible compromise between the conflicting double logic of conservation or demolition. It has been convincingly argued that the three principal laws that informed Fascist design, architecture, and urban planning were the law of health (hygienic reasons were often at the basis of many interventions in the city), the law of speed (in the sense of both fast execution and, from a futurist perspective, active traffic, Hght, and air), and the Roman law, with its insistence on the grandiose in the sense of the imposing and powerful. From Mussolini's early years in power, his ideas on monumental interventions in the city center reflected such laws. One of the best examples in this sense is the plan to free the Mausoleo di Augusto (or Augusteo). According to the project devised by the architect Vittorio Morpurgo, new porticoed buildings of the National Fascist Institute of Social Insurance were to define the piazza in which the Mausoleo stands on the north and east sides. A wide street piazza was created between the churches of San Girolamo and San Rocco. Moreover, a reconstruction of the *Ara Pacis* was located in glazed protective building (an example of rationalist architecture in sharp contrast with its classical content) between Via Ripetta and il Lungotevere. Quite different from the works around the Augusteo is the EUR project (also known as E 42). In this case, the plan was to build a new Rome, a modern one but with the same characters of monumentality and universality, on a hilltop five miles south of piazza Venezia. The EUR was meant to house the World Exhibition of Rome in 1942; thus, the task was to create a city of representation that conjugated the scenographic and artistic necessities of a world exhibition with the practicalities of a real city. Although the first plan was not extremely original, it must be said that it lacked the usual iconography of fasces, eagles, statues, or epigraphs that would come later. However, Romanità and modernity, monumentality and rationalist aspirations could not coexist, so it happened that the more advanced projects were relegated to the temporary exhibitions buildings, whereas the permanent buildings had a neoclassical style. The EUR was not completed because of the war; still, what is left proves wrong the widespread misconception that after Bernini and Borromini, little of significance was built in Rome.

EUR lies to the south of the city, toward the sea, in an area that had been open countryside until only a few years before. The building project was entrusted to the top architects of the day, who sought to blend the principles of ancient classical architecture with European rationalism. One fine example of this composite style is the Palazzo della Civiltà del Lavoro, familiarly known as the "square colosseum." The defining features of this original zone are the broad avenues and wide-open squares.

The Fascist era also saw the building of another major example of this type of architecture: the Foro Italico. Formerly named after Mussolini, the Foro Italico is a large sports complex that encloses several facilities, including an indoor swimming pool decorated with mosaic work. It also contains the Stadio dei Marmi, a stadium encircled by 60 marble statues of athletes donated by towns and cities around the country. A sphere measuring three meters in diameter rests in the forecourt.

The Dora zone, completed in 1926, offers a unique example of Roman architectural eclecticism from the early years of the 20th century. A large, decorated arch leads rather unexpectedly into a remarkable area designed by Gino Coppedè, whose surname provides the popular name for the zone. Every building has its own special ornamentation, though Art Nouveau and mock-medieval motifs stand out in the rich mix of styles.

After the war, the Italian architects who had best represented the cause of modern architecture were dead: G.L.Banfi, G. Pagano, E.Persico, and G.Terragni. However, a new sensation started influencing Italian culture: that of making contact with reality in a new way, seeing reality with new eyes. It was this sensation that gave rise to Neorealism, which became widely known thanks to the films of Roberto Rossellini and Vittorio De Sica but that influenced the arts and architecture as well. The best example of the latter is the architecture of Ridolfi at Terni and the Tiburtino district in Rome in the early 1950s. To the design of the Tiburtino district, a sort of manifesto of architectural neorealism, C.Aymonino, C.Chiarini, M.Fiorentino. F.Gorio, M.Lanza, S.Lenci, P.Lugli, C.Melograni, G. Menichetti, L.Quaroni, and M.Valori also contributed.

Neorealism, particularly for the architects of the Roman School (Ridolfi, Quaroni, and Fiorentino), is characterized by a concern for everyday reality, a preference for popular forms, an interest for one's immediate environment, and the rejection of any abstraction. Such concerns were already evident in the design for the Stazione Termini (1947), the new Rome railway station, by Quaroni, Ridolfi, and Fiorentino. Between 1950 and 1954, Ridolfi also designed what was a nucleus of innovative tall houses on the Viale Etiopia, the so-called African quarter. In the years between 1954 and 1962, three different plans were prepared for Rome while architects were facing a cultural and political debate that included the status of a new town-planning discipline and a new legal ruling on building land. In the 1962 plan, inspired by Quaroni and Piccinato, a multifunctional axis girdling the east zone of the city was due to connect up with the national superhighway system. In addition, the plan included the creation of three areas of expansion that would deploy some of the functions of the congested city center. Unfortunately, the Rome plan was not realized, mainly because of administrative deficiencies.

For the Olympic Games in 1960, the Palazzo and Palazzetto dello Sport and the Flaminio Stadium were built by Vitellozzi and Pier Luigi Nervi; these structures combined technological inventions with neomonumental organisms. In the 1960s, the EUR came to prominence again by developing into an efficient business district and a residential area for the upper-middle class. It became the only real administrative pole of the capital at a time when Italy was in the midst of a real economic miracle. Also noticeable are the new magistrates' courts, designed by the Perugini-Monteduro group between 1959 and 1969, on Piazzale Clodio; the Vitellozzi's project (1959–67) for the Biblioteca Nazionale at castro Pretorio; the RAI-TV office building (1963–65) on Viale Mazzini by Berbarducci and Fioroni; and Albini's Rinascente department store in the area of Piazza Fiume/Via Veneto. Also worth mentioning is the residential complex (1973–82) in Corviale (Rome), which contained new building types and was realized with advanced techniques of prefabrication.

From 1975 to 1984, while Rome had a left-wing administration, there were plans for rehabilitating the most derelict districts *(borgate),* building new public housing, acquiring more green space, and recovering historical buildings. The projects implemented after the national *Roma Capitale* law have given rise to 445 projects, mainly relating to road improvements and public facilities.

In the early 1980s, the Italian architect Paolo Portoghesi launched a style that has been designated postmodern and is characterized broadly by a taste for citation, pastiche, and free association. Portoghesi's only projects in Rome are the mosque and the cultural Islamic center in Via Magnani and the City of Science for the site of the old slaughterhouse in Testaccio.

The sprawling metropolis that now extends all over the *Agro romano* has its roots in the idea of a centralized Italian state, and its development as a bureaucratic city has been plagued by an army of land speculators and builders. Since its annexation to the kingdom of Italy, architects working in Rome have often been caught in an inextricable web of bureaucratic and political difficulties. In the past 30 years, the city has changed remarkably, yet the contrast between a dominant center and a subaltern periphery is still a sharp one. Rome is only recently starting to live up to what is expected of it given its exceptional past.

ANNA NOTARO

S*ee also* **Fascist Architecture; Gregotti, Vittorio (Italy); Moretti, Luigi (Italy);**

Nervi, Pier Luigi (Italy); Portoghesi, Paolo (Italy); Sant'Elia, Antonio (Italy); Terragni, Giuseppe (Italy)

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ROSSI, ALDO 1931–97

Architect, Italy

Aldo Rossi was an influential architect, designer, teacher, and theoretician whose works emphasized historical types and memories as poetic elements in architectural design. Working primarily in Italy, his later work was designed and constructed for cities in the United States, Germany, Argentina, and Japan.

Rossi's representations of architecture, from the scale of furniture to that of urbanism, were reminiscent of Giorgio de Chirico's metaphysical paintings and the Enlightenment-era projects of Étienne-Louis Boullée. Rossi's design sketches contain haunting irregularities of scale and typology, disciplined and refined in their final construction. Rossi's timeless vocabulary of forms remained relatively constant throughout his career, although the scale, material, and functions shift across projects. His works synthesized pure repetition, modern space, and remembered forms into a singular vision that he named "analogous architecture," and the frequent return to the questions of cultural meaning and signification in architectural forms permeated his writings, images, and buildings.

Rossi's professional education at the Milan Polytechnic brought him into close contact with Marxist critical theory and the revolutionary potentials in architecture under the influence of Italian Neorealism in the arts. These sources influenced his work as a writer and editor of the journal *Casabella-Continuita* (1961–64). Although his early written and built work was sympathetic to the ascetic modernism of the Viennese architect Adolph Loos (1870–1933), he moved far from this position in his later career.

In 1966, Rossi published his influential book on urban theory titled *L'Architettura della citta* (The Architecture of the City). Identifying building typology and urban morphology as inseparable and always saturated with history, the city is conceived as a political construct. Written from a rationalist perspective indebted to the Enlightenment, the text places politicized humanist concerns over the orthodoxy of modernist functionalism and forms. Monuments and housing types are saturated with unique social and political meanings and cannot be considered purely functionalist forms. This reconceptualization of the historically structured meanings of cities operated as the foundation for his and others subsequent designs.

Rossi's later writings and projects moved from an ascetic architecture of concrete to rich metaphoric constructions invoking memories of cities (as fragments). It was a progression from ideological concerns to questions of memory and a revival of humanist referents, an attempt to recuperate what modern urbanism had eliminated. Rossi's works were a deeply personal examination and reconstruction of architecture's own history. Rossi did not copy or imitate existing models but proposed reduced typological elements to allow cultural and personal meanings to be projected into them. Relying on a limited number of significant classical types and anonymous vernacular forms that are immediately familiar, Rossi's architecture animated memories of these architectural forms to create a strong visual and spatial effect of timelessness.

Rossi's architecture communicated simultaneously personal and archetypal concepts, much like a visual language. He frequently described this method as "analogous architecture," which he derived from the work of psychologist Carl Jung, who described analogous thought as "sensed yet unreal, imagined yet silent…it is archaic, unexpressed, and practically inexpressible in words." Analogous architecture draws on the dialogue between the real and representation (as in photography or theater) to communicate meaning through nonlinguistic associations, fusing past and present into experience and remembering.

Rossi examined the limits of analogous architecture at a large urban scale in his later works and specifically through drawing in the hypothetical designs for an Analogous City

(1976) and an invited entry to the Roma Interrotta (1977). Given the original segment of Nolli's map of Rome containing the Baths of Caracalla, Rossi proposed a historically self-conscious architecture that was to be "borrowed, converted, and invented," a habitual urban strategy examined in his text *Scientific Autobiography* (1981). In this text, he stated, "The construction of a logic of architecture cannot omit the relationship with history."

Rossi's design projects originated in a Loosian search for reductive, rational, and precise architectural expression but then involved distinct Platonic shapes found in books of perspectival drawing and stereometrics. In his many designs for urban spaces, he situated autonomous and enigmatic monuments in the voids of public space to make their haunting presence and silence obvious. Their timelessness was animated only by cast shadows. The competition project (1962) for a Monument to the Resistance in Cuneo, Italy, offers a cube with a slit framing the distant battlegrounds. The built iron bridge (1962) for the Milan Triennale and the Monument de la Piazzetta Manzoni (1988–90) in Milan continue to develop this language of concrete form without any scale or material references, as if they were childhood memories. The unbuilt Piazza del Municipio (1965) in the Segrate district of Milan appears as a fusion of monument and tomb, the two aspects of architecture that Loos identified as belonging to art. These dematerialized but visually heavy forms invoke political and historical associations between modernism and Fascism as inevitable and fated.

Rossi's first built large-scale project, the urban housing project Gallaratese (1969–73) in Milan, was a fusion of high-modernist housing typology within an attenuated form nostalgic for premodern Milanese urban housing, galleries, or barracks. As a representation and inventory of earlier precedents, they are built in the grammar of the early monuments and plazas. A relentless repetition of panel-like columns is punctuated only by two massive round columns in the center of this arcade, marking a small crevice in the form above. These support the undifferentiated flats in an extended linear schema. The circulation is arranged as corridors or elevated private streets unseen from the ground plane. Each housing unit appears identical, with identical fenestration, and the overall stark and simplified result implies that there is no individuality in a social class.

Rossi completed two schools that evoked a concern with childhood memories through his emergent vocabulary. The elementary school (1972–76) at Fagnano Olana, Italy, and a secondary school (1979) at Broni, Italy, are both organized around a dominant central courtyard containing individualized central elements as in the early plaza designs. The public space is defined spatially by a strong perimeter boundary created by the repetition of identical classrooms. This classical ordering schema appears in most later projects when the functional program contains a diversity of spaces.

The role of timeless forms and historical memories in architecture is evident in Rossi's competition-winning design for the addition to the Cemetery of San Cataldo (1971–84 in phased construction) in Modena, Italy. Rossi fuses monument and tomb within a larger concept of the cemetery as a city of the dead, designed to evoke memories of urban conditions through its volumes and plazas. Other funerary architecture is distributed axially as diverse object-types through the center space like scaleless volumes or districts. The communal graveyard is inside and beneath a cone-shaped form, marking one end of the axis. The opposite end holds the shrine to the war dead. This monumental metaphysical object is constructed as an orange cube perforated with square openings, its insides containing unadorned metal balconies arranged like fire escapes. It is a disturbing house of the dead, roofless and windowless. Between these two object-types, more ossuaries are arranged in a riblike diminishing pattern of linear construction, forming a triangular district articulated as a labyrinth or mandatory path. The cemetery complex draws heavily on visual and historical references to history, memory, and death through Rossi's remembered archetypal forms.

During San Cataldo's construction, Rossi's written and drawn works began to attract significant international recognition, defining a place for the reemergence of history in the postmodern period. Contemporaneous with San Cataldo, Rossi's architecture began to include increasingly differentiated materiality (pattern, color, and textures) and overt references to nostalgic memories of historic precedents. Timeless historical types become specific to their unique sites and contexts. Rossi's early interest in cinema and theater became a dominant analogy in the theoretical and urban projects that followed.

The Teatro del Mondo (Theater of the World), created for the Venice Biennale (1979), was a floating pavilion enclosing a centralized theater space. The steel frame of its octagonal wood form was welded to a functioning barge that traveled the seas of Italy, creating a transitory object that combined building, barge, and folly. Its echoes of historical theaters in the round and its toylike appearance showcased Rossi's personal rediscovery of the Renaissance relationship between theater and architecture, first explored in his furniture-size theoretical project the Little Scientific Theater (1978). In the Carlo Felice Theater (1983–89) in Genoa, Italy, a unique historical precedent became the site of construction for "civil architecture." Barbarino's prior neoclassical theater facing the ducal palace was reborn as a large, 2000-seat balconied theater. A chimney-like cone, used in earlier projects, distributes light by penetrating through the internal public spaces. A stone-clad tower block rises above the theater, and the entrance to the theater acts as a filter between city and spectacle.

In 1981, Rossi submitted the winning housing scheme for the international design competition for urban renewal in the former West Berlin (IBA). Finished in 1988, the perimeter-block housing project exhibits a wide range of materials and scale. Although housing is supported by an arcade as in Gallaratese, the vertical circulation towers facing the interior courtyard, pitched spires over elevators, and gridded glass facades between masonry housing blocks materially differentiate each element of the project, creating the impression of linkages between identical small buildings. Only the oversize columns at both ends of the project recall his earlier works. Other works in Berlin included the smaller apartment building (1983) in Berlin-Tiergarten on Rauchstrasse and an unbuilt competition design (1978) for the Museum of German History.

In the 1980s, Rossi turned his methodology toward commercial institutions within urban contexts. The Commercial Center of Fontivegge (1982–89) in Perugia, Italy, is a U-shaped complex of shops and offices framing a multistory house form on exaggerated piers. The Commercial Center "Centro Torri" (1985–88) in Parma, Italy, adopts the typology of Renaissance market stalls to recuperate commerce as "the center of human life." Ten brick towers mark the dominant central arcade that holds the stores together. The office building (1984) for Officine GFT in Turin and the unbuilt Edificio Techint (1984) in Buenos Aires, Argentina, turned back from normative modernism to three-dimensional assemblages of historical elements. In 1989, the Il Palazzo Hotel and Restaurant Complex in Fukuoka, Japan, drew on Roman construction forms, presenting a blank public facade of travertine with exquisitely detailed, disengaged columns separated by iron banding at each floor level. Constructed on a raised public plaza, this project translates premodern urban gestures into a frenetic high-tech context, offering the qualities of serenity, silence, and eternity that Rossi pursued in all his works.

Rossi's earliest passions and vocabulary remained a constant referent throughout his career, reemerging and slowly transforming into more sophisticated compositions, all with increasing sensitivity to materiality and related connections. Virtually every project can be read as an examination of the historical essence of architectural form and an interrogation of the city as a historical force. His highly personal approach placed the human condition at the conceptual and physical center of the works, and by offering unique memories of historical forms, he created an architecture that invites the projection of individual meanings on the constructed forms. His widely disseminated writings, drawings, and buildings encouraged the turn away from dehistoricized modern urbanism in Europe and elsewhere.

THOMAS MICAL

Biography

Born 3 May 1931 in Milan. Graduated from the degree program in architecture Milan Politecnico in 1959. Editor of *Casabella-Continuita* (1961–64). Published the influential text *The Architecture of the City* (1966); taught at the Milan's Politecnico, ETH Zurich, Cooper Union, and the Venice Instituto Universitario di Architettura. Awarded the Pritzker Prize in Architecture (1990). Died in Milan, 4 September 1997.

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ROTTERDAM, THE NETHERLANDS

Descriptions of Rotterdam, in the province of South Holland, abound in quantitative superlatives: the world's largest port, Europe's densest metropolis (more than 4,000 people per square kilometer), one of the country's most industrialized areas, the Dutch town most grievously destroyed during the German occupation of 1940–1945, and also the tallest, boasting many more skyscrapers than any other city in the Netherlands. Moreover, even in a country renowned for creating itself from land won from the sea, Rotterdam stands out, aggressively reclaiming portions of *Maasvlakte* (Maas Flats; the Maas is the major river) for its expanding terminals, chemical plants, and petroleum refineries as well as for satellite towns. A thoroughly 20th-century city in which remarkably few buildings from previous periods survive, Rotterdam enters the new millennium with a vigorous architectural and urbanistic growth that bids fair to surpass other Dutch contenders.

The population of almost 600,000 (more than 1 million live in adjacent municipalities) makes Rotterdam second in size only to Amsterdam (*c.*728,000), and comparisons are instructive no less than inevitable. Both were chartered in the early 1300s on sites that began as a dam on a river (the Rotte and the Amstel, respectively), but thereafter their fortunes diverged. Amsterdam rose to power in the Golden Age of the 17th century; Rotterdam, based more exclusively on shipping-related activities, began its economic challenge only after 1872, when the opening of the New Waterway *(Nieuwe Waterweg),* which connected the port city directly with the North Sea, set it on the path to eventual maritime dominance. Urbanistically Rotterdam followed at a somewhat later date a trajectory similar to Amsterdam's: the late 19th century brought severe overcrowding in the inner city, unplanned speculative growth on the outskirts, and the gradual adoption of municipal codes and extension plans to counter these problems. Although both cities are water-girt, Rotterdam's aqueous bodies are larger and more intrusive; instead of picturesque canals, it offers major rivers and harbors spanned by imposing bridges very different in size from those of Amsterdam. Although Amsterdam's new construction is mainly outside the inner city, Rotterdam's heart is one huge construction site constantly in transition. That makes it dynamic if a bit unsettling, oriented to the future with little fidelity to the past. Rotterdam has also been more hospitable to foreign firms: Marcel Breuer (De Bijenkorf Department Store, 1955–57, with Dutchman A. Elzas), and

Skidmore, Owings and Merrill (the three Europoint 24-story towers, 1971–75) have worked there, and in the 1990s it has been the first to welcome such international figures as Norman Foster, Renzo Piano, and Helmut Jahn.

Architecturally the contrast was noted already in 1923, in the oft-quoted letter by Erich Mendelsohn describing Rotterdam as analytic in danger from the deadly chill in its veins and Amsterdam as visionary, threatened by the fire of its own dynamism. The claim may be somewhat exaggerated, but its basic premise about the distinct characters of each city touches on a truth that has obtained throughout much of the century. Rotterdam was the stronghold of Dutch functionalism, the *Nieuwe Bouwen,* which exalted usefulness over aesthetics. Until recently, its major monuments were almost exclusively for practical ends—housing, commercial, and industrial structures rather than cultural buildings—and the stunning elegance that several attained was a byproduct of efficiency and economy; speed and size took precedence over beauty.

During the fin-de-siècle, Rotterdam was overshadowed artistically by The Hague, its near neighbor and the seat of government, and followed it in favoring the Franco-Belgian variant of the Art Nouveau, unlike Amsterdam, where the more sober, indigenous, and enduring version of *Nieuwe Kunst* prevailed. The major work during this period is the *Witte Huis* of 1897–98 (one of the few buildings in the center to have survived the firebombing), the first Dutch, indeed European, skyscraper. Designed by W.Molenbroek, the mansard-roofed, 138-foot-high, 11-story office building with load-bearing walls of stone and white brick was prophetic of Rotterdam's future as the dominant skyscraper city of the Netherlands. Henry Hobson Ricardson's work (one of its stylistic influences) was familiar in Holland through the teachings of H.P.Berlage, who, regrettably, found few opportunities in Rotterdam. A workers cooperative (1906–07) and an insurance company (1911; destroyed) were his only executed works; his grand redesigns of the Hofplein square (1921 and 1926), commissioned by the municipality, were rejected. The most conspicuous public building of the first two decades was the neo-Northern Renaissance Town Hall by Henri Evers (1855–1929), professor at Rotterdam's Academy of Fine Arts and Technical Sciences from 1887–1902. Subject of an invited competition of 1912, the choice of Evers's ecclectic design, an anachronism before it was completed in 1920, indicated the city's conservatism, for it might have chosen the much more original entry by Willem Kromhout (1864–1940).

Kromhout, whose work was akin to Berlage's but more playful and exotic, left a distinguished career in Amsterdam as architectural leader and teacher to move in 1910 to Rotterdam to teach at the academy and reestablish his practice. If earlier he had inspired the Amsterdam School, now among his students were future leaders of the *Nieuwe Bouwen* such as J.J.P.Oud, Cor van Eesteren, and Leendert van der Vlugt. Kromhout's own free style retained allusions to architecture from the early Christian, Byzantine, and medieval periods laced with Arabic and Art Nouveau motifs, the whole transformed by a unique imagery that expressed the individual program.

In 1920 Kromhout, who had been president of the Amsterdam club, Architectura et Amicitia, was instrumental in founding, with Michiel Brinkman (1873–1925), a new association, *De Opbouw,* dedicated to architectural debate. It would attract various factions, including representatives of De Stijl, theosophists (the universalist philosophy popular with many Dutch cultural leaders), and dedicated functionalists, who brought in avant-garde architects from Germany and the Soviet Union and rejected the aesthetic priorities of other members, in part as a response to the urgent task facing architects and city officials—creating inexpensive housing.

In 1916 Rotterdam established a Municipal Housing Service, which embarked on constructing extensive new residential quarters outside the center. Among the most acclaimed are the blocks (1919–21) by Brinkman on Justus van Effenstraat in Spangen, a new worker's neighborhood, which provide housing for 270 families and community facilities—a bathhouse, a laundry, and a children's play space—in the generously sized interior courtyards. The first two stories are composed of flats; those at ground level have modest private gardens. Portals provide access to the interior terrain where the entries to most of the dwellings are located. Comprising the top two stories are *maisonettes,* the doors of which open onto a continuous gallery wide enough to permit delivery vans and provide exercise space for children.

Spangen also is home to the first municipal housing by Oud, city architect from 1918–1933; I & V (1918–20), and VIII & IX (1919–20). These necessarily sober brick perimeter blocks are enlivened by abstract sculptural effects at the corners and over entryways and windows, which reveal, however tenuously, the impact of De Stijl, to which Oud briefly belonged but felt obliged to leave when he took the municipal job, believing that social projects precluded its formal tactics. More obviously indebted to that movement was the red, yellow, and blue temporary superintendent's office of 1923 (recently reconstructed) belonging to the *Witte Dorp* (white village) in Oud-Mathenesse, another worker's quarter. The modest one-and-a-half story row houses, intended as semipermanent, remained in use until the 1990s. Oud's most mature housing project in Rotterdam, Kiefhoek (1925–29), is a canonical example of the International Style, with its continuous strip windows and taut, whitestuccoed surfaces.

One of the most justly celebrated examples of the *Nieuwe Bouwen* is the Van Nelle Factory and Administration Building, by Johannes Andreas Brinkman (1902–1949) and L.C. van der Vlugt (1894–1936) assisted by Mart Stam. The architects exploited all the possibilities of transparency and dynamic movement in this interconnected complex in which each of the varied functions is signaled by the contrasts of curved with rectilinear volumes, and rendered stucco planes with large sheets of glass. The structure, which includes novel mushroom-shaped columns, and the skin are skillfully distinguished in the prescribed manner of the International Style.

Another functionalist active chiefly in Rotterdam is Willem van Tijen (1894–1974), who shares responsibility—and fame—for two groundbreaking blocks of flats: Bergpolder (1932–34) and Plaslaan (1937–38), the former in association with Brinkman and Van der Vlugt, the latter with H.A.Maaskant (1907–77), who became his partner in 1937. Both were erected at the behest of the company NV Volkswoningbouw Rotterdam, established on the initiative of the municipal planner, A.Plate, to experiment with new construction techniques. Each stands discretely in a parklike setting, reflecting the tenets of Congrès Internationaux d'Architecture Moderne (CIAM), which was very influential in Dutch planning circles and was headed from 1930 to 1947 by Van Eesteren. Bergpolder, the first high-rise housing slab in the Netherlands, has balconies facing west and, on the eastern side, a gallery at each of its nine levels. The steel skeleton was enclosed with numerous prefabricated elements, still a rarity in the Netherlands at the time. The ten-story Plaslaan has a concrete frame and is more luxurious, with larger flats for the middle class. Orientation is reversed for views; the galleries are on the west. It has a roof terrace and at ground floor a laundry space, the concierge's dwelling, a few guest rooms, a shop, and storage space.

De Bijenkorf, Rotterdam (1957), by Marcel Breuer

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Represented also in Rotterdam is the most conservative movement in the Netherlands, the Delft School, comprised mainly of Roman Catholics and nationalists who believed in building according to the timeless Dutch tradition of loadbearing brick. The garden village Vreewijk, by Marinus Granpré Molière (1883–1972), with its pitched-roofed low-rise row houses is a significant example. So is the Museum Boymans-Van Beuningen of 1928–35, by A. van der Steur (1893–1953), city architect from 1931–39, who adapted the round arches and brick-and-stone vernacular worshipped by this school to the rare institutional building found in Rotterdam in this period. Yet a third way appeared in the singular architecture of Rotterdam native (and from 1915 to 1959 designer in various capacities for the National Dutch Railways), Sybold van Ravesteyn (1889–1983), who in the 1930s abandoned the functionalist route to introduce baroque themes and moderne decoration, as demonstrated in his various stations in Rotterdam (Beurs, Delftse Poort, and Feyenoord, 1934–37) and elsewhere and in the delightful Blijdorp Zoo (1937–41). In 1957, after many alterations from his first proposals of 1941, Van Rayestevn's Central Station for Rotterdam was completed.

On 14 May 1940, to force the Netherlands to capitulate, Nazi planes made a terrifying example of Rotterdam's inner city. Reconstruction after 1945 was as pedestrian as it was expedient, in part because of the attempt by municipal and national planners to negotiate a compromise between modern functionalists and the Delft School. One thoroughly functionalist project to receive international approbation was De Lijnbaan (1949–53), arguably the first car-free shopping precinct in the modern world. What made it particularly successful was its mixture of boutiques, offices, and housing, each in its own container (i.e., functions were combined not in a single building but in a single urban district). The two-story rows of shops are accessed on the front from pedestrian streets, with deliveries made in the rear via service streets that also serve the blocks of flats and offices behind. The concrete frame that structures the shops allows internal flexibility according to the needs of each retailer. Kiosks, plantings, and handsome paving articulating the module that governs the proportions are palliatives to the rather bland architecture. The apartments are by H.Maaskant and others, the shopping center by the firm of Van den Broek (J.H.; 1898–1978) and J.B.Bakema (1914–1981), which garnered innumerable commissions, and not just in Rotterdam, in the sixties and seventies.

Rotterdam has continued to expand its boundaries to create huge housing districts on the periphery. In 1974 the city again embarked on an aggressive policy of renewal, which as well as restoration of existing areas included new construction like the 549-unit superblock by Carel Weeber (b.1937), *De Peperklip* (1978–82), named for its unusual footprint. Its multicolored, tile-faced, prefabricated concrete panels acknowledge the Dutch fondness for polychromy, and its mix of apartment types is heir to the spatial ingenuity frequently encountered in this densely populated land. Exciting new developments are occurring as well on the Southern Tip, which besides housing includes commercial and government buildings such as Cees Dam's Central Tax Bureau and Wilhelmina Tower (1997–99), their strong cubic, curving and prow-shaped volumes boldly contrasting with each other.

A healthy shift began in the later '80s when institutional structures took their place beside the more practical building types. In the Rotterdam Schowburg (theater; 1982–88), Wim Quist (b. 1930) was asked by the municipality to provide for a complex program including opera, ballet, and different kinds of theatrical performances; it is a serious and sober building with an intricately sectioned interior that respects the functionalist tradition. More striking and lucid are the Deconstructivist Kunsthal (1988–92) by Rem Koolhaas and the Office of Metropolitan Architecture, and the Erasmus Bridge (1990–96) by UN Studio, headed by Ben van Berkel (b. 1957). Affectionately dubbed the baby-blue Monster, the 139-meter concrete and metal sky-colored bridge that spans 800 meters over the Maas challenges the skyscrapers in height and functions simultaneously as a thoroughfare for cars, cycles, pedestrians, and trams and as urban stage, lighted at night to reveal the dematerialized reflection of its daytime self.

Rotterdam's architectural position has been ratified by the fact that it now is the home of two prime institutions, both of which have moved from Amsterdam: first the Netherlands Architectural Institute (NAi), which in 1995 was installed in its remarkable polychrome and polytextured intertwined series of buildings by Jo Coenen (b. 1949), and the Berlage Institute, an internationally recognized educational facility established in 1990, that in 2000 relocated to the former bank building at Botersloot 25 (1951) by Oud. Further, Rotterdam takes pride in the fact that it resembles a giant construction site that is never fixed in place. It has embraced with unparalleled enthusiasm the new pluralism manifest during the last decade of the 20th century and, as European Design City of 2001, is determined to retain its uniqueness in the new millennium.

HELEN SEARING

S*ee also* **Amsterdam; Amsterdam School; Art Nouveau (Jugendstil); Berlage, Hendrik Petrus (the Netherlands); Breuer, Marcel (United States); De Stijl; Duiker, Johannes (the Netherlands); Foster, Norman (England); International Style; Jahn, Helmut (the Netherlands); Koolhaas, Rem (the Netherlands); Mendelsohn, Erich (Germany); Netherlands; Oud, J.J.P. (the Netherlands); Piano, Renzo (Italy); Skidmore, Owings and Merrill (United States); Team X, the Netherlands; Van Nelle Factory, Rotterdam**

Further Reading

Unlike Amsterdam, which has an extensive reading list in English, Rotterdam thus far has been examined chiefly in Dutch. Particularly useful for the English-speaking reader for the period when Rotterdam first gained attention as an architectural leader is *Rotterdam 1920–1960,* a catalog published on the occasion of five exhibitions on the *Nieuwe Bouwen*. Although it covers far more territory than Rotterdam alone, Rem Koolhaas's runaway favorite, *Small, Medium, Large, Extra-Large,* casts a fascinating and provocative light on the city and should be read by all who wish to fathom Rotterdam's character as manmade artifact. Although a general book on contemporary architecture and theory, 10×10 includes many projects executed in Rotterdam. For further references, see bibliography under the Netherlands.

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ROW HOUSE

The row house, also known as a town house in the United States or a terrace house in England, is a ubiquitous feature of Western urban landscapes. It is defined as one unit of a series of attached houses that shares at least one common wall with its neighbor. The traditional urban row house front is parallel to the street and shares sidewalls with its neighbors, giving it a narrow, rectangular footprint and only two facades. Generally, it is one or two rooms wide but varies in depth and height.

Certain features of the row house are timeless. It has housed the entire socioeconomic spectrum and thus ranges from luxurious in size and appointments to small and functional. Although it remained essentially a static, relatively rigid form until this past century, it has been affected by changes in architectural styles and societal needs in ways similar to freestanding homes. It is cheaper to build and easier to maintain, and its street access keeps residents attuned to their neighborhood. Its efficient land use and sense of private space make it an attractive alternative to higher-density apartment blocks. It has consistently fought the idea that attached housing is less desirable than freestanding housing and in the final decades of the 20th century has experienced a renaissance as a solution to many housing issues in historic and newly developing cities around the world.

Formerly, row houses were built by individual owners or in groups by small-scale speculators. Twentieth-century row houses, however, were most commonly built in entire blocks or complexes by developers who included community facilities as part of the complex. Row houses were designed not as individual entities but as component parts of a larger whole and were seen in relation to the community at large. Despite this emphasis on the whole, market-driven builders still attempted to make attached houses individualized and private by varying the facades, building materials, floor plans, and home sizes from unit to unit and minimizing intrusions from neighbors. There was increased attention to row house surroundings as well. It became universal to provide each unit with private outdoor living spaces, such as patios, balconies, and gardens, and landscaping became a crucial part of town house design. Access to services and private garages was provided by alleys linked to the urban street grid.

The form of the 20th-century row house had infinite variations defined by local or regional preferences or characterized by broader architectural design trends. Those built as urban in-fill often attempted to blend in by echoing older houses in scale, materials, and orientation, but architects emphasized individuality by varying the facades or staggering the houses by height or setback. As many were built in suburban areas, the row house form was liberated in these more expansive settings from the gridlike plots of city streets. Traditional straight rows continued, but circles, clusters, steps, and curves were common as well. Groups of houses were often designed to follow the topography of their location, rising up hillsides or curving along a shoreline, as seen in San Francisco or Miami. The shape of each house unit itself varied widely, from a plain gabled block to such extremes as a trapezoid or even a tilted cube, as in Piet Blom’s Pole Houses (1978–

84) near Rotterdam. The widespread adoption of central heating and electricity enabled open floor plans designed to meet the needs of different populations. Interior space was greatly expanded by the use of split-level floor plans. Large windows and glass walls brought in more air and light than ever before. Another universal change was the addition of the garage, as convenient parking was a much-desired amenity after the automobile was made affordable to the middle classes. Initially, the garage was tucked under or behind the house, but more recently it has become part of the ground-level facade. In terms of style, eclecticism was mixed with pure form; 20th-century row houses expressed all the major architectural trends of the century and admixtures thereof and were designed by idealistic architects and profit-minded developers alike.

Twentieth-century changes in society and land use have had an immeasurable impact on the row house, which diverged dramatically from its constricted plan and adapted itself to both city and suburban lifestyles with astonishing flexibility. Initially, its popular image was negative, as older row house neighborhoods became slums and the attached house seemed to connote an undesirable ethic. The vast spread of suburbs and commuter culture led to the building of millions of detached homes across the countryside while row houses were left behind in the cities to deteriorate. Although innovative row house designs were explored in prewar Europe and working-class row houses were still built in growing cities, the form was obsolete elsewhere. Urban-renewal efforts in the 1960s led to the razing of entire row house neighborhoods in favor of high-rise public housing, seen as the best way to house the inner-city poor. By the 1980s, however, social reformers concluded that this housing type bred crime, misery, and a sense of isolation, and soon many cities began tearing down the high-rise projects and replacing them with new row houses.

The rediscovery of the row house was not limited to public housing, however. By the 1970s, faced with environmental conservation efforts and rising land costs, developers began to reconsider town houses as a commercially viable option. The row house lent itself nicely to the concept of a condominium development, which gave it a more upscale image, and increasing concerns about sprawl have made town house communities a popular option. Greater appreciation of historic town houses has added to the appeal of new ones. Vacation homes have become another force behind the row house revival, as many resort developments were restricted in size because of land conservation and higher-density attached housing was needed to shelter increasing numbers of vacationers.

Finally, changes in the traditional family unit also supported town house developments, with increasing numbers of single people, divorced parents, childless couples, and retirees seeking smaller-sized homes. For many members of these groups, a row house fulfills the need for one’s own house and garden while providing certain amenities not found in a detached home. Increased security, decreased maintenance, lower costs, and a feeling of community among neighbors are common motivations. Many architects designed successful town house communities by targeting these demographic groups, adapting the once-inflexible row house to meet highly specific needs.

KATHERINE LARSON FARNHAM

Further Reading

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ROWE, COLIN 1920–99

Architecture historian and critic, England

Colin Frederick Rowe was born in 1920 in Rotherham, Yorkshire. He studied architecture at the Liverpool School of Architecture and wrote a thesis on the unpublished drawings of Inigo Jones under Rudolf Wittkower at the Warburg Institute. His studies with Rudolf Wittkower led to his coming into a Palladian inheritance, but his fascination with Palladio was not that of an art historian but that of an architect who saw in Palladio's use of harmonic proportions a series of clues that could be exploited to imbue all plans with intellectual qualities.

In 1951, Rowe was awarded a Fulbright Scholarship for study in the United States and at Yale University was able to work with Henry Russell Hitchcock. Hitchcock raised his interest in the transformations by which modernism developed out of 19th-century architecture. He also communicated his enthusiasm for walking in the city, whether it was New York or London, examining the evidence as it presented itself to the eye. This immediacy had a lot to do with Rowe's appeal, and it is also represented in both his writing and his lecturing style, which tended toward the conversational.

Between 1952 and 1953, Rowe traveled in the United States and worked in Vancouver with Sharp, Thompson, Berwick and Pratt on the Blue Cross Building and on Bakersfield Junior College in Los Angeles; he also traveled in Mexico and between 1953 and 1956 was at the University of Texas, Austin, where he taught for five semesters, collaborating with the design teacher Bernhard Hoesli and creating an entirely new framework for teaching architectural design. His brief intervention at Austin created the legend of the Texas Rangers, a band of teachers who saw a way of teaching modernity consistent with traditional architectural principles.

Between 1958 and 1962, Rowe was a lecturer at Cambridge University. There, Peter Eisenman fell under his spell and was induced to study Terragni closely and to become interested in Italian mannerism. Rowe's enthusiasm for the inherent contradictions that made Italian mannerism, allied to frequent trips to Italy, created something of a legend, and when he came to inhabit the Palazzo Massimi during a spell running the Rome program of Cornell University, it seemed perfectly appropriate, a personal apotheosis.

From 1962, Rowe was professor of architecture at Cornell, took up residence in Ithaca, and remained there as a teacher until his retirement. Under his influence, a whole generation of students at Cornell learned about the social nature of city space, well before it became a new orthodoxy, the inspiration for New Urbanism. For example, in the Manhattan Project of 1966, organized by Peter Eisenman's Institute for Architecture and Urban Studies, Rowe suggested that the city would be better approached not as a series of individual object buildings but as a basic ground—the city fabric—like a field of standing corn waiting to have spaces made in it. His approach was undoubtedly influenced by his experience of Italian cities, where the still-vital tradition of the *passagiatta* continued to represent the popular appeal of city space. This acute sense of the space as social conferred on Rowe's whole view of architecture an important freedom from the traditional art-historical approach.

It was Rowe's peculiar virtue to imbue the present moment of creation with an excitement derived from past moments of creation, and students were often sent to the library to check out the plan of a Palladian villa before drawing up their plan for a secondary school. In his very personal method of analyzing architecture as a sourcebook of new ideas, Rowe imbued Le Corbusier with a style that he hardly deserved. By the same token, architecture of any period could be scrutinized for its potential as idea. He never lost his sense of architecture as a unique form of mental activity: a story of how thought and feeling can imprint themselves on inert material. Without adopting any fashionable theory, he drew attention to the psychological dimension in architectural form, and without ever managing his career, he conveyed possibilities that have changed the course of architecture in England and in America.

Rowe was attracted by the openness of American society (he became an American citizen in 1984) and by the extraordinary effect that this freer horizon had on architectural models imported from Europe. During his five semesters at the University of Texas, Austin, he not only revolutionized the teaching of architectural design by bringing in European models but also alerted Americans to their own heritage by his praise for the city of Lockhart and generally by pointing to the continuity in the American revitalization of the classical and the dynamic quality of American settlements.

Rowe's life as a scholar was bent on the discoveries that come only through close reading. A master of hermeneutics, he was not intimidated by cultural studies and preferred to ignore "the whole semiology thing." His first essay, "The Mathematics of the Ideal Villa" (*Architectural Review,* 1947), remains in some ways his best, but all his writing was tremendous in showing how modern architecture, just as clearly as classical architecture, can be understood through the subtleties of form that it employs. In this way, he established a crucial continuity in architectural culture.

In 1981, Rowe was awarded the American Institute of Architects' Topaz Award for services to teaching. In 1985, he was awarded the Andrew Dickson White Professorship in architecture at Cornell and became emeritus in 1990. After retirement, he resided for a time in London, bemoaning the death of James Stirling, whose "education" he had intended to complete. Bereft of old friends, he returned to Washington. In 1995, he received the Royal Institute of British Architect's Gold Medal. His books include *The Mathematics of the Ideal Villa, and Other Essays* (1976), *Collage City* (1978, with Fred Koetter), *The Architecture of Good Intentions* (1994), and *As I Was Saying* (three volumes, 1996). He died in 1999 in Washington, DC.

ROBERT MAXWELL

S*ee also* **Hitchcock, Henry-Russell (United States); Institute for Architecture and Urban Studies; Stirling, James (Great Britain)**

Selected Publications

"Introduction" in *Five Architects: Eisenman, Graves, Gwathmey, Hejduk, Meier,* 1975

T*he Mathematics of the Ideal Villa, and Other Essays,* 1976

C*ollage City* (with Fred Koetter), 1978

"Introduction" in *James Stirling, Buildings and Projects,* by Peter Arnell and Ted Bickford, 1984

T*he Architecture of Good Intentions,* 1994

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ROYAL INSTITUTE OF BRITISH ARCHITECTS (RIBA)

The Royal Institute of British Architects (RIBA) began its life in 1834 under the name "Institute of British Architects." After a Royal Charter was obtained from William IV in 1837, the term "Royal" was added, and the purpose of the RIBA was clearly expressed:

"(for) the general advancement of Civil Architecture and for promoting and facilitating the acquirement of the knowledge of the various Arts and Sciences connected therewith."

During the period from 1834 to 1900, most of the structure and workings of the 20th-century RIBA were put into place. Its Register of Architects, Architectural Library and Drawings Collection, Competitions Committee, Professional Practice Committee, Qualification Examinations, Scale of Charges, Code of Professional Conduct, membership rules, and publication of building contracts were all established during this time.

Architectural examinations became a compulsory condition of RIBA membership in 1882, but it was not until 1905 that the RIBA adopted the policy of statutory (rather than discretionary) registration of architects. This policy move was brought on by pressure from the Society of Architects, a body formed in 1884 by dissatisfied RIBA members. The Society of Architects and the RIBA later merged in 1925.

In 1931, a competition was held to design the national headquarters of the RIBA on Portland Place in London. This competition was won by George Grey Wornum (1888–1957), and the building opened in 1934. The building's appearance is very much a product of its time period: not quite completely modernist—instead, a rather stripped-down classicism bordering on Art Deco in its subtle usage of a limited palette of materials, generous proportions, and low-relief sculpture. The RIBA's London Headquarters, however, does befit a building representing a professional body: it is prominently located on the corner of Portland Place and Devonshire Street and contains the RIBA's library, a large auditorium, a bookshop, several sizes of gallery spaces, and the RIBA's administrative offices, all organized around a central main stairway.

One of the most significant changes to the RIBA in the 20th century was the Architects' Registration Act, which came into force on 1 January 1932. This took the responsibility for the architects' register away from the RIBA and gave it to a newly formed Architects Registration Council of the United Kingdom (ARCUK). This separation of duties came about because the RIBA was beginning to be seen by the government less like the representative body of the profession and more as merely a "gentleman's club." It was thought that if the register were kept separately from the RIBA, then the public's interests would be better served.

The RIBA, however, still maintained control over professional examinations and the schools of architecture that were accredited to conduct them. This division of labor is completely opposite to the situation in the United States, where the National Council of Architectural Registration Boards (NCARB) is responsible for architectural examinations and the American Institute of Architects (AIA) for professional registration. Membership in the RIBA (of which registration with ARCUK is mandatory) gives an architect the right to call him- or herself a "chartered architect," whereas registration with the ARCUK allows only for the title "registered architect."

The years following World War II saw a large increase in the number of architects in England to match the increased amount of construction, especially in the area of public housing. A widening of architects' responsibilities also occurred. In addition to the traditional roles of building designer and construction manager, British architects began to take leading roles in processes from large-scale town planning to smaller-scale furniture design. During this time, the RIBA focused its attention mainly on influencing the way that architects functioned and were treated. Topics such as fee scales, salaries, government interference, economic fluctuations, and the promotion of "good" architecture were addressed and attempted to be regulated.

In 1969, three separate companies owned by the RIBA were formed to provide additional services for RIBA members above those provided by membership fees. RIBA Publications Ltd issues legal and professional documents used by architects and the construction industry and also runs the RIBA Bookshops in London, Manchester, Leeds, Birmingham, and Belfast. RIBA Services Ltd provides technical and other services, such as the RIBA Product Selector, Office Library Service, Conference and Exhibition Service, Appointments (Employment) Bureau, and RIBA-approved Building Site Signboards. Finally, National Building Specifications Ltd publishes specification documents to be used in conjunction with professional contracts. The ownership of these companies was transferred to a holding company, RIBA Companies Ltd, in 1985.

The British economic boom of the 1980s, combined with government policies that decreased social architecture expenditure, saw many British architects move away from jobs with local government authorities and into the private sector. During this same time period, the RIBA was forced by the Thatcher government to change its standard fixed-percentage scale of charges from "mandatory" to "recommended." The result was a more competitive atmosphere in which architects began undercutting each other in hopes of a commission—devaluing the knowledge, skill, and experience that a professional architect possesses.

During the 1990s, the RIBA endeavored to become more open to its members and the general public. The most physical result of this campaign was renovating and restyling its London headquarters; incorporating a privately run cafe, a new bookstore, additional gallery space, and handicapped access; and founding an Architecture Center open to the public. In 1995, the RIBA introduced a program of compulsory Continuing Professional Development for its members, similar to the AIA's Continuing Education System (CES), in which members must periodically update their knowledge of professional and technical issues to keep abreast of new developments.

In 1993, a report to the Department of the Environment recommended abolishing architects' statutory registration with ARCUK and ending the protection of the title "architect." These recommendations did not come to be. Instead, in 1997, ARCUK was changed to the "Architects Registration Board" (ARB), a majority of whose council members are external lay members (nonarchitects). The consequences of this on the RIBA is yet to be seen in the 21st century.

CHRISTOPHER WILSON

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RUDOLPH, PAUL 1918–97

Architect, United States

The American architect Paul Marvin Rudolph is best known for his large-scale, rough-surfaced concrete buildings of the 1960s. His architecture, inspired by the postwar work of Le Corbusier and Frank Lloyd Wright, is often confused with the Brutalism practiced by the Smithsons and theorized by Reyner Banham. Along with Eero Saarinen, Philip Johnson, Edward Durell Stone, and Minoru Yamasaki, Rudolph rejected functionalism in favor of a highly expressionist architecture based on historical precedents. He turned away from the Bauhaus-derived values that he had learned from Walter Gropius at Harvard University's Graduate School of Design in an attempt to reconcile Wright and Le Corbusier to produce a monumental, urban architecture. Rudolph's architecture is one of the most complete expressions of the humanistic and often heroic ambitions of postwar American architecture.

During the late 1950s and early 1960s, Rudolph was internationally acclaimed as one of the most imaginative heirs to the first generation of modernists. He was widely emulated for his boldly graphic drawing style, which emphasized the section, and for the rugged surfaces of his buildings. Rudolph accomplished a great deal in a short period of time, but by the early 1970s his highly ambitious works had fallen out of favor with the rise of Postmodernism, and he received little notice afterward.

As chairman of Yale University's architecture department (1958–65), Rudolph made it one of the most important American architectural schools of the decade. He was well regarded as a teacher, attracted top students, and fostered an Anglo-American axis that introduced such important figures to the United States as James Sterling, Colin St. John Wilson, and the Smithsons to serve as critics and teachers at Yale. Most remarkably, he was the architect of his own school, Yale's Art and Architecture Building (1958–64), which is among the most controversial of the large-scale concrete buildings of the 1960s.

Born in 1918 in the small town of Elkton, Kentucky, to the family of a Methodist minister, Rudolph spent his formative years not far from the public works projects of the Tennessee Valley Authority in the mountainous region where Alabama, Kentucky, and Tennessee intersect. He excelled in music and art. A formative experience was seeing Frank Lloyd Wright's Usonian Rosenbaum House (1939) in Florence, Alabama. As an undergraduate from 1935 to 1940, Rudolph studied architecture at the Alabama Polytechnic Institute (now known as Auburn University), where he received a Beaux-Arts education and first noted the potential that the regional buildings of the Deep South had for modern architecture. Rudolph's talents were recognized, and he received a scholarship from Harvard's Graduate School of Design, newly reorganized under Joseph Hudnot and Walter Gropius.

Before matriculating at Harvard in 1941, in 1939 Rudolph journeyed south to see Wright's Florida Southern College in Lakeland, Florida, which would inform many of his later campus designs. In Florida, Rudolph met Ralph Twitchell, an architect who was building beach houses in nearby Sarasota based on Wright's Usonian designs. Rudolph worked briefly with Twitchell before leaving for Harvard in the fall of 1941. There, he studied under Walter Gropius and Konrad Wachsman and made the acquaintance of students who would become his life-long colleagues, such as I.M. Pei and, most significant, Philip Johnson.

Rudolph spent most of World War II supervising ship construction in the Brooklyn Navy Yards, where he recognized the significance of the new wartime materials and developed his unique drawing style. After the war, Rudolph completed his degree in just one semester (1947), traveled to Europe on a prestigious Wheelwright Fellowship (1948–49) from Harvard, and entered into a partnership with Ralph Twitchell in Florida. In Sarasota, Rudolph's design talents complemented Twitchell's salesmanship to produce between 20 and 30 eloquent, structurally expressive beach houses. These houses received international attention, mainly because of Rudolph's innovative graphic presentation. His pen-and-ink chiaroscuro-like style was instantly recognizable and easily reproduced in architectural journals. Twitchell and Rudolph's best-known house was the Cocoon, or Healey Guest House (1948), which used cocoon—a preservative plastic spray used to mothball ships in the Brooklyn Navy Yards—to create a dramatic catenary roof.

Always intensely individualistic, Rudolph began his own practice in 1952. At the same time, he renounced Gropius's concept of "teamwork" and the functionalism that he had been taught at Harvard. He lectured extensively in architecture schools throughout the United States and soon formulated a philosophy that reacted against functionalism in favor of the expressionism that he would adhere to for life. In his 1956 lecture and article, "The Six Determinants of Architectural Form," Rudolph said that in addition to function, architects should consider the importance of environment (by which he meant surroundings rather than a concern for nature), regionalism, materials, psychology, and spirit of the times.

An early advocate of urbanism, Rudolph attempted to integrate his buildings into the preexisting conditions of the site, as in his first major public commission, the Mary Cooper Jewett Arts Center (1958) in Wellesley, Massachusetts. His early efforts were often classed with the formalist or eclectic work of Philip Johnson, Minoru Yamasaki, and Edward Durell Stone. The Jewett Center featured screens in the manner of Stone and received widespread acclaim for the sensitive manner in which it dealt with the problem of inserting a modern structure into a historic campus. Before the project was completed, Rudolph was named chairman of Yale's architecture department at the age of 39.

Yale University Art and Architecture Building, New Haven, Connecticut. Designed by Paul Rudolph (1964)

Soon after, Rudolph received the commission for Yale's Art and Architecture Building (1958–64), a building that would unite the teaching of the arts in one monumental structure in fulfillment of many of Rudolph's developing ideas about urbanism. The building was a monumental gateway marking the western edge of the campus. It was the culmination of a processional that led the pedestrian from the New Haven Green past Yale's earlier arts building, among them Louis Kahn's Yale University Art Gallery (1955). The rough-edged, corduroy-like exterior was achieved by first pouring the concrete into forms and then breaking the ridged edges with a bush hammer to create an irregular outline that would cast an ever-changing play of shadows across the facade. Although it was similar to Le Corbusier's *beton brut,* this method was actually derived from the precisely rendered parallel lines in Rudolph's pen-and-ink drawings. The building resembled both Le Corbusier's La Tourette (1955) and Wright's then recently demolished Larkin Building (1903).

However, in violation of the established norms of modernism, the labyrinthine interior seemed to have little relation to the exterior. The 36 or so different levels were arranged in a pinwheel-like form around two double-height central spaces containing a drafting room and jury pit. The building was topped by a glamorous penthouse that housed visiting lecturers and critics overnight. The sublimely gloomy, cavernous interior spaces disconcerted many who thought that they were more like a glimpse into the maker's unconscious than a rational design for a school for the arts. Rudolph carpeted the building in a startling bright orange and decorated the interior with works of art, including a curtain by the abstract expressionist artist Willem de Kooning.

Critics such as Nikolaus Pevsner, who still upheld the Bauhaus as the norm, warned students in a dedication speech not to emulate so individualistic a building. Charles Jencks labeled the building “camp”—the exaggerated homosexual style first theorized by Susan Sontag in her 1961 essay, “Notes on ‘Camp.’”

Camp, however, was precisely the point. With its intricate interiors and decorative use of Beaux-Arts plaster casts and ornamental fragments from demolished Louis Sullivan buildings, the interior of the building can be interpreted as a product of the homosexual camp, also practiced by Philip Johnson at this time, that reacted against the normative conditions enforced by postwar modernism and society. Most remarkably, the rough-edged concrete surfaces found both inside and out gave the building an aura of aggression that had as much to do with the hypermasculinization of postwar homosexual culture (e.g. the interest in bodybuilding and male figures of rebellion, such as James Dean and Marlon Brando) as it did with anything found in the culture of architecture. Vincent Scully said that the roughened surfaces were sadomasochistic. “The building repels touch: it hurts you if you try,” he wrote in *Architectural Review* in 1964. Rudolph intended his surfaces to be a statement in favor of decoration and expression—qualities long repressed by the Modern movement—and against the alienation and corporate conformity of the slick, glass-walled structures of the International Style.

Although it was soon called “Brutalist,” the building’s highly aestheticized values were in fact the diametric opposite of the British Brutalism practiced by the Smithsons. In fact, Banham said that the Art and Architecture building had nothing to do with his definition of Brutalism. The building was actually the culmination of the monumental, heroic humanism of the 1950s practiced in the United States. It was the final project of Yale President A.Whitney Griswold’s campaign to create for Yale a museum of modern architecture with buildings by Eero Saarinen, Philip Johnson, and others that would defend the liberal arts against the sciences and mass culture.

The accidental burning of the building in 1969 at the height of student unrest and the apocrypha that this has generated has unfortunately overshadowed Rudolph’s other achievements. Leaving Yale in 1965 for private practice, Rudolph began a series of campus buildings and master plans in a similar vein, among them the Charles Dana Arts Center (1963–66) at Colgate University in Hamilton, New York; the chapel and master plan for the Tuskegee Institute (1958–69) in Tuskegee, Alabama; the Boston Government Services Center (1962–71); and the master plan for a campus that he regarded as the most complete expression of his ideas: the University of Massachusetts (1963–72) in Dartmouth. An idea for which Rudolph is rarely given credit was the development of a rough-surfaced, mass-produced concrete block ubiquitous in American construction during the 1970s that economically imitated the effects of his bush hammer construction.

By the early 1970s, Rudolph’s monumental projects had fallen out of favor with clients who thought that they were expensive and impractical and with a younger generation that now saw them as representing the Establishment. A casualty of state politics, the University of Massachusetts campus was taken away from Rudolph and completed by others, and the Boston Government Services Center—intended to house the health, education, and welfare bureaucracy of the Great Society—was never completed. This virtual ruin became a symbol of the demise of the liberal idealism of the 1960s after the political and economic disarray of the early 1970s. The chorus of critical voices that had begun to turn against Rudolph culminated with the publication in 1972 of Robert Venturi, Steven Izenour, and Denise Scott Brown's unfavorable comparison in *Learning from Las Vegas* between his Crawford Manor Housing for the Elderly (1962–66) in New Haven, Connecticut, and Venturi and Rauch's Guild House (1960–63) in Philadelphia, Pennsylvania. Ironically, Rudolph had hired Venturi to teach at Yale, and there were many similarities between their ideas.

During the 1970s and 1980s, Rudolph returned to practicing architecture in an austere, almost 19th-century atelier-like environment. He maintained rigorous control of his drawings as the key to his creativity and produced two important private works: the Bass House (1970–72) in Fort Worth, Texas, a large villa that combined elements of Wright's Fallingwater with the lightweight architecture of the 1920s and 1930s, and his own multilevel private penthouse apartment (1977–97) on Manhattan's Beekman Place, a sybaritic fun house of multiple layers and transparent Plexiglas surfaces derived from his drawing methods and designed to accommodate his roving, homoerotic gaze.

In the 1980s, Rudolph embarked on an ambitious new career in Southeast Asia as the designer of a series of startling sculptural skyscrapers in Hong Kong, Singapore, and Jakarta. These buildings were infrequently published and seen by few in the West, thus giving rise to the myth that Rudolph was inactive. By the late 1980s, however, Rudolph had developed a devoted following among critics such as Michael Sorkin, who saw Rudolph as the last holdout against Postmodernism at a time when many of his contemporaries had turned their backs on their modernist past. Few acknowledged that Rudolph's reaction against functionalism and the International Style had in fact informed Postmodernism, particularly the branch theorized by Venturi.

Rudolph died in 1997 just at the moment when his architecture was undergoing a reappraisal by subsequent generations. He left behind a remarkably varied group of students in the United States and Britain who have become the leading practitioners of the last quarter of the century: Stanley Tigerman, Robert A.M.Stern, Charles Gwathmey, Der Scutt, Sir Norman Foster, and Richard Rogers.

TIMOTHY M.ROHAN

Biography

Born in Elkton, Kentucky, 23 October 1918, the son of a Methodist minister. Attended Alabama Polytechnic Institute (now Auburn University) 1935–40; studied under Walter Gropius at the Graduate School of Design, Harvard University, fall 1941. War years were spent as a lieutenant supervising ship construction in the Brooklyn Navy Yards. Returned to Harvard and received master's degree in 1947. Winner of a Harvard Wheelwright Fellowship for travel 1948–49. Chairman Yale University's School of Architecture 1958–65: pupils included Stanley Tigerman, Robert A.M.Stern, Charles Gwathmey, Der Scutt, Sir Norman Foster, and Richard Rogers. Partners with Ralph Twitchell, Sarasota, Florida, 1947–52. Independent practice, 1952–97. Died in New York, 8 August 1997.

Selected Works

Rudolph's extensive archive of drawings and papers is now housed in the Library of Congress, Architecture, Design and Engineering Collection in the Division of Prints and Photographs. Rudolph gave several important drawings to the Museum of Modern Art, New York, as well.

Healey Guest House/Cocoon House, Siesta Key, Florida (with Ralph Twitchell), 1948

Mary Cooper Jewett Arts Center, Wellesley College, Wellesley, Massachusetts, 1958

Yale Art and Architecture Building, Yale University, New Haven, Connecticut, 1964

Crawford Manor Housing for the Elderly, New Haven, Connecticut, 1966

Charles A.Dana Creative Arts Center, Colgate University, Colgate, Massachusetts, 1966

Chapel and master plan for the Tuskegee Institute, Tuskegee, Alabama, 1969

Boston Government Services Center, Boston, 1971

Master plan and humanities building for the University of Massachusetts, Dartmouth, 1972

Bass House, Fort Worth, Texas, 1972

Paul Rudolph residence, Beekman Place, New York, 1977–97

Colonnade Condominiums, Singapore, 1987

Office headquarters for Dharmala Sakti, Jakarta, 1988

Bond Centre Office Towers, Hong Kong, 1988

Concourse Offices and Condominiums, Singapore, 1992

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"Walter Gropius—the Spread of an Idea," *L'architecture d'aujourd'hui* (February 1950) (special issue devoted to the work of Gropius and his students in the United States)

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RUSSIA AND SOVIET UNION

The origins of 20th-century Russian architecture derive not only from technological advances in construction at the turn of the century but also from a reaction to 19th-century Western eclectic styles that architects in St. Petersburg and Moscow applied profusely to the facades of apartment houses and commercial buildings. By the 1870s, there arose a national style based on decorative elements from medieval Muscovy as well as on motifs from folk art and traditional wooden architecture. Major examples of the Russian style in Moscow include the Historical Museum (1874–83), built on the north side of Red Square to a design by Vladimir Shervud (1833–97), and the Upper Trading Rows (1889–93) by Alexander Pomerantsev (1848–1918), assisted by the construction engineer Vladimir Shukhov (1853–1939). The influence of this historicism continued through the early 1900s as the "neo-Russian" component of the style moderne. Painters such as Viktor Vasnetsov (1848–1926), who created the entrance building at the Tretiakov Gallery (*c.* 1905), and Sergei Maliutin (1859–1937) were particularly active in using traditional Russian decorative arts as part of a new architectural aesthetic.

The "new style," or style moderne, that arose in Russian architecture at the turn of the century included among its diverse sources the Arts and Crafts component of the Russian Revival style as well as Art Nouveau and the Vienna School. Its main emphasis was on the innovative use of materials such as glass, iron, and glazed brick in functional yet highly aesthetic designs. The style flourished above all in Moscow, where its leading practitioner was Fedor Shekhtel (1859–1926). Shekhtel worked primarily for patrons among Moscow's entrepreneurial elite, such as the extended Riabushinsky family. His most notable work was a mansion (1900–02) for Stepan Riabushinsky, which is rivaled by his more modernist design for the Alexandra Derozhinsky mansion (1901). Shekhtel also designed a number of commercial buildings and public buildings in Moscow, such as the Yaroslavl Railway Station.

Other leading architects of the early 20th century in Moscow include Lev Kekushev (1863–1919), Adolf Erikhson, and William Walcot (1874–1943). All three were involved in the prolonged construction of one of the largest and most significant moderne buildings in Russia: the Hotel Metropole (1899–1905). Like Shekhtel, both Kekushev and Walcot produced major examples of the modern style in the design of private houses for wealthy clients.

In St. Petersburg, the style moderne appeared primarily in the design of apartment complexes by architects. (St. Petersburg's relatively compact urban plan impeded the construction of detached private houses.) Yet, despite the rapid expansion of apartment space, the lack of adequate housing, particularly for workers, remained a major social problem. The style moderne also appeared in St. Petersburg's commercial buildings, such as the Singer Building (1902–04) on Nevsky Prospekt by Pavel Siuzor (1844-c.1919).

After 1905 the style moderne began to merge with a form of modernized classicism, known in Russia as *neoklassitsizm*. Architects in St. Petersburg were especially receptive to the neoclassical revival, and they applied it to almost every major structural type, including banks, department stores, apartment buildings, and private houses. One of the most accomplished and versatile architects in this style was Fedor Lidval (1870–1945), designer of the Hotel Astoria (1911–12).

In Moscow the most accomplished revivalist was Roman Klein (1858–1924), architect of the Museum of Fine Arts (1897–1912; known since 1937 as the Pushkin Museum) and the Muir and Mirrielees department store (1906–08). Although less prolific than Klein, other architects distinguished themselves in a more austere variant of the neoclassical revival for major office buildings in Moscow's commercial center. In contrast to

Territorial Executive Committee Building, by A.D.Kriachkov and others, Norosibirsk, Russia their American contemporaries, Russian architects made little use of the skeletal frame in the design of large buildings, but they frequently applied new techniques of reinforced-concrete construction.

Russia's rapidly developing industrial base lay in a shambles after a war, a revolution, and a civil war; technological resources were extremely limited in what was still a mainly rural nation; and Moscow's population—poorly housed before the war—increased dramatically as the city became in 1918 the administrative center of a thoroughly administered state. One of the USSR's earliest edicts, in August 1918, repealed the right to private ownership of urban real estate. Even as the country plunged into civil war, groups of architects in Moscow and Petrograd (formerly St. Petersburg) designed workers' settlements that represent an extension of the Garden City movement which had already tentatively appeared in Russia during the decade before World War I.

The prerevolutionary building boom had established a viable foundation, in both architectural theory and practice, for urban development on a large scale. Furthermore, the Russian architectural profession was relatively intact after the emigration that decimated other areas of Russian culture after the revolution. In addition, the most prominent art and architectural schools in Moscow and Petrograd were capable of providing a base for the development of new cadres despite sometimes sweeping changes in the composition of the faculty. Nonetheless, there were enormous problems in resuscitating these institutions, of allocating resources for new construction, and of devising a plan for coordinating further development.

With the gradual recovery of the economy in the 1920s, bold new designs—often utopian in concept—brought the USSR to the attention of modern architects throughout the world. The assumption that a revolution in architecture (along with the other arts) would inevitably accompany a political revolution was soon put to the test by social and economic realities. The brief history of the Soviet avant-garde in architecture was marked by theoretical debates and factional disputes, such as that between rationalism and Constructivism. At the same time, the role of artists such as El Lissitzky, Kazimir Malevich, Vladimir Tatlin, and Nikolai Punin in defining new approaches to volume and structure had a profound impact on the conceptualization of avant-garde architecture.

Constructivism, the most productive modernist movement, adopted a rigorously functional approach to design that rejected "bourgeois" decorative effects and concentrated on clearly defined geometric volumes articulated on a monumental scale that expressed the ethos of the new state. Ironically, the backward condition of Soviet building technology in the 1920s often re-

Russia and Soviet Union

Izvestiia Building, designed by Grigory Barkhin, Moscow (1925–27)

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sulted in a primitive realization of those Constructivist projects that reached the stage of implementation.

In Moscow leading Constructivist architects and theoreticians included Moisei Ginzburg (1892–1946), whose most notable building was the apartment house (1928–30) for the People's Commissariat of Finance; Grigory Barkhin (1880–1969), designer of the

Izvestiia Building (1925–27); Ilya Golosov (1883–1945), architect of the Zuev Workers' Club (1927–29); Panteleimon Golosov (1882–1945), author of the Pravda Building (1930–35); and the Vesnin brothers, Leonid (1880–1933), Viktor (1882–1950), and Alexander (1883–1959), architects of a number of major projects, such as the Likhachev Palace of Culture (1931–37), built for the workers of a large automobile factory.

These and other Constructivist projects in Moscow set a standard for functional design in administrative and apartment buildings as well as social institutions, such as workers' clubs. Another prominent modernist active during the same period but not a part of the Constructivist movement was Konstantin Melnikov (1890–1974), known for his designs for exposition pavilions, a number of workers' clubs (most notably the Rusakov Club, 1927–28), industrial structures such as the Leyland Bus Garage (1926–27), and his own house (1927–29) in the Arbat district of Moscow.

Important projects by Constructivist architects also appeared in other Soviet cities, such as Leningrad, Kharkov, Gorky (Nizhnii Novgorod), Sverdlovsk (Ekaterinburg), and Novosibirsk. Notable examples in Leningrad include the Kirov District Soviet complex (1930–35), whose overall design was entrusted to the architect Noi Trotskii (1895–1940). Beginning in 1928, the five-year plans, with their emphasis on the rapid expansion of heavy industry, led to the massive rebuilding of industrial centers. In Kharkov, a massive complex of several buildings known as the State Industry Building (Gosprom, 1926–28) was designed by an architectural team headed by Sergei Serafimov (1878–1939). In Sverdlovsk, whose entire city center was redesigned with the participation of architects such as Moisei Ginzburg, a model housing development known as "Chekists' Village" (1929–38) was designed by I.Antonov, V.Sokolov, and A.Tumbasov. Industrial architecture also received much attention, as foreign architects such as Ernst May, Erich Mendelsohn, Hannes Meyer, and Albert Kahn collaborated with Soviet architects and engineers in creating mammoth industrial complexes. Theoreticians such as Ivan Leonidov (1902–59) developed concepts of the "linear city" for new industrial centers.

During the 1930s, more conservative trends asserted themselves in major buildings sponsored by the bureaucratic apparatus, as designs inspired by classical, Renaissance, and other historicist models received the party's approval. Prominent traditionalists, trained in the prerevolutionary neoclassical revival, included Ivan Zholtovskii (1867–1959), Aleksei Shchusev (1873–1949), and Noi Trotskii (1895–1940). Despite the formal break with Constructivism, earlier work by Shchusev and Trotskii belongs to the Constructivist movement, and other connections with the architecture of the 1920s continued throughout the 1930s. The grandomania of prewar Stalinist architecture is best expressed by the project for the Palace of the Soviets (1933–35) in Moscow, designed by Boris Iofan (1891–1976), Vladimir Gelfreikh (1885–1967), and Vladimir Shchuko (1878–1939). The structure was to be built on the site of the massive Cathedral of Christ the Savior (demolished in 1931), but the project was canceled in the late 1940s.

After World War II, architectural design became more firmly locked in traditional, often highly ornate eclectic styles, epitomized by the postwar skyscrapers in Moscow and other Soviet cities. Of the seven such towers in Moscow, the largest is the building of Moscow State University (1949–53) by Lev Rudnev (1885–1956), Pavel Abrosimov (1900–61), and Alexander Khriakov (1903–76). On this, as on several other projects during the Stalinist period, much of the construction was done by prison labor.

In the period following Stalin's death, in March 1953, a reassessment of priorities, particularly in regard to the housing crisis, led to a functionalism that had been among the goals of Soviet design and planning during the 1920s. Teams of engineers and architects began to produce standardized plans that could be applied with relatively simple technology, and the pursuit of a historical framework for architectural style was largely discarded, as indicated by the abolition of the Academy of Architecture in the early Khrushchev era. The acceleration of standardized construction achieved an impressive volume, first with five-story apartment buildings that appeared throughout the country and subsequently with mass-produced buildings as high as 20 stories and, in rare cases, even higher.

The industrialization of building and the curbing of decorative pomposity produced a different set of problems. Apart from the general monotony of design, creative projects were constrained by the processes of standardized, "industrial" construction based on prefabricated modules or precast-concrete forms assembled on-site. The seams and cracks that resulted from such methods of assembly gave many buildings a shoddy appearance. Whatever the project type, Soviet architects were usually faced with a narrow range of options limited by mass-construction methods and meager financial resources.

Even showcase projects with considerable support shared in the general monotony. The most prolific practitioner of postwar Soviet modernism was Mikhail Posokhin (1910–89), who had collaborated in the design of a Stalinist apartment tower on Insurrection Square but shifted adroitly into the new functionalism of the Sputnik era. His design for the Kremlin Palace of Congresses (1959–61, in collaboration with A. Mndoiants and others) had the appearance of a modern concert hall of huge proportions, whose marble-clad rectangular outline was marked by narrow pylons—also faced with white marble—and multistoried shafts of plate glass. The main virtue of its style was how relatively unobtrusively the large structure stood among the historic Kremlin ensemble, part of which had been destroyed in the 1930s.

Not all Soviet architecture of the modern period descended to nondescript conformity. Futuristic construction technology appeared in the Ostankino Television Tower (1967, N.Nikitin, L.Batalov, and others), a reinforced-concrete monolith of impressive design and engineering. The ferroconcrete shaft, 385 meters in height (on a foundation of only four meters), supports a steel-frame antenna superstructure that rises another 150 meters. Technological ingenuity also characterizes the design of many contemporary sports arenas, which, like television, served the regime's propaganda interests. Large stadium complexes began to take shape even in the late Stalinist period, such as Leningrad's Kirov Stadium (1950, A.Nikolskii and others) on Krestovskii Island and culminating with the Luzhniki stadium complex (1955–56, A.Vlasov and others) in south Moscow. The emphasis on the culture of sports, which reached a crescendo in the preparations for the 1980 Summer Olympics, produced some of the most interesting forms in contemporary Russian architecture. An example notable for its high technology and sweeping lines is the Velotrek bicycle racing stadium (1978–79, Natalia Voronina and others) in the west Moscow suburb of Krylatskoe, with a bifurcated roof composed of rolled-steel membranes four millimeters thick stretched between a pair of tilted elliptical arches supported by a truss frame system.

With the demise of the Communist system in the USSR, the revival of private practice in architecture seems likely to change the face of the profession, even as new problems arise in zoning, housing, and resource allocation. Foreign investment has encouraged the assimilation of Western commercial architecture, from modernism to postmodernism to deconstructivism. At the same time, historicist elements from Russian and even Stalinist architecture are being recycled in new projects for cities such as Moscow in order to achieve a distinctive, colorful urban environment. It would be premature to comment on the success of these efforts, but Russian architecture is rapidly regaining the variety that characterized it at the beginning of the 20th century.

WILLIAM C. BRUMFIELD

S*ee also* **Art Nouveau (Jugendstil); Constructivism; Golosov, Ilya (Russia); Leonidov, Ivan Ilich (Russia); Melnikov, Konstantin (Russia); Moscow, Russia; Shekhtel, Fedor (Russia); St. Petersburg, Russia; Vesnin, Alexander, Leonid, and Viktor (Russia)**

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S

SAARINEN, EERO 1910–61

Architect, Finland

Eero Saarinen shared the same date of birth with his famous architect father, Eliel (20 August 1873 and 1910); both the elder and the younger Saarinen were and are very likely to remain the only father-son duo recipients of the Gold Medal of the American Institute of Architects.

The younger Saarinen was born in Kirkkonummi (Kyrksläte), Finland (then Russia) and grew up in the secluded retreat of "Hvitträsk," the home/studio where Eliel Saarinen entertained many of Finland's intellectuals and artists and produced ideas in architecture and planning. Saarinen attended high school at a special progressive school housed within the University of Michigan's School of Education (then nearby Baldwin High School in Birmingham, Michigan) and apprenticed in the Cranbrook architectural office from 1928 to 1931, taking eight months in Paris, France, beginning in late 1929 to study sculpture at the Académie de la Grande Chaumière. After his return to Cranbrook, Saarinen developed furniture designs from 1930 to 1931 that concurrently embraced a conscious variety of styles, from handicraft to an industrial aesthetic. He entered Yale University in the fall of 1931 and completed Yale's five-year program in three years.

With the award of a traveling fellowship, Saarinen visited Europe and the Near East and then worked in Finland, where he came in more direct contact with European modernism. Thus began his own synthesis of historic architecture and the progressive trends of technological innovation and its expression. On his return to the United States in 1936, Saarinen entered into a partnership with his father separate from Cranbrook (Eliel Saarinen and Eero Saarinen, 1936–42). Through small commissions, independent competition entries, and collaborations, he achieved national recognition for his American modernism. He briefly worked as a designer for the office of Norman Bel Geddes on the General Motors "Futurama" building for the 1939 New York World's Fair. In buildings such as the Kleinhans Music Hall (1938–41, with Kidd and Kidd) in Buffalo, New York, and Crow Island School (1940, with Perkins, Wheeler and Will of Chicago) in Winnetka, Illinois, as well as first place in the 1939 national competition for the Smithsonian Art Gallery (unexecuted), the Saarinens became synonymous with a progressive style free of the radical overtones of the International Style.

Charles Eames was among the younger designers with whom Eero collaborated, and their molded-plywood furniture designs for the "Organic Design in Home Furnishings" competition and exhibition at the Museum of Modern Art (1941) established their position among a new generation of modernists. World War II saw a number of transformations in their practice, changes that also represented the gradual independence of the son from the aesthetic dispositions of his father. It was at the end of this period that Eero's entry in the 1948 competition for the Jefferson National Expansion Memorial (St. Louis, Missouri) was awarded first prize (both father and son submitted designs under the firm name, resulting in a brief confusion as to the winner). Presenting a "Gateway to the West," its abstract 630-foot-high catenary-arch form combined symbolism with technological daring and structural innovation.

Saarinen's aesthetic took on its own character during the 1940s with buildings such as the suspended tensile-roof structure of the "Demountable Space"/Community House project (1941, with Ralph Rapson) for the United States Gypsum Company, the "Unfolding House" project (1943–44) based on trailer/containers, and the "Serving Suzy" restaurant project (1944) featuring a mobile food service for the Pittsburgh Plate Glass Company. Built works included the Opera-Concert Hall and Berkshire Music Center at Tanglewood (1940–41) in Stockbridge, Massachusetts (a structure that employed laminated wood arches and tensile rod-suspended roofs); the steel Case Study House #8 and #9 (1945–50, with Charles Eames; #9 built as John Entenza House) for *Arts & Architecture* in Pacific Palisades, California; and the lightweight Music Tent (1949, with Smith, Hegner and Moore, Associate Architects) for the Goethe Bicentennial Convocation Music Festival in Aspen, Colorado.

The most significant example of this evolution was the postwar, $100 million General Motors Technical Center (1951–56, designed with Smith, Hinchman and Grylls, Associate Architects) in Warren, Michigan. The initial scheme of 1945 combined familiar design motifs of Eliel Saarinen, such as the interplay between a horizontal space (the man-made lake) and the vertical accent of a water tower and the younger Saarinen's desire for industrial objects. After three years, a new scheme, influenced by Mies van der Rohe, was proposed. This included the use of a standard planning module and a new thin-skin technology for the building envelopes based on car-manufacturing techniques, including the innovation of neoprene gaskets for window installation, modeled on the system developed for car windshields. The GMTC plan formed the background of a portrait of Saarinen on the 2 July 1956 cover of *Time* magazine.

The 1950s saw work ranging from the reductivist, anonymous, and abstract, such as the visually neutral indeterminacy of the IBM Manufacturing Plant (1956–59) in Rochester, Minnesota, and the Bell Telephone Laboratories (1957–62) in Holmdel, New Jersey, to the evocative expressionism in the forms of the thin-shell Trans World Airlines (TWA) airport terminal (1956–62) in New York City and the suspended roof of the David S. Ingalls Hockey Rink (1956–59) at Yale University in New Haven, Connecticut.

Structure and construction were used to serve themes other than structure in Saarinen's search for form. Formal invention was paralleled by technical innovation, where technique and evocative imagery were often merged. Representation was manifested in metaphorical forms, most notably in the TWA terminal's evocation of a "bird in flight." The Ezra Stiles and Samuel F.B.Morse Colleges (1958–62) at Yale University consisted of injection-formed concrete walls that alluded to a medieval community of scholars. The campus of Concordia Lutheran Senior College (1953–59) in Fort Wayne, Indiana, represented a Scandinavian village. At the Massachusetts Institute of Technology in Cambridge, the Kresge Auditorium (1950–55) and MIT Chapel (1953–55) oppose the advanced thin-shell technology of the auditorium dome against the primal imagery of a closed brick cylinder placed in a circular moat for the chapel. His only tall building, the Columbia Broadcasting System Headquarters (1960–64) in New York City, was also the last design of his career. Its solid, masonry cladding proposed his first departure from the modernist glass box, where he alluded instead to the context of Manhattan.

PETER C.PAPADEMETRIOU

S*ee also* **Airport and Aviation Building; Concrete; Dulles International Airport, Chantilly, Virginia; Expressionism; Gateway Arch, St. Louis, Missouri; Saarinen, Eliel (Finland); Tensile Structures; TWA Airport Terminal, New York**

Biography

Born in Kikkonummi, Finland, 20 August 1910; emigrated to the United States 1923; naturalized 1940; son of architect Eliel Saarinen. Studied sculpture at the Académie de la Grand Chaumière, Paris 1929–30; studied architecture at Yale University, New Haven, Connecticut; bachelor's degree in fine arts 1934; received a Charles O.Matchum Fellowship for travel in Europe 1934–36. Worked in father's architectural practice, Ann Arbor, Michigan 1936–41; partner, with father and J. Robert Swanson, Saarinen, Swanson and Saarinen, Ann Arbor 1941–47; employed in the Office of Strategic Studies, Washington D.C. 1942–43; partner, Saarinen, Saarinen and Associates, Ann Arbor 1947–50. Principal, Eero Saarinen and Associates, Birmingham, Michigan from 1950. Fellow, American Institute of Architects; fellow, American Academy of Arts and Sciences. Gold Medal (posthumous), American Institute of Architects 1962. Died in Ann Arbor, 1 September 1961.

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Kresge Auditorium and Chapel, Massachusetts Institute of Technology, Cambridge (with Anderson and Beckwith), 1955

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Ingalls Hockey Rink, Yale University, New Haven, Connecticut, 1959

Samuel F.B.Morse and Ezra Stiles Colleges, Yale University, New Haven, Connecticut, 1962

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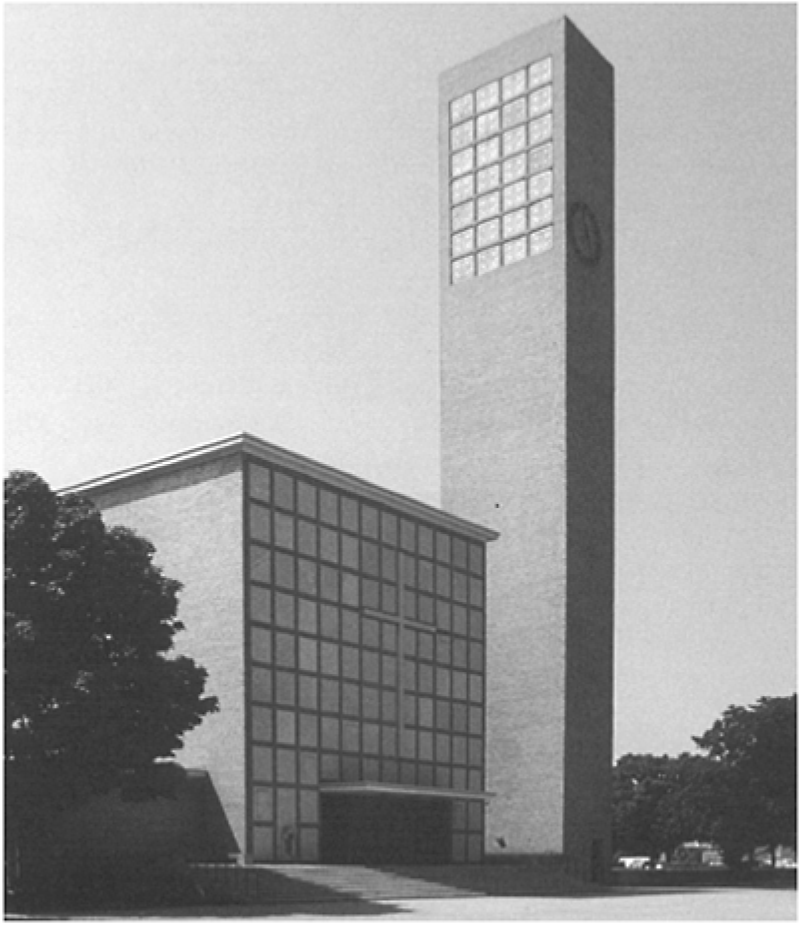
SAARINEN, ELIEL 1873–1950

Architect, Finland

Eliel Saarinen was a leading proponent of a humane approach to modernist architecture whose work was influential in bringing about a transition from the decorative obsession of Romantic Nationalist architecture to modernism. As designer and president of Cranbrook Academy (1932–50) in Bloomfield, Michigan, Saarinen had a significant impact on the teaching of architects and designers. Born in Rantsalami, Finland, the son of a highly educated and culturally aware Lutheran pastor, his early years were divided between rural towns and the city of Moscow. As a youth, Saarinen, who was impressed with the art of the Hermitage in Moscow, was more devoted to painting than to his formal studies at the lyceum. In 1893, his devotion to painting led him to study painting at the University of Helsinki while simultaneously studying architecture at the Polytekniska Institutet (1893–97). In 1896, while still an architectural student, he formed a partnership with two fellow students, Herman Gesellius and Armas Lindgren. They quickly won first prize in the competition to build the Talberg Building (1897) in Helsinki. More significant prizes and commissions followed. A first prize in the competition to design the Finnish Pavilion for the Paris Exposition of 1900 brought the partnership critical acclaim in Europe. Compared with the pavilions of other nations, the Finnish Pavilion was simple in form and refined in its combination of restrained and appropriately Nordic ornamentation, including frescoes by Akseli Gallen-Kallela.

Saarinen's ability to spend the long hours necessary for solving complex architectural problems was the basis for his subsequent success. With his designs for the Helsinki and Viipuri Railroad Stations, he moved away from seeking a uniquely Finnish solution and toward International Style modernism, allowing function to play an ever-larger role in determining his architectural solutions. Never sacrificing functionality for avant-gardism, his urban planning designs for Helsinki, Canberra, and Chicago retained a concern for community and context. Although none of these large-scale plans was realized, Saarinen was able to put his planning skills to good use in his designs for Cranbrook Academy.



First Christian Church (originally the Tabernacle Church of Christ), (1942)

Photo © Mary Ann Sullivan

Saarinen's early architectural practice focused on defining and creating a Finnish style of architecture, giving focus to the notion of *Gesamtkunstwerk,* or the total work of art. Exteriors tended toward the rugged and plastically picturesque using local rusticated soapstone or granite. Interiors were richly detailed, with the partners attending to every detail, from the design of tiled stoves to decorative carvings, many of which were derived from Finnish culture or landscape. This interest in *Gesamtkunstwerk* led the firm to design and construct Hvitträsk (1901–03), a communal office and dwelling complex located 18 miles from Helsinki. At Hvitträsk, they emphasized a cultured rusticity with exposed-log interiors, copper fireplace hoods, exposed beams, and a functional approach to the arrangement of space. A log tower and effective placement on a sloping, dramatic site above White Lake (Hvitträsk) emphasized a romantic attachment to the wilderness of the northern forests. Even as Hvitträsk was under construction, the partnership, and eventually Saarinen on his own after the partnership began to dissolve in 1905, moved away from Romanticism toward greater simplicity of ornament and formal clarity. The rugged stone-and-log construction and informality of Hvitträsk gave way to the smoother stuccoed exterior and formality of the Molchow House (1905–07) in Mark-Brandenburg, Germany. Saarinen's designs for the Helsinki Railway Station provide an excellent opportunity to observe changes in his approach to design; the medieval-style tower and crenellations of his early drawings gave way to the simpler, more streamlined elevations of the final design. His final design for the Helsinki Railroad Station demonstrates his awareness of German architecture in general and the influence of Behrens in particular. Glass and concrete play a large role in his railroad station designs. At Viipuri, a large concrete barrel vault with minimal ornamentation dominated the interior of the station's main hall. Large windows above the main entrance created an overall feeling of openness and efficiency. Ornamented soapstone columns and oak furnishing balanced this emphasis on function with their tactility.

After the disruptions of the Russian Revolution and World War I, Saarinen's second-place finish in the competition for the Tribune Tower (1922) in Chicago brought him again into the architectural limelight. Shortly thereafter, he traveled to Chicago and was soon working on plans to develop the lakefront of Chicago. In 1924, Saarinen became a visiting professor of architecture at the University of Michigan. In 1925, he was asked by George G. Booth to develop educational plans for what would eventually include Cranbrook Academy. From 1925 to 1950, Saarinen was architect-in-residence, and in 1927 he became the chief architectural officer for Cranbrook. Designs for Cranbrook include the Cranbrook School for Boys (1926–30), the Saarinen Residence (1928–29), the Kingswood School for Girls (1929–30), the Institute for Science (1931–33), and the Museum and Library (1942–43). Saarinen's design for the Museum and Library structures connected by a peristyle exemplifies his later, more austere approach to design. Large functional spaces, straight lines, and geometric formal relationships and the wall of glass on the north face of the library connect Saarinen's design with the International Style. On the other hand, the choice of brick and stone, the abstract designs of the ceiling, the figurative sculpture of Carl Milles' *Orpheus Fountain* to the north of the peristyle, and attention to the relationship between landscaping

First Christian Church (originally the Tabernacle Church of Christ), interior (1942)

Photo © Mary Ann Sullivan

and structure maintain a humanity not always present in International Style architecture.

DOUGLAS CAMPBELL

See also **Finland; Helsinki Railway Station, Finland; International Style; Saarinen, Eero (Finland)**

Biography

Born in Rantasalmi, Finland, 20 August 1873; emigrated to the United States 1923; naturalized 1945. Studied painting at the University of Helsinki and architecture at the Polyteknista Institutet, Helsinki 1893–97; degree in architecture 1897. Married sculptor and weaver Loja Gesellius 1904:2 children; son is architect Eero Saarinen. Partner, with Herman Gesellius and Armas Lindgren, Gesellius-Lindgren-Saarinen, Helsinki 1896–1905; partner, Gesellius-Saarinen, Helsinki 1905–07. Solo private practice, Helsinki 1907–23, Evanston, Illinois 1923–24, and Ann Arbor, Michigan 1924–27; collaborated with son, Ann Arbor 1937–41; partner, with son and J. Robert Swanson, Saarinen-Swanson-Saarinen, Ann Arbor 1941–47; partner, Saarinen, Saarinen and Associates, Ann Arbor from 1947. Visiting professor of architecture, University of Michigan, Ann Arbor 1924; director, 1925–32, president, 1932–50, director of the graduate department of architecture and city planning, 1948–50, Cranbrook Academy of Art, Bloomfield Hills, Michigan. Honorary member, Imperial Academy of Art, St. Petersburg 1906; honorary member, Deutsche Werkbund 1913; honorary member, Zentrale Vereinïgung der Architekten Österreichs, Vienna 1913; honorary member, Finnish Academy of Art 1920;

honorary member, Society of Arts and Crafts, Budapest 1921; honorary member, Freie Deutsche Academie des Stadtebaues 1922; honorary member, Royal Institute of British Architects 1924; honorary member, Society of Finnish Architects 1930; honorary member, Architects' Society of Uruguay 1931; honorary member, Central Institute of Architects of Brazil 1931; chairman, City and Regional Planning Committee, American Institute of Architects 1935; fellow, American Institute of Architects 1944; academician, National Academy of Design, New York 1946. Commander First Class, Finnish Order of the White Rose 1925; Grand Cross, Finnish Order of the Lion 1946; Gold Medal, American Institute of Architects 1947. Died in Cranbrook Hills, 1 July 1950.

Selected Works

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Finnish Pavilion, Paris Exposition (with Herman Gesellius and Armas Lindgren), 1900

Hvitträsk, Kirkkonummi (with Herman Gesellius and Armas Lindgren), 1903

Railway Station, Viborg, Finland, 1904

Molchow House, Remer Country Estate, Mark-Brandenburg, Germany (with Herman Gesellius), 1907

National Museum, Helsinki, 1912

Helsinki Railway Station, 1919

Tribune Tower (Second prize, competition), Chicago, 1922

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Cranbrook School for Boys, Bloomfield Hills, 1930

Kingswood School for Girls, Cranbrook, Bloomfield Hills, 1930

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Further Reading

Eliel Saarinen: Projects, 1896–1923 provides extensive coverage of Saarinen's career prior to his move to the United States. Christ-Janer's book provides biographical material, catalogs his architectural works, and covers Saarinen's career as an architect and educator.

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SAFDIE, MOSHE 1938–

Architect, Israel and Canada

An Israel-born and Canada-educated architect who has maintained practices in Jerusalem, Montreal, Boston, and elsewhere, Moshe Safdie is best known for his internationally recognized modern revisionist project, the Habitat housing experiment for the 1967 World's Exposition in Montreal.

The initial idea for Habitat came to Safdie when he was working on his student thesis concerning cellular housing, questioning the social, environmental, ethical, and tectonic ideas of modernist architecture. Safdie drew on his childhood memories of the Israeli settlements to create an unsentimental articulate structure based on these traditional forms. Habitat was one of the first prefabricated housing complexes built at the time and was the forerunner of R.Buckminster Fuller's megastructure Triton City (1968). Fuller's project model introduced a floating city comprised of prefabricated cellular units, a flexible structure that was never realized. It was during the late 1960s that Safdie, like Fuller, began to believe in the promise of industrialization and prefabrication for low-cost and improved structures. The 1960s espoused various collective social agendas by architects as well as politicians; similarly, architects and urban designers were reassessing the urban and architectural ideas of the modernists. Expo '67's Habitat project proved to be too expensive, and many difficulties arose in its construction. Greatly reduced in size, Habitat proved to evoke Safdie's revisionist attitude, one that rejected the Le Corbusian and Miesian vertical models of Unite d'Habitation and the Lake Shore Drive Apartments in Chicago.

During the 1970s Safdie concentrated his efforts on massive urban design schemes that emphasized context. One of these schemes was a plan (1971) for a new town, Coldspring, close to Baltimore, Maryland. During this time, he also produced a number of urban projects in Israel including the Yeshivat Porat Joseph Rabbinical College (1971–79) in Jerusalem and the Desert Research Institute (and Ben Gurion Archives) (1974) in the Negev. The Rabbinical College, located in the center of the Jewish Quarter of the old city, combines a traditionally shaped structure with traditionally shaped domes of the region, using modern construction and materials. In this work, Safdie explored the use of natural lighting and its symbolic quality. This symbolic use of lighting played a key role in his later works. Corresponding to its site and its context within the city, the Rabbinical College marries tradition with modernist invention. Safdie's work in Jerusalem particularly corresponds with the indigenous architecture of the city, blending with its traditional geometric shapes and colors as well as with the site.

In 1982, Safdie was commissioned by the Canadian government to design the new National Gallery of Canada in Ottawa. The building was completed in 1988, when he was then asked along with the firm Belzile, Brassard, Gallienne, Lavoie, with Sungur Incesulu and Maurice Desnoyers, to offer a scheme for a competition held for the Quebec Museum of Civilization (1988). They won the commission, and Safdie used ideas from his Jerusalem projects concerning the importance of place and cultural traditions; only this time, the northern and French culture of Canada was considered in the design process.

Safdie's writings, including *Beyond Habitat* (1970) and *For Everyone a Garden* (1974), argue for a reevaluation of modernism that promotes the humanistic and ethical dimensions of architecture. Safdie is also dedicated to the idea of the importance of designing public buildings that are intertwined with city street life. *Beyond Habitat by Twenty Years* (1987) reviews the architectural, aesthetic, and political concerns of the 1960s, from Habitat project through Postmodernism of the 1980s. Safdie admonishes the postmodernist agenda of historical eclecticism that centers on architecture concerned mainly with stylization and detachment from site. Safdie's technological ideas (manifest in Habitat) are also viewed as a starting point for other projects concerned with high-volume housing construction. He remains committed to a practice of contextualized architecture that is achieved through locality, iconography of site, color, and building technologies found geographically. His work investigates the importance of place, history, cultural identity, tectonics, and materiality.

REBECCA DALVESCO

S*ee also* **Exhibition Building; Fuller, Richard Buckminster (United States); Habitat 1967, Montreal**

Biography

Born in Haifa, Palestine (now Israel), 14 July 1938; moved to Canada 1955; dual citizenship 1959. Studied under H.P.D. Van Ginkel at McGill University, Montreal 1955–61; bachelor's degree in architecture 1961. Married 1) Nina Nusynowicz 1959 (divorced 1981): 2 children; married 2) Michal Ronnen 1981:2 children. Architect with Van Ginkel and Associates, Montreal 1961–62; architect with the office of Louis I.Kahn, Philadelphia 1962–63; section head, architect, and planner for the Canadian Corporation for the 1967 World Exhibition, Montreal 1963–64. Private practice, Montreal from 1964; private practice, Jerusalem from 1971; private practice, Boston from 1978; private practice, Toronto. Visiting professor, McGill University 1970; Davenport Professor of Architecture, Yale University, New Haven, Connecticut 1971; professor of architecture and director of the Desert Architecture and Environment Department, Desert Research

Institute, Ben Gurion University, Beersheva, Israel from 1975; professor of architecture and urban design and director of urban design program, Harvard University Graduate School of Design, Cambridge, Massachusetts 1978–84; Ian Woodner Studio Professor of Architecture and Urban Design, Harvard University Graduate School of Design 1984–89. Fellow, Royal Architectural Institute of Canada; member, Ontario Association of Architects; member, Israel Institute of Architects and Engineers; member Royal Canadian Academy of Arts; member, American Institute of Architects. Order of Canada 1988.

Selected Works

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Habitat Housing (unbuilt), New York, 1968, 1970

Habitat Housing, Israel, 1970

Town Plan, Coldspring, Maryland, 1971

Habitat Housing, Puerto Rico, 1972

Desert Research Institute and Ben Gurion Archives, Negev, Israel, 1974

Yeshivat Porat Joseph Rabbinical College, Jerusalem, 1979

Housing, Singapore, 1984

National Gallery, Ottawa (with Parkin), 1988

Museum of Civilization (First place, competition), Quebec (with Belzile, Brassard, Gallienne, Lavoie, Sungur Incesulu and Maurice Desnoyers), 1988

Khalsa Heritage Memorial Anandpur Sahib, Punjab, India, 1997–2005 (scheduled completion)

Hebrew College, Newton Campus, Massachusetts, 2000

Ben Gurion Airport, Tel Aviv, 2000

Exploration Place Science Center and Children's Museum, Wichita, Kansas, 2000

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SAINSBURY WING, NATIONAL GALLERY

Designed by Venturi, Scott Brown and Associates; completed 1991
London, England

The Sainsbury Wing by Venturi, Scott Brown, and Associates is the major 20th-century extension to England's premier art museum, the National Gallery, built in 1833–37 to the designs of William Wilkins (1778–1839). An addition by E.M.Barry was completed in 1876, and subsequently, galleries were added in piecemeal fashion in 1887, 1911, 1927, and 1970, but these are deferentially tucked behind the original building's main facade on Trafalgar Square. In contrast, the Sainsbury Wing confidently gestures toward its monumental urban setting and complements a building long perceived as awkward and compromised. The architects have cunningly mirrored the more pleasing stylistic features of Wilkins' Neoclassical structure while quietly serving practical needs by using the most sophisticated technology available in museum design.

The controversial history of this wing commenced in 1958, when the government acquired the site of the former Hampton's furniture store immediately to the west of the National Gallery. To encourage the government to raise funds to use these premises for museum purposes, the *Sunday Times* newspaper the following year mounted a competition that garnered an unmemorable group of proposals in the monolithic Brutalist style then dominating British architecture. Nothing came of the *Times's* intervention, and plans to extend the National Gallery on this site languished until December 1981, when the government launched its own contest. However, the program, addressed to developers as well as architects, was tainted from the outset by the requirement, for financial reasons, that the galleries should form but a small part of a larger commercial enterprise. From 79 entrants to the first phase in April 1982, seven architectural firms, each with its own developer, were selected to pursue the project. After much debate, Ahrends, Burton, and Koralek won the opportunity to finalize their proposal, but their definitive scheme met with general public dismay, most poignantly encapsulated in the words of Charles, prince of Wales, who in 1984 likened it to a "vast municipal fire station" as well as a "monstrous carbuncle on the face of a much loved and elegant friend." The misguided brief was set aside, and in 1985 the Sainsbury brothers—Simon, John, and Timothy, owners of a thriving supermarket chain and generous donors to the arts—offered a munificent gift to make possible the erection of an extension solely at the disposal of the National Gallery.

A reformulated competition was then held in which four British firms—James Stirling and Michael Wilford, (Alan) Col-

Sainsbury Wing, National Gallery, London

quhoun and (John) Miller, Jeremy Dixon, and Piers Gough of Campbell, Zogolovitch, Wilkinson, and Gough—were invited to submit entries. They were joined by the Americans Henry N.Cobb of I.M.Pei and Partners (today Pei, Cobb, and Freed) and Robert Venturi and Denise Scott Brown (at that time Venturi, Scott Brown, and Rauch). The choice in 1986 of Robert Venturi and Denise Scott Brown in the face of such a strong English showing was somewhat of a surprise, especially because Venturi, Scott

Brown, while not inexperienced in museum additions, had not previously executed a building in Britain. However, the jury found their scheme the most sensitive to the scenography of London's most celebrated square. Although all six entries, unlike the aggressively modernist designs in the 1982 competition, incorporated some references to the classical vocabulary of Wilkins' building, it was Venturi, Scott Brown, and Associates's proposal that most skillfully integrated the new with the old rather than standing as a separate entity. Their dramatic but sympathetic resolution turns on a veritable cascade of the Corinthian order, which begins to the west of the main entrance as a fluted, fully engaged column faithfully reproducing those on Wilkins' original portico. Then the rhythm quickens as a crescendo of irregularly spaced Corinthian pilasters form a masonry screen of Portland stone that inflects toward the National Gallery before terminating along the side as prelude to a glazed curtain wall, behind which lies the grand staircase. The concrete and steel frame facilitates the skillful composition of a complex variety of interior spaces.

Standing sentry at the entrance are slender, brightly painted metal columns reminiscent of John Nash (1752–1835) in an Egypto-Pompeiian mood. Within and immediately to the left is a large shop that also can be accessed directly from a side street. The foyer comprises a checkroom, an information desk, and an area sufficiently generous to accommodate informal concerts and performances. This space leads to the grand stairway, that icon of public architecture that has been strategically displaced from the center to the extremity of the wing, *a parti* used in other Venturi, Scott Brown institutional facilities, such as the Seattle Art Museum. The glazed envelope on the eastern side provides enticing views toward London's most famous square as well as to the original building. On the inner, more solid surface that defines the stair on the west, a limestone frieze, carved in early 19th-century lettering with the names of renowned artists, didactically enlivens the upward and descending journeys. The ceiling above the stair is punctuated by suspended metal arches that allude both to Renaissance structural systems and to Victorian iron architecture while reminding the visitor that subsequent building technologies and economies have rendered these arches a purely visual conceit.

At the topmost, fifth level lie the sixteen permanent galleries, comprising 1408 square meters and dedicated to the museum's European (notably Italian, northern, and English) masterpieces from 1260 to 1510. Because the pictures vary greatly in size, subject, and medium, providing a compatible home was a challenge but one that was met successfully by the firm in an appropriately contextual way. Each white-walled room, scaled to the works on display, is articulated by cool gray *pietra serena* moldings, doorframes, and Tuscan Doric columns, a combination beloved by the Florentine Filippo Brunelleschi. Another architect to whom homage is paid is Louis Kahn, whose museums gave Venturi, Scott Brown valuable lessons in circulation and lighting. Although a few British critics have faulted certain features of the Sainsbury Wing as being overly theatrical, eclectic, and mannered, the galleries have won widespread praise for their serenity and purity, qualities attained through the dignified details and the natural light that, purged of harmful ultraviolet rays and supplemented by artificial lighting, illuminates the Old Master pictures in a way that most favorably enhances their colors and textures. Clerestoried monitors, square or oblong according to the plan of their respective galleries, are set under a double-glazed roof that admits measured light via electronically controlled louvers. Passage through the collection may vary according to the visitor's preference, but enfilades give order to the spatial sequences. At this topmost level, the link to the main building provides an inviting vista toward the more richly colored and ornate older rooms.

Immediately below, on level 4, are restaurant facilities and other visitor services, including a unique computerized Micro Information Gallery. Level 3 contains the entrance foyer, and the auditorium and temporary galleries are located on the two lowest floors, beneath ground level, where daylight would inhibit the requisite flexibility. The galleries comfortably accommodate diverse types of exhibitions, whether monographic shows devoted to a single artist or epoch or thematic displays rich in objects and artifacts.

The historical references that enrich the architectural language of the Sainsbury Wing are particularly apposite to a museum, and allusions to Christopher Wren, medieval, Georgian and Victorian London, Italian masters of the Renaissance, and mannerist and baroque periods, as well as 20th-century heroes such as Sir Edward Lutyens, are discernible. One of the hallmarks of Venturi, Scott Brown, and Associates's variety of Postmodernism is the recognition that after modernism, one cannot return to history pure and simple; thus, they offer a piquant palimpsest rather than a revivalist copy, an interplay between past and present that is enriched by witty transpositions in scale, materials, and the putative functions of their sources and quotations.

HELEN SEARING

S*ee also* **Brutalism; Historicism; Kahn, Louis (United States); Lutyens, Edwin (England); Museum; Postmodernism; Venturi, Robert (United States)**

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SALK INSTITUTE, LA JOLLA, CALIFORNIA

Designed by Louis Kahn; completed 1966

In 1959 the City Council in San Diego, upon learning of the Salk Institute's intention to build a research institute, offered a number of sites for the development including a unique piece of coastal land in La Jolla. The remoteness of the site and its relationship to the vast Pacific Ocean are often commented on in relation to the building's function, as a place of cutting-edge research with philosophical implications. In February 1960 Salk had a site meeting with Kahn, who soon began work on a master plan. The complex was to include the laboratories, as well as two unbuilt components—a meeting hall and residences to the extreme west of the site. Apparently due to over expenditure on the laboratories, design work on the unbuilt components was suspended in 1963. Meanwhile, the property was deeded to Salk in April 1960, and construction of the laboratories proceeded from June 1962 until 1965.

Stage one of the Salk Institute comprises two parallel laboratory buildings that delineate the long sides of a rectangular courtyard space. Each laboratory block contains a column-free space that is 60 feet wide by 240 feet in length. Significantly, Kahn's design allowed each of the laboratory spaces to be coupled with a service floor. This allows each block to consist of two laboratory and associated service levels above ground and another such coupling of levels below ground—light reaches the lower laboratories via sunken courtyards on either side. Although the structure of the Richards Building fails to provide a satisfactory "servant" space for pipes and ducts at ceiling level, the Salk laboratories are each "served"—to use Kahn's words—by ninefoot-deep service floors, or "pipe laboratories." At the time these spaces seemed to provide excessive room for pipes and ducts, but since that time much of the space has been filled. These service floors occupy the spaces between a series of Vierendeel trusses, which Kahn developed with August Komendant, his engineer and collaborator on this and many other projects. In what would become a signature motif of his later work, Kahn rejected his contemporaries' rough handling of concrete, choosing instead to detail the off-form concrete for these laboratory blocks with great care and finesse. Like Le Corbusier's rough concrete *(béton-brut),* which was made famous in his Unite d'Habitation (1952) in Marseilles and his Capitol Complex (1952–60) in Chandigarh, concrete at the Salk Institute is presented as unmaniupulated. However, whereas Le Corbusier made a virtue of the often-unintentionally rough finish he achieved in his buildings in Marseilles and Chandigarh, Kahn's concrete at the Salk only displays the marks of carefully planned formwork and ties.

In the intermediate zone between the laboratory buildings and the central plaza are a series of small towers that comprise individual studies for the scientists. Each study features a 45-degree angled wall section providing oblique views of the Pacific Ocean to the west. The studies have weathered teak wall panels, providing the only moment of relief and counterpoint to the off-form concrete used elsewhere. Befitting their domestic scale, the study windows feature finely crafted glazing, insect screen, and sliding louver components, reminiscent of those found in Kahn's houses.

The Salk Institute's most memorable feature—its ascetic treeless plaza of travertine and concrete—was intended to feature two parallel rows of Italian cypress trees, until the laboratories were almost complete and Kahn began to have misgivings. Credit for the potent image that is so familiar today belongs to the Mexican architect Luis Barragan, who recommended to Kahn that the open space be left completely bare. Kahn conceived the resulting plaza as a “facade to the sky,” with a central canal that marks the development’s axis of symmetry. From the rear of the plaza, also known as the Theodore Gildred Court, the canal appears to extend to the ocean horizon; in fact, it spills into a series of pools below and to the west of the plaza.

According to Kahn, particular buildings of the same type share an archetypal counterpart, or form, which is seen in the mind’s-eye as a vague idea that can only be represented by an *esquisse-like* diagram. The Salk Institute is important in this context because it provided Kahn with an ideal arrangement, or archetypal form, for a laboratory building and a model for subsequent laboratory proposals, such as the University of Virginia Chemistry Building (unbuilt). In its form it would also be an intimation toward what Kahn termed “the unmeasurable,” a transcendent realm of inspiration with mystical and divine connotations.

STEVEN FLEMING

S*ee also* **Barragán, Luis (Mexico); Concrete; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Kahn, Louis (United States); Modernism; Research Center; Rationalism**

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SALMONA, ROGELIO 1929–

Architect, Columbia

The designs of Rogelio Salmona comprise over 70 projects built during the past 40 years and range from domestic to large housing complexes as well as institutional architecture. He is undoubtedly one of the most prolific and significant architects of Latin America.

Wanting to study fine arts but advised by his father to take a similar but more pragmatic route, Salmona entered the National University to study architecture in 1948. His first year of studies coincided with Le Corbusier's visit to Bogota, where he had been invited to develop an urban master plan. In 1948, Salmona's father decided to send his children to France in light of the increasing political unrest in Colombia. Salmona began working for the architect at the atelier de la rue de Sèvres 35, where he would stay for the next ten years. Under Le Corbusier, he would further develop his passion for drawing, thereby coming in direct contact with the pragmatic aspects of architecture though his work in projects such as the Jaoul and the Rob et Roq houses and in the projects for Chandigarh. At this same time, however, he began attending the lectures given by the art historian Pierre Francastel at La Sorbonne and developing a strong friendship with him. Francastel's social concerns and humanistic views deeply influenced Salmona's attitudes toward architecture and led him in particular to develop a sense for an architecture in tune with the Latin American reality and in opposition to both the precepts imparted by Le Corbusier and those emerging from the International Style.

From the onset, Salmona's preoccupations with craftsmanship infused his work with the tectonic aspects of architecture and a concern for its experiential qualities. His understanding of history, his intimate relation with the Colombian landscape, and his affinity for the use of brick (Bogota's local material par excellence) and concrete (with which he had worked extensively while at Le Corbusier's atelier) became his trademarks.

Three significant projects serve as a watershed in the career of the architect: the Torres del Parque residential complex (1967) in Bogota, the President's House for Illustrious Guests (1981) in Cartagena, and the National Archives of Colombia (1992) in Bogota. Las Torres del Parque is without doubt one of the most significant housing projects of its kind, built in the Americas at the precise moment at which the International Style precepts were being questioned. The project consists of three brick towers built on a steep plot at the northern edge of the Parque de la Independencia (Independence Park) at the beginning of the Monserrate foothills. Las Torres del Parque was designed to house some 1,500 dwellers in 300 units.

An architecture aligned neither to the vanishing ideals of the International Style nor to the emerging and multifaceted postmodern trends of the 1960s that replaced them, Las Torres is uncompromisingly fresh and vigorous, and it expresses a profound sympathy for a sense of urbanity, evocative of memorable places. In this project, Salmona also introduced a major choreography of urban places in which plant materials play a major role, giving a precise character to the outdoor zones of the project and integrating it with the adjacent park.

Salmona's President's House for Illustrious Guests in Cartagena is a careful intervention in the topography. While respecting and enhancing the silhouette of neighboring El Manzanillo fort, it creates a new landscape on what previously was a barren site occupied by ruins. To accomplish this, Salmona used simple pragmatic principles derived from the Spanish-Moorish tradition as well as from pre-Hispanic sources.

The President's House is a compound formed of seven courtyards. Quarters for the president, his guests, and accompanying personnel have been carefully arranged around these courtyards. Additional facilities include a living room, a dining room, meeting rooms, a library, and service areas. Throughout the house, the materials used in its construction are consistent: brick, tile, coral stone, concrete, and hardwood. Rooms vary in proportion according to their function, yet they maintain a continuous unity. Differentiation is evident everywhere, carried out with extreme subtlety. The President's House speaks clearly of solemnity and becomes a lesson in the restrained use of materials and forms.

In the General Archives of Colombia, site, history, and distance become integral elements of Salmona's form-making process. It is not accidental that Salmona, although alluding to the traditions of Colonial architecture in Colombia, reintroduces two important concepts evident in pre-Columbian buildings and poetry: the roof ambulation and the skewed access to precincts along diagonal lines. It is possible to experience both wandering and wondering on the Archives' roof, which has become the ludic area of the building occupied by a garden and areas adjacent to the cafeteria. Pedestrians on the roof can view and seize the entire surrounding urban panorama modulated by the distant landscape while observing the comings and goings of users traversing the building's great central cylindrical void. The central space of the Archives is undoubtedly a significant addition to the public spaces of Bogota. Acting as a sounding box that gathers the echoes, the light, and some of the landmarks of the city, it is, in every sense, a memorable place.

RICARDO L.CASTRO

S*ee also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France); International Style; Parliament Building, Chandigarh**

Biography

Born in Paris, 28 April 1929. Studied at the Universidad Nacional de Colombia, Bogota 1948–49; apprentice to Le Corbusier, Paris 1949–57; attended the École des Hautes Etudes Sociales, Sorbonne, Paris 1949–57; studied at Metiers Art School, Paris 1953–54. Returned to Colombia in 1958; began a successful architectural practice in Bogota and started teaching at the Universidad de los Andes. Granted a professional degree in 1963 by the Universidad de los Andes.

Selected Works

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Full details of Salmona's biography appear in Téllez, which also includes illustrated critical analyses of the most significant buildings prior to 1991. Sixteen significant projects up to 1997 are discussed and illustrated in Castro.

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SANT'ELIA, ANTONIO 1888–1916

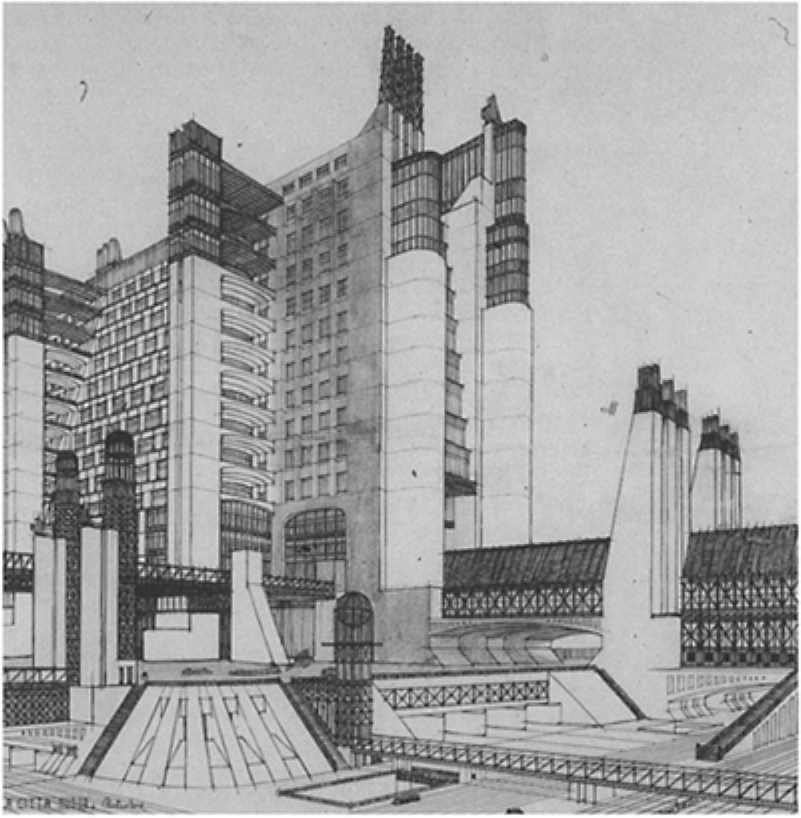
Architect, Italy

Sant'Elia attended a technical school in Como and graduated as master builder in 1906. He moved to Milan in 1905, where he worked as a draftsman for a canal company, then for the municipal engineering department. In 1909, his study for a villa appeared in the Milanese review *La Casa,* and he enrolled at the Brera Academy. Between 1911 and 1914, Sant'Elia participated in numerous competitions and exhibitions that would prepare him for the most significant project of his oeuvre: *La Città Nuova* (The New City). In 1914, he exhibited 60 drawings in the show of the group Nuova Tendenze, which he co-founded. Its catalogue contained his *Messaggio,* a text later transformed into the Manifesto, with six views of *La Città Nuova.* These, with the sketches, represent the peak of his graphic work. He probably met the Futurist Fillipo Tomaso Marinetti at this time.

When Italy entered the war in 1915, Sant'Elia was among the first to volunteer, joining the same regiment as Umberto Boccioni, Marinetti, and Mario Sironi, among other Futurists. He enjoyed a brief period of leave, but his relations with the Futurists were then interrupted. Conscripted and sent to the front again, as second lieutenant in the infantry during the ensuing attacks against enemy trenches between June and July 1916, he was wounded and decorated. At this time, Sant'Elia was commissioned to design a cemetery for the Arezzo Brigade at Monfalcone. It was still under construction when he fell during an assault, shot in the forehead by a machine gun bullet.

Before Futurism, there had been pragmatic solutions to the problems of urbanism through the use of new materials—steel, glass, and concrete—but without a radical renewal of architectural language. The symbolic and typological themes of the metropolis, skyscrapers, factories, residential and commercial complexes, power- and railway stations, had already been treated by Otto Wagner, Tony Garnier, and the Chicago School, but the first real urban vision of the future in Italy was presented by Sant'Elia in his *Messaggio* and drawings of *La Città Nuova.* Here he proposed, even if in utopian terms, the profound modifications that were needed to connect architecture to urban structure. The power and originality of his vision derives from an ability to interrelate, in all their complexity, the forms and volumes of his chosen elements. He shows an interconnected system of circulation and communication that is different from the American model of isolated skyscrapers. Though it would seem partly to derive from illustrations of futuristic American visions, he presents an architectural understanding of simultaneity derived not only from crisscrossing circulation but, above all, from a close relation between urban form and building type. The layered traffic suggests a new and mutual dynamism between building and circulation that may be understood by reference to the concepts that Umberto Boccioni had pioneered: fusion, all-embracing atmosphere, and a concept of space as a field. The radical innovation of his imagery, his conception of the city as flows, acceptance of the world of machinery, use of industrial types as models, and promotion of undecorated flat surfaces with brilliant hues are all original. Sant'Elia was concerned with showing how industrialization and the working city required new forms of art, thought, behavior, and language.

The Fascists tried to claim him as their national architect, but his work is without a consciously national character. In the postwar decade Futurism was seen as little more than an offshoot of Fascism, so the discovery of the *Messaggio* 42 years after it originally appeared offered hope of severing Sant'Elia from Futurism, and hence Fascism. Both documents were apparently ghost written, and despite the absence of the word "Futurism"



La Città Nuova, Apartment block with external elevators, tunnel, covered passage, on three traffic levels (tramway, road for cars, metal gangway), beacons and wireless telegraphy; ink and pencil on tracing paper

in the *Messaggio,* in inspiration and form, both are under the pervasive influence of Marinetti and Boccioni. Saint'Elia never disclaimed the Manifesto, and if his designs show evidence of originality, it has to be proven that he was not also the principal source of the written ideas.

Provincial, untraveled, caught between modernity and tradition, Sant'Elia in his last works reveals a nostalgic return to the Viennese orbit under whose sway he began. The ideas that Sant'Elia developed before the war became ever more a part of the mainstream of Modern architecture but were never again so vigorously or freshly presented.

Ross JENNER

See *also* **Città Nuova (1914); Fascist Architecture**

Biography

Born in Milan 30 April 1888; attended a technical school in Como and graduated as master builder in 1906; moved to Milan in 1905 to work as draftsman for a canal company, then for municipal engineering department; participated with Italo Paternoster on the international competition for Monza cemetery 1912; designed the rustic Villa Elisi near Como and with Paternoster went to Bologna, where he successfully took the entrance exam for the Academy of Fine Arts. Opened his own studio in Milan 1913; participated in competitions for offices for the Verona Savings Bank and in 1914 for a church in Salsomaggiore. Exhibited sketches in the "First Exhibition of Lombard Architects" in Milan 1914; exhibited 60 drawings at the seat of the "Artistic Family" in the show of the group Nuova Tendenze, co-founded in February by Sant'Elia. Enlisted in the Italian army in July 1915 and was killed by a machine-gun bullet on 10 October 1916 in Monfalcone.

Selected Works

La Città Nuova (project), 1914

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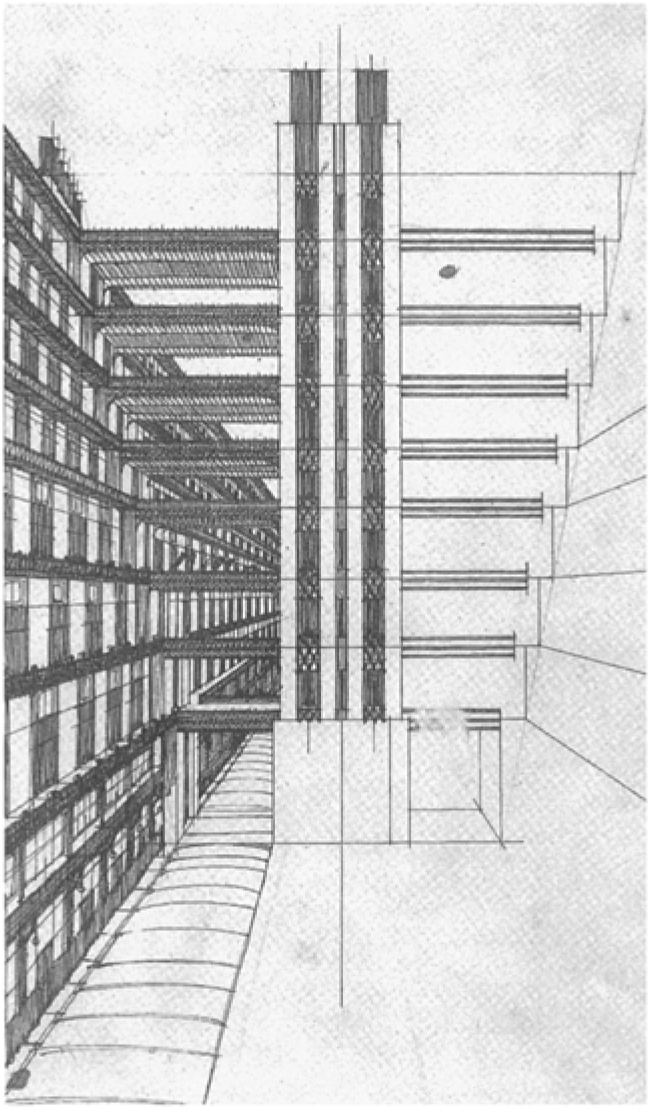
Maurizio Calvesi provides an important argument against separating Sant'Elia from Futurism. Alberto Sartoris examines an early book by the architect, containing the text of his "Manifesto." Reyner Banham provides perhaps the most ardent promotion of Sant'Elia in English.



La Città Nuova, Secondary street for pedestrians, with elevators in the middle; ink and pencil on tracing paper

Esther da Costa Meyer provides the most recent and comprehensive study of the architect, in any language

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SANTIAGO, CHILE

The city of Santiago was founded in the 16th century, between two rivers at the base of a hill, following the Spanish grid plan for American cities. Until the 19th century, references in the skyline were churches and significant public buildings. In the 20th century, the city center included high-rise buildings of six to ten stories.

Parallel to the downtown area, a peripheral zone, unbounded from the city center, began to grow, separating the working activities from housing. Appearing toward the east, the communes of Providencia in 1897 and Las Condes in 1901, together with the city center, concentrate the best examples of 20th-century architecture in the city.

By 1900, the city of Santiago had emerged with clear recognition of its limits and structure because of the ideas of the intendant, Benjamin Vicuña Mackenna inspired himself in the French baron Haussman and the Spanish Idelfonso Cerdà, which later was further developed by the Austrian Carl Brunner, differentiating a center and four sections in a concentric scheme that was maintained well into the 20th century.

By the 1930s, the first manifestations of the leading urban and architectural trends prevailing in Europe and the United States appeared, introducing Art Nouveau and Art Deco expressions, followed by modernism and the International Style. In the 1950s, residential growth in the communes of Providencia and Las Condes, inspired by the Garden City movement, broke the urban scheme that had prevailed since colonial times. In the 1970s, a large commercial axis with high-rise buildings developed, connecting the center with these communes and transferring traditional business to new centers in these areas.

The primary architectural expression in Santiago remains the skyscraper. The first manifestations, built between 1920 and 1940, borrow their image from those prevailing in the United States and Europe, expressed as an eclectic mix of styles in rapid succession. Formally, the first examples of tall buildings use the *palazzo* model in its two versions, referring to the image of the *palazzo* itself or stretching the middle part up to the needed height. In the first case, classical elements are used: in the second, a variety of styles are adopted. Clear examples of the classical *palazzo* are the *Banco del Pac'fico* (Bank of the Pacific, 1921) by Shade, Oyarzún and Phillippi and the office building of the *Banco Hipotecario* (Mortgage Bank, 1925) by Siegel and Sons. Fine examples of the stretched *palazzo* are the *Edificio Ariztía* (Ariztía Building, 1921) by Alberto Cruz Montt and the Díaz Building (1925) by Valdivieso and de la Cruz.

Around 1927, the first Art Deco designs appear, with a nationalistic character showing local indigenous elements, such as the Merced 849 (1927) by Luciano Kulczewski or the Ministerio de Hacienda (Exchequer Ministry Building, 1930) by Smith Solar and Smith Miller. At the same time, the first rationalist designs appear, such as a streamlined version, an example being the Oberpauer Building (1929) by Sergio Larraín, today a national monument. Especially interesting in this period is the architecture of J.Martínez, with works such as the University of Chile's Law School (1934) and the Military School (1943), which suggests the Fascist architecture of the 1930s in Europe.

In a second stage of architecture in Santiago, between 1945 and 1960, rationalism precedes the International Style. Early

Downtown district of Santiago

examples include the Banco del Estado (State Bank, 1945) by Hector Mardones and later the Plaza Italia Building (1956) by Santiago Roi. A fine Le Corbusier-inspired building is the Benedictine Church and Monastery (1954–65), by J.Bellalta, P. Gross, J.Swimburn, R.Irarrazaval, and Fathers M.Correa and G.Guarda.

From 1960 to 1980, the volume of the block disappears, and the isolated tower emerges with an open space, surely inspired by Mies' Lake Shore Drive Apartments or the Seagram Building. In this period, clearly the International Style is consolidated, producing buildings with volumetric purity and the use of curtain walls. Fine examples of this period are the Reval Building (1963) by Jorge Aguirre; the Costanera Building (1975) by Echenique, Cruz and Boisier; and the Torre Santa María, Santa María Tower (1977), by C.A.Cruz, J.M.Figueroa, J.Claude, Alemparte and Barreda. This period also sees the development of large complexes inspired by Le Corbusier that in some cases wiped out extended areas of the city. These include the *Remodelación San Borja* (San Borja Unit, 1960s) by the Ministry of Housing; the *Unidad Vecinal Providencia* (Providencia Neighborhood Complex, 1966) with its twin towers by Esquenazi and Barella; the *Torres de Tajamar* (Tajamar Towers, 1962–67) by Bresciani, Valdes, Prieto, Castillo, Lorca, Huidobro and Bolton; and the *Villa Presidente Frei* (President's Frei Complex, 1965) by J.Larraín, O.Larraín, and D.Balmaceda. Other complexes also began to appear in the garden city communes toward the new areas farther east of the city, such as the *Remodelación San Luis* (San Luis Renovation, 1974) by Sandoval and Arancibia and the *Torres de Vitacura* (Three Towers of Vitacura, 1973) by Mauricio Despouy. An important Le Corbusier-inspired building is the Cepal Headquarters for Latin America (1963–68) by E.Duhart, R.Goycoolea, C.de Groote, and O.Santelices.

A fourth and final period of architectural development includes the last two decades of the 20th century, when several of the models used in the previous stage continued to prevail, such as the curtain wall-isolated high-rise, as demonstrated by the building Estado 10 (1982) by Borquez, Paredes and Sotomayor, or using the mirror glass wall as a covering, such as the *Edificio Catedral* (Cathedral Building, 1982) by Echenique, Cruz, Boisier and Dunner or the Shell Building (1989) by Asahi and Associates. Other interesting examples include the *Consorcio Nacional de Seguros-Vida* (Insurance Building, 1992) by B.Huidobro, E.Browne, and Judson (with European influences) and the CTC Building (1995) by M.Paredes, J.Iglesis, and L.Prat.

The Lever House (designed by Gordon Bunshaft, New York City, 1951) model continues its influence in the Crowne Plaza Hotel (1981) by Alemparte and Barreda. Other examples increasingly use mirror glass. The interior galleries used in the past, penetrating the city block, are now rescued and reinterpreted in several fine examples, such as the Panorámico Building (1981) by San Martin, Browne and Wenborne, which is later renovated by Record-n and Sartori (1990), and the Edificio Plaza Lyon (1977) by Larraín, Murtinho and Associates and the Shell Building (1989) by Asahi and Associates.

New in the 1980s and 1990s is the presence of more local and contextual aspects that adhere to Postmodern currents. Examples include the use of pre-Colombian references in the Montolin Building (1988) by C.Fernández and Associates, Art Deco references in the Financo Building (1989) by Alemparte and Barreda, classical elements in the Codelco Building (1984) by Boza and Associates, and the CCT Building (1991) by G.Mardones and Associates, inspired in the old brick buildings of downtown Santiago.

The recognition of scale of place directed the design of the Fundación Building (1982) and the Americas Building (1990) by Boza and the Torre San Ramón (San Ramón Tower, 1988) by Flaño, Nuñez, and Tuca.

The use of color or the curve is also present as a strong plastic element applied to buildings, such as that located at Callao and Versalles Streets (1991) by Boza and Associates and the Banmedica Building (1998) by B.Huidobro and Associates.

At present, architects are reinterpreting famous existing buildings, such as the Simon

Bolivar Building (1991) by Paredes and Associates, with a clear reference to the AT&T Building by Philip Johnson in New York, and the Cruz Blanca Building (1991) by G.Kreft, producing a bizarre reference to the Chrysler Building in New York. We leave the 20th century and enter the 21st with an increasingly eclectic architecture that, together with the mall culture, is slowly making our cities lose their local character in a world of globalization.

MARCELA PIZZI AND MARÍA PAZ VALENZUELA

See *also* **Chile**

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SANTOS, ADÈLE NAUDÉ 1938–

Architect, South Africa

Adèle Naudé Santos' early design projects in southern Africa in collaboration with her first husband, Antonio de Souza Santos, included innovative private houses, apartment buildings, and low-cost workers' housing and facilities, including a church and school. Her early houses incorporated principles of planning the "house as a city," controlling space through section, and a process for analyzing site and social issues that would govern her design and teaching throughout her career. The most remarkable of these early projects were the five Molteno houses at Rowan Lane, Kennilworth, Cape Town (1973), fitted into an existing garden grove, and House Stekhoven (1972), a private residence that opened like a grand piano from a dull cul-de-sac of suburban houses dramatically toward Table Mountain, seen as the culmination of a private garden from carefully segregated family spaces through glazed walls and across shared walkways sheltered by an undulating *bris-soleil.*

Throughout her career as architect and educator, Naudé Santos treated practice as a component of research. "The work is usually designed experimentally, imagining space or spatial sequences," she wrote. "The cross-section is a design tool that often precedes the plan." Research projects have included urban design studies such as "Open Space Choice for Blighted Inner City Neighborhoods" (1985) and "Urban Design Strategy for Center City East, San Diego" (1993) as well as the development of housing prototypes for Misawa Homes, Tokyo (1989), and for the city of Kitakyushu, Japan (1992–94), where the Kadota and Dairi Nishi housing projects were built (1996).

In the 1980s, Naudé Santos often used entries in national and international design competitions as a means to further her research into contextualizing design. She won competitions of the Hawaii-Loa Pacific Center for the Media Arts (1986), the Los Angeles ArtsPark (1989), and the Perris California Civic Center (1991) and had premiated entries in competitions for In-fill Housing, Harlem, New York (1986) and Hillside Housing, Cincinnati (1985). In 1988, she also won an invited competition sponsored by the Museum of Contemporary Art, Los Angeles, and the Community Redevelopment Agency for New Case-Study Houses. Replacing dingbat models for low-cost housing with a "small-town" structure made up of courtyards linked by offset walkways, with 40 interlocking, variably functioned units with distinctive curved roofs and balconies, her winning Franklin-La Brea project, with revisions, was built (1995), nestled atop the intersection of Franklin and La Brea Avenues in Los Angeles.

Expanding her practice to Japan, Naudé Santos was commissioned to design a mixed-use building in Harajuku, Tokyo (1984), where she interlocked shared and private spaces for a joint family, ideas worked out further in a two-unit family house in Tokyo (1990). As Philip Arcidi wrote in *Progressive Architecture* (November 1990), "In this house, Santos's spatial strategy yields results that complement those of her public buildings. … She renders the interior an exceptional sequence of layered volumes, where Nature is encountered within an urban refuge."

Other major projects in Japan included a playful small office building of interlocking spaces, bringing light deep into a very constrained Ichiban-Cho urban site (1988), that has adjusted gracefully to changing uses since it was built; the Ohgimi Beach House (1988), a company lodge that "settles like a leaf" into a protected pine forest in exurban Ninomiya; and Tokyo Fantasia, an unbuilt atrium office building organized around a remarkable six-story garden stairway.

Yerba Buena Gardens (1998), San Francisco, California

Photo © Antonio Garbasso. Courtesy Adele Naude Santos and Associates with LDA Architects.

In the United States in the 1990s, Naudé Santos designed public spaces that interpenetrated spatially complex interiors with the variable light and nature of a variety of exterior landscapes, including the Institute of Contemporary Art, Philadelphia (1991); Albright College Center for the Arts, Reading, Pennsylvania (1991), a series of buildings that reshaped a campus around an open atrium-amphitheater that incorporated a collaboration sponsored by the National Endowment for the Humanities between Naudé Santos and the environmental artist Mary Miss; the Natatorium at Albright College (1990); and the unbuilt Perris California Civic Center. These public projects culminated in the Zeum and Rooftop Complex at Yerba Buena Gardens, San Francisco (1998), intertwining a children's museum, a child-care center, a glazed pavilion for an antique carousel, a bowling alley, a cafe, and an indoor ice-skating rink forming a subtle people's acropolis on top of the city's Moscone Convention Center.

Throughout her career, Naudé Santos explored housing in sociologically sensitive spatial terms, nowhere more experimentally than in a series of lofts, some for her own use in Boston (1980) and Philadelphia (1983) and others responding to San Francisco's demand for live-work units, as in the five lofts that she interwove around a shared court that she carved into the center of an old warehouse between Rich and Zoe Streets (1998). These issues of space, design, and society also governed her teaching and formed a rigorous frame for the new curriculum that she and the formidable faculty whom she recruited had begun to frame for the new school that she conceived for the University of California, San Diego. As a final gift to that city, the school sponsored the production of an urban design strategy that the city adopted, as the school itself was being dismantled in 1994 during one of California's deep financial downturns and was able to graduate only a single class.

MICHAEL W.MEISTER

S*ee also* **Africa: Southern and Central Africa**

Biography

Born in Cape Town, South Africa, 14 October 1938; received British citizenship 1961; father was architect Hugo Naudé. Attended University of Cape Town; degree from the Architectural Association, London 1961; master's degree in urban design from Harvard University, Cambridge, Massachusetts 1963; master's degree in architecture and city planning from the University of Pennsylvania, Philadelphia 1968. Principal, Adèle Naudé Santos, Philadelphia from 1979; principal, Adèle Naudé Santos and Associates, San Diego and San Francisco; partner, Santos Levy and Associates, with Alan Levy, Philadelphia from 1990. Profes-sor, Rice University, Houston 1973–79; professor, Graduate School of Design, Harvard University 1979–81; professor and chair of the architecture department, University of Pennsylvania, Philadelphia 1981–87; founder and first dean, School of Architecture, University of California, San Diego 1990–95; Thomas Jefferson Professor of Architecture, University of Virginia 1993–94; professor, University of California, College of Environmental Design, Berkeley from 1995. Exhibition of her work held at the Kitakyushu, Japan, Museum of Modern Art (1998).

Selected Works

Stekhoven House, Cape Town, 1972
Molteno Houses, Cape Town, 1973
Loft, Boston, 1980
Loft, Philadelphia, 1983
Mixed-Use Building, Tokyo, 1984
Hillside Housing (competition; unbuilt), Cincinnati, 1985
Hawaii-Loa Pacific Center for the Media Arts (First prize, competition; unbuilt), 1986
In-fill Housing (competition; unbuilt), Harlem, New York, 1986
Office Building, Ichiban-Cho, 1988
Ohgimi Beach House, Ninomiya, 1988
Tokyo Fantasia Office Building (1988; unbuilt)
Los Angeles ArtsPark (First prize, competition; unbuilt), 1989
Misawa Homes (prototype), Tokyo, 1989
Two-Unit House, Tokyo, 1990
Natatorium, Albright College, Reading, Pennsylvania, 1990
Institute of Contemporary Art, Philadelphia, 1991
Albright College Center for the Arts, Reading, 1991
Civic Center (First prize, competition; unbuilt), Perris, California, 1991
Franklin-La Brea Project (with revisions), Los Angeles, 1995
Kadota Housing project, Kitakyushu, Japan, 1996

Dairi Nishi Housing Project, Kitakyushu, 1996
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SÃO PAULO, BRAZIL

The city of São Paulo, capital of the state with the same name and the industrial and financial center of Brazil, has been described since the last decades of the 19th to the 20th century as a locomotive. Unlike cities with outstanding natural beauty, such as Rio de Janeiro, São Paulo has been likened to a powerful engine, the product of human impact, altering and overcoming natural obstacles in favor of civilization.

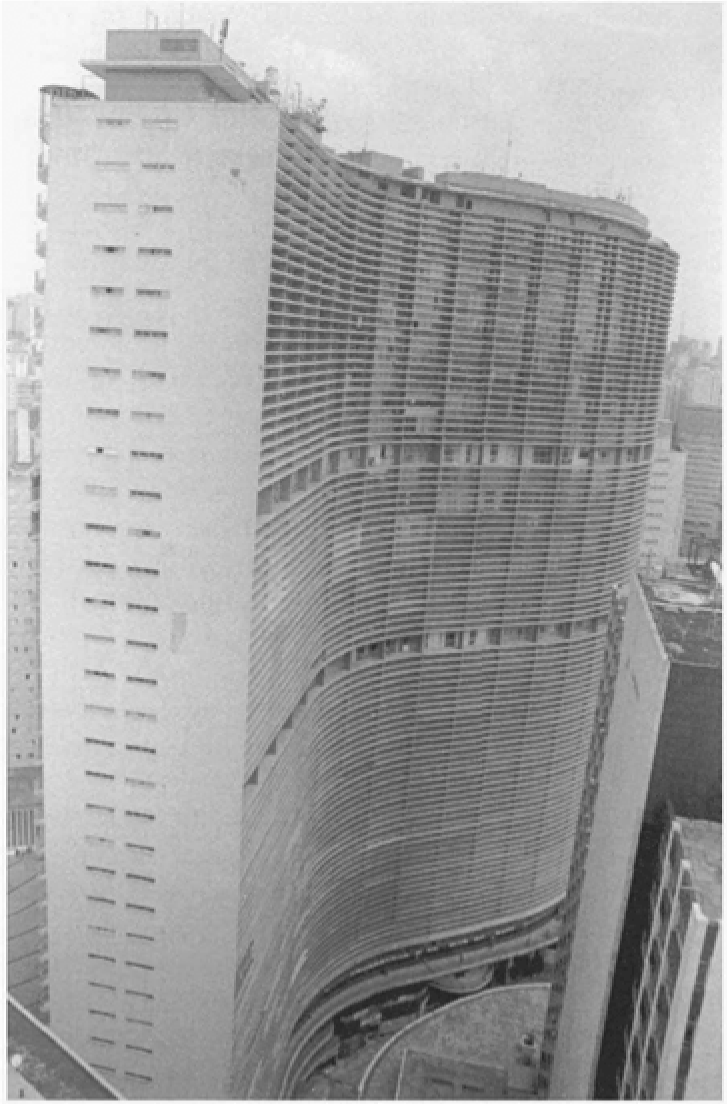
São Paulo was founded by the Jesuits in 1554 as a mission center (the central colonial area called Patio do Colégio) on a plateau 760 meters (2,493 feet) above sea level, although only 72 kilometers (35 miles) from the Atlantic coast. It remained a small town for a long time and would have to wait until the 18th century to be chartered as a city (1711) and a further century and a half to experience unparalleled urban growth to become today one of the largest cities in the world, housing more than 15 million inhabitants in its metropolitan area.

Local pride had attributed the industriousness of São Paulo inhabitants ("Paulistas") to the "bandeirantes" who had the city as a base for their expeditions. They were explorers responsible for marking territory for the Portuguese crown while imprisoning or killing native Indians and searching for precious stones. However, it was the massive European immigration at the turn of the 20th century (Italian, Portuguese, Spanish, German, Syrian-Lebanese, and later Japanese), together with the coffee export boom and industrialization, that defined the modern city and its architecture.

As a result, if in 1895 São Paulo had 130,000 inhabitants, in 1900 its population had almost doubled. Disorderly growth was met with remarkable urban improvements, including the opening of avenues, lighting, gasworks, public transportation, and works for embellishment. Municipal commissions prepared reports on the living conditions of the working classes of the industrial neighborhoods of the city, especially Luz, Bom Retiro, Brás, and Mooca. Epidemics such as smallpox, Spanish flu, and yellow fever, as well as the moral and physical menace of slums, were to be avoided by sanitation, street planning, and drainage and channeling of rivers, all planned by the local administration and the newly created Engineering School (Escola Politécnica, 1894). The opening of Avenida Paulista (1891) and the building of Viaduto do Chá (1892), uniting the old center to new industrial areas, and of the São Paulo Railway Station (Estação da Luz, 1901) were seen as proof of progress.

Architecture was a major force behind these changes. The style chosen—ecclecticism—reflected European models and was considered to be the most civilized and appealing to bourgeois taste. It can be found at Carlos Ekman's Vila Penteado (rua Maranhão) and in the works of architect engineer Francisco de Paula Ramos de Azevedo (1851–1928), who studied in Belgium and planned a large number of private mansions and public buildings, such as the school Caetano de Campos (1894), the Palácio das Indústrias (Industry Palace, 1911–24, with Domiziano Rossi), and the Municipal Theatre (Teatro Municipal, 1895–1911, with associates).

In 1912, the City of São Paulo Improvements and Freehold Company (known as the "City") was established in London with the aim to develop distant suburban areas in São Paulo following the pattern of Ebenezer Howard's (1850–1928) garden cities. Raymond Unwin (1863–1940) and Barry Parker (1867–1941) were commissioned to develop the areas of Jardim America and City Lapa and to rearrange the Trianon Park at Avenida Paulista (1917–19). The growth of São Paulo and workers' unrest during the first decades of the century led Mayor Washington Luis to declare during the opening of São Paulo Industry Palace that the city was "Chicago and Manchester together in one."



Copan Building (1957) designed by Oscar Niemeyer

During the 1922 São Paulo's Modern Art Week, spearheaded by the intellectuals Mário de Andrade and Oswald de Andrade, among others, there was an urgent cry for devising a national style in the arts and a modern aesthetics rooted on indigenous sources. Ecclecticism was substituted for a vigorous modern architecture and urban planning. Skyscrapers were built, and the Plano de Avenidas, an ambitious design of radial streets by the engineer Francisco Prestes Maia (1826–1965; twice mayor, nominated 1937–45, elected 1961–65), was partly executed.

Modern architecture in Brazil has created a regional version of the International Style. Although there are examples of the Art Deco style, such as Rino Levi's cinemas and skyscrapers of the 1920s (Columbus Building, Rino Levi, 1932, demolished; Martinelli Building, 1934, 105 meters and 26 floors, the largest ever built in South America at the time), São Paulo houses several examples of the local adoption of Le Corbusier's "five steps." Gregori Warchavchik (1896–1982) designed several residences, including his own (1928, rua Santa Cruz), a boxlike building based on geometry, symmetry, and standardization of building materials that was visited by Le Corbusier himself in 1929. The Esther Building (Praça da República, 1938) by Álvaro Vital Brazil (1909–97), with Ademar Marinho (1909–), featured a roof terrace, continuous window strips, and free facade composition in a residential and commercial building.

In the postwar period, with about two million inhabitants, São Paulo experienced huge and disorderly growth as a result of real estate speculation, clandestine housing, and lack of basic public services. Verticalization was regarded as a symbol of the city's economic power, beating its rival Rio de Janeiro. During his 1958 visit, Roger Bastide noted with astonishment, "Here the architect's hand replaced God's hand." The highlights of this period are the Masp Building (Modern Museum of Art, 1957–68) by Lina Bo Bardi (1914–92) and Niemeyer; several buildings, such as Copan, a lyrically curved residential and commercial building; the buildings of Ibirapuera Park and the park itself; and landscapist Burle Marx (1909–94). The park was conceived as a 1.6-million-square-meter green area inside the metropolis. Niemeyer's Memorial da America Latina (Latin America Memorial) was built only in 1988–89.

During the 1960s, São Paulo found in the architect Vilanova Artigas (1915–85) a voice of renovation. He created the architecture courses at the University of São Paulo and planned its building (1961–68), defending that design as a tool for political, social, and ideological emancipation. His engaged and revolutionary style cost him a serious persecution during Brazil's dictatorial rule but enabled him to open the road for a "Paulista School" against Rio de Janeiro's "Niemeyer School."

The Paulista Brutalism movement was soon to follow, with several examples in the houses built by Carlos Milan (1927–64). Among the new crop of architects, several stood out, such as Rodrigo Lefevre (1938–84), Paulo Mendes da Rocha (1928–), Fábio Penteado (1928–), Júlio Katinsky (1932–), Siegbert Zanetiini (1934–), Ruy Othake (1938-), Joaquim Guedes (1932–), and Sérgio Ferro (1938-).

The city's underground was built during 1973–79, a remarkable engineering work featuring an original use of reinforced concrete in all stations.

The last decades of the 20th century witnessed São Paulo stepping, perhaps too late, into the preservation era, listing several buildings and areas and sponsoring daring revitalization projects, such as the Pinacoteca do Estado (1998, Paulo Mendes da Rocha). At the same time, however, pollution and urban violence had worsened, social inequality had mounted, and urban growth continued at a chaotic pace. "Postmodern" architecture has had its share at Avenida Paulista, once the setting for the mansions of the local bourgeoisie and today a corridor of skyscrapers; the same happened at the Avenida Berrini skyscrapers for offices and banks, many of them the work of Carlos Bratke and his associates. These huge glass towers are a few steps away from one among several existing favelas (shantytowns). Housing problems have escalated, and about 2.5 million inhabitants live today in clandestine urban areas, constituting a parallel city inside São Paulo the size of the country's third-largest city in population.

CRISTINA MENEGUELLO

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SARASOTA SCHOOL

The Sarasota School was the name given to a group of architects practicing from 1940 to 1960 in and around Sarasota, Florida, on the Gulf of Mexico. The Sarasota School was one of several regional interpretations of modern architecture in the United States to emerge in the years following the end of World War II, including the Bay Area School in San Francisco and the Case Study Houses group in Los Angeles. By comparison to these other regional movements, the Sarasota School was the least intentional, evolving as it did from Ralph Twitchell's fortuitous presence during one of Florida's building booms. From the very start of his Sarasota career in 1936, Twitchell's work exhibited a respect for the unique landscape and climate of the west coast of Florida, his interest in local vernacular building culture, and his desire to employ newly emerging construction materials and methods to appropriately house the particularly American version of a tropical lifestyle then being defined in Sarasota.

In 1941, Twitchell was joined by Paul Rudolph, who moved to Florida as a result of his interest in Frank Lloyd Wright's recent works, in particular Florida Southern College. Rudolph was a designer of remarkable ability, and the buildings and projects that resulted from this partnership were astonishing in their consistent high quality. In their designs, Rudolph and Twitchell endeavored to engage the landscape and to develop individual buildings that employed modernist concepts of spatial liberation framed by a complementary urban order. Their project for the Finney residence on Siesta Key (1947), a design that Rudolph had made the previous year while a graduate student at Harvard University, proposed a series of walls, bridges, and dredged inlets that allowed the house to be fully integrated with its site, acting to join remote bodies of land and water while remaining delicately suspended above the landscape. The Rudolph and Twitchell project for six linked residences on the Revere property in Siesta Key (1948) represents a remarkably prescient and constructive critique of postwar American suburban development. These six houses, of which only the Revere residence was built, opposed the typical suburban distribution of houses as freestanding objects, proposing instead a series of plastically interlocked walls and horizontal planes, providing a mix of shade and sun to open-air courts while weaving interior and exterior space to yield both increased privacy and significantly greater density.

The paradise-like settings of the Sarasota School houses, which today appear so lushly "natural," were in fact the result of a process of ruthless scalping, shaping, and dredging of the original mangrove-covered, water-saturated landscape to produce navigable canals and buildable sites. These newly created and virtually barren lots on the Gulf coast required the architects of the Sarasota School to design not only the houses but also their sites. The result was a series of buildings that subtly wove their sharp-edged geometric forms into the relentless horizontality of the Florida landscape, employing structural and constructional techniques developed for the local climate, economy, and available materials and providing their occupants varied seasonal experiences of sun-drenched interior and exterior spaces. The Healy "Cocoon House" (1950), built on the edge of a canal in Siesta Key, with its suspended rubberized roof secured with cable stays, exemplified the manner in which Twitchell's interest in engaging new building technologies complemented Rudolph's capacity to explore their liberative spatial possibilities.

Following the establishment of his individual practice in 1951, Rudolph began to receive significant national and international attention. His Revere model house was visited by more than 16,000 people during 1949. His working relationship with the architectural photographers Ezra Stoller and Joseph Steinmetz (Steinmetz Studio, Sarasota, 1947) was instrumental in Rudolph's ability to create his own publicity. Skillful photographs highlighted the crisp lines and thin planes of the Leavengood residence built in St. Petersburg (1951), the Sandeling Beach Club built in Siesta Key (1952), the Walker Guest House built on Sanibel Island (1952), and the Hiss "Umbrella House" built on Lido Shores (1953). When combined with Rudolph's signature perspective drawings of both built and unbuilt projects, these publications conveyed a sense of informality and naturalness of lifestyle while exhibiting an inevitability and precision in their architectonic resolution.

At its height, the Sarasota School included Mark Hampton, Victor Lundy, Tim Siebert, Jack West, Gene Leedy, Carl Abbott, Bert Brosmith, Joseph Farrell, William Rupp, and Ralph and William Zimmerman, many of whom began their careers working for Rudolph and Twitchell. Each of these architects developed his own distinct qualities of space and form, from Lundy's sweeping pagoda-like wood roofs (St. Paul's Lutheran Church, Sarasota, 1958) to Leedy's rhythmic lines of precast concrete beams (First National Bank, Cape Canaveral, 1963) to Abbott's elegantly articulated geometries (Weld Residence, Boca Grande, 1966). The variety of designs within such a small community defied the stereotypical representation of modern architecture as lacking richness and diversity.

After starting construction on his four final Florida masterworks—Riverview High School in Sarasota (1958), Sarasota High School (1959), the Deering residence in Casey Key (1959), and the Milam residence in Ponte Vedra (1960)—Rudolph in 1958 was appointed dean of the School of Architecture at Yale University, where among his first students were Norman Foster and Richard Rogers. With the exit from Sarasota in the 1960s of Rudolph, Lundy, Hampton, Rupp, Farrell, Brosmith, and Leedy, the Sarasota School ended.

Sarasota High School, Sarasota, Florida, designed by Paul Rudolph (1959)

Ezra Stoller © Esto

Although the American architectural profession has been slow to recognize the quality of the work of the Sarasota School (having failed to award Rudolph the American Institute of Architecture Gold Medal at his death in 1997), it received extensive and immediate international attention. Typical is the experience of British architects and Team 10 founders, Alison and Peter Smithson, who, in their search for alternatives to the universal formula of the International Style in the early 1950s, were inspired by the works being built in Sarasota. The Sarasota School exemplified the concept of a regionally inflected modern architecture, true to the universal intentions of spatial liberation yet capable of engaging local climate, landscape, and building culture and demonstrating the significant benefits of an evolutionary rather than revolutionary development of modern architecture.

ROBERT McCARTER

S*ee also* **Foster, Norman (England); Rogers, Richard (England); Rudolph, Paul (United States); Smithson, Peter and Alison (England); Team 10 (Netherlands)**

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SAUDI ARABIA

With a land area in excess of 2.2 million square kilometers, the kingdom of Saudi Arabia today covers most of the Arabian peninsula. The recent history of its architectural and urban development has been closely linked to its emergence as a modern nation and to the development of a powerful economy based on the exploitation of natural resources. Saudi Arabia's opening to the international economy from the 1950s on introduced new building technologies and styles that have today largely replaced centuries-old traditional practices. However, since the 1980s, the maturation of native Saudi institutions and the work of Saudi designers, engineers, and planners has led to many successful projects that bridge modern design practices and technologies and still-valued traditional forms and lifestyles.

Climate has played a key role in urban form and architectural production in Saudi Arabia for centuries. The kingdom generally lies within one of the world's hottest and driest regions, with more than 50 percent of its land being desert. Yet within this dominant climatic milieu, local characteristics vary considerably. This relationship was long evident in the traditional approaches to the built environment in Saudi Arabia's four principal regions: the Central *(Najd)* and Northern region; the Western *(Hijaz)* region; the Eastern region along the Persian Gulf; and the Southern mountainous region.

In the extremely hot and arid areas of the Central and Northern region, the courtyard was long the main feature of any building. Courtyards traditionally acted as climatic moderators and allowed a unique private lifestyle to develop. In desert communities, built largely of adobe, open spaces generally only took the form of private courtyards and narrow, winding streets.

In the Western *(Hijaz)* region, with its hot and humid climate of Red Sea coastal communities, the basic traditional building type was the multistory row house built of coral stone and imported wood. The refined building art of this region was also influenced by an intermixing of cultures and the import of technological skills as the result of trade and pilgrimage. One distinct vernacular form that developed here was the *mashrabiyah,* a facade of transparent wooden screens, originally used in the houses of Jeddah to afford both ventilation and visual privacy. When this form gained popularity as a decorative element, it in turn influenced house design in the hot and dry inland cities of Mecca and Medina and in the upland city of Taif.

The Eastern Region along the Persian Gulf includes the cities of al-Ahsa, Qatif, Dammam, and Jubail and is characterized by a maritime inland desert climate. Here, two-story courtyard houses built of mud were the typical building type. Such dwellings often featured traditional *bagdir* or *malqaf,* wind catchers used to control ventilation.

The Southern region, which includes the Asir Mountains and extends from Taif through Baha to Abha, is characterized by a cooler climate with considerable seasonal rain. In its settlements, many located at altitudes greater than 2000 meters, buildings generally took the form of square, multistory towers. Four principal construction types developed based on the local microclimate and available materials: mud tower houses, stone rubble houses, stone apron houses, and mud and slate tower buildings. A particularly characteristic form of the Asir region was the *qasabah,* a freestanding tower of mud or stone used in isolated farming villages both for defense and to warn of the approach of raiders from other tribes.

Until the second half of the 20th century, these regional urban and architectural traditions responded well to local cultural and material conditions and allowed people to adjust their activity cycles to climatic variations. In more recent times, however, modern forms and patterns have been introduced that have largely replaced these traditional practices.

Two major building campaigns of the 1950s can today be judged as having initiated this process: the expansion of the holy mosques of Mecca and Medina and the huge program involved in transferring the nation's capital from Mecca to Riyadh. From 1951 to 1955, the government undertook a major effort to repair and expand the Prophet Mosque in Medina, with the result being a fourfold increase in the area for prayer; a second huge project from 1955 to 1974 expanded the holy mosque in Mecca, where the area available for prayer was increased from 29,127 to 193,000 square meters. The building program in Riyadh likewise spanned many years. Its first phase, in the mid-1950s, included construction of both a complex of ministry buildings on the airport road and a housing project for government employees in the Malaz area. Also a part of the early work were the rebuilding and expansion of the royal palace at Nasirriyah to cover 250 hectares, the rebuilding of the main mosque and government palace in the city center, and the widening of the two main streets leading into the city.

Coupled with the Aramco grid plans for al-Khobar and Dammam in 1947 and the Aramco Employees Home Ownership program launched in 1951, these government building campaigns laid a foundation for the development of contemporary building and planning practices in Saudi Arabia. However, the introduction of new processes, materials, and techniques was first carried out largely through the import of foreign expertise to the kingdom. From the early 1960s on, the gridded street pattern and the villa as a preferred house type assumed primacy in the development of most every city and town. Processes of urban change and expansion were given further impetus by the compensation given private property owners in Mecca, Medina, and Riyadh following the expropriation of their traditional city center houses to make way for government projects. Apartment buildings also first began to appear in Riyadh, Mecca, Medina, and Jeddah from the late 1950s on. In the mid-1950s, the government launched a national school-building program, which brought international-style design in reinforced concrete and cement block to the smallest towns and villages.

A further change in Saudi cities and towns in the 1960s was the introduction of high-rise construction. Distinct among the earliest such projects were the Saudi Arabian Airlines and the Saudi Radio Broadcasting buildings in Jeddah. However, the twenty-two-story Queen building (1972) in Jeddah represented the most radical break with tradition, and for many years it stood as a principal landmark on the city's skyline. Other notable projects in the early 1970s included the UPM Campus in Dhahran by CRS, whose design considered the natural terrain and employed an exposed-aggregate texture to blend with its surroundings; the Equestrian Club Building (1973) in Riyadh by Frank Basil, which responded effectively to climate using new architectural forms; and the Intercontinental Hotels and Conference Centers (1971) in Riyadh by Trevord Dannat and in Mecca (1973) by Rolf Gutbrod and Frei Otto, which emerged from international design competitions.

Following the oil boom of 1973, the new wealth had profound, wide-reaching consequences for Saudi cities and towns. This was particularly evident in campaigns of infrastructure development and in the design and construction of new universities, schools, hospitals, hotels, airports and seaports, factories, housing estates, and entire new towns. The oil boom also led to the establishment of the national Real Estate Development

Holy Prophet Mosque of Medina (1950–55, first phase; 1983–1994, second phase)

Fund, offering individual Saudi citizens subsidized long-term loans to build private houses, apartments, and office buildings. Half the country's housing stock has been replenished through this program since its initatiation. Coupled with government land grants, available to every Saudi citizen 18 years of age or older, it has led to a several-fold expansion of most Saudi cities and towns.

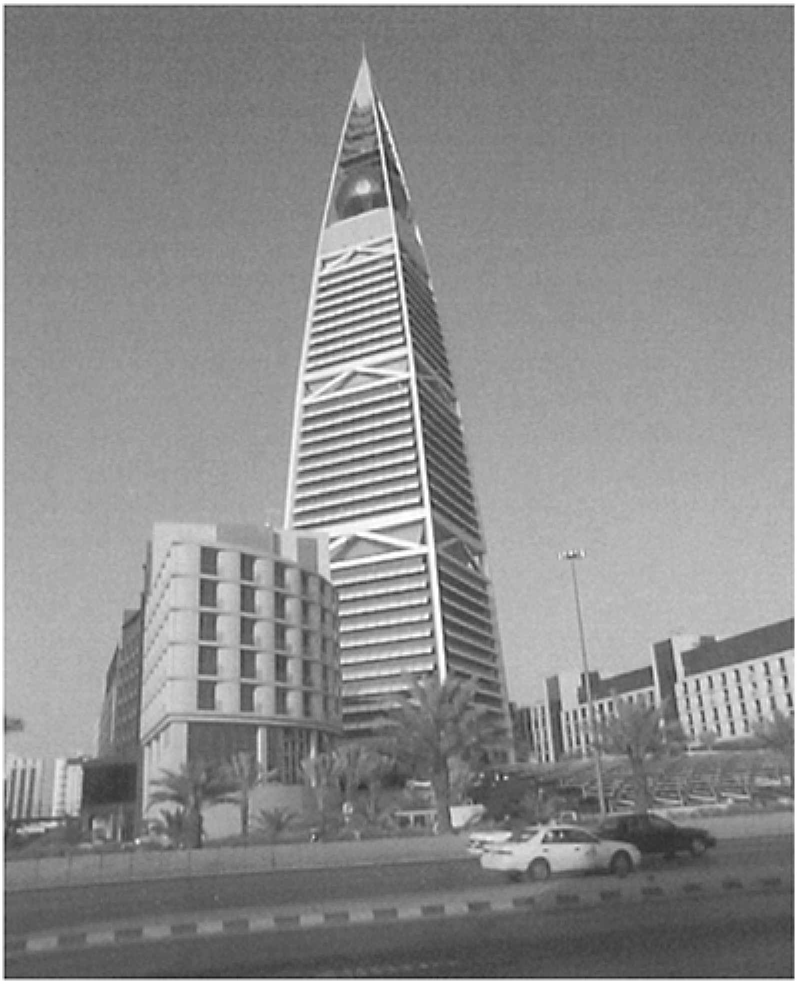
Although most early modern architecture and planning in the kingdom was carried out by foreign-trained experts, from the 1980s onward, local architects, engineers, and planners began to assume an increasingly important role. For instance, Ali Shuaibi and Abdurrahman Al-Hussaini of Beeah Group Consultants have given special emphasis to sociocultural values, in particular to the desire to relate modern construction methods to the Islamic past. Their distinct planning work has included the al-Uqair Tourist Development Plan (1986), the Jubail Subregional Plan (1998), and the Strategic Comprehensive Plan (1998) for the Holy Environs and Mecca, which addressed the need to accommodate and transfer two million pilgrims between Mecca and the Holy Environs during the five-day pilgrimage. Beeah Group Consultants has also been known for such urban design work as its Central Spine, DQ(1980); the Qasr al-Hukm project (1983); and the King Abdulaziz Historical Center (1998), all in Riyadh. The continued value of seclusion and privacy in Saudi culture was evident in the design of al-Kindi Plaza (1986) in Riyadh, which won the Agha Khan Award for Architecture. Other important designs are the Saudi Embassy (1987) in Yemen, the King Saud Mosque (1992) in Riyadh, the SAPICO Headquarters (1992) in Islamabad, and the Municipality of Medina Complex (2000), all of which combine past and present, a necessity in the perpetuation of culture.

Equally impressive projects have been designed by the team known as Basim al-Shihabi of Omrania. Their projects include the General Organization for Social Insurance (GOSI) Headquarters (1978); the Twaiq Palace (1985), an Agha Khan Award winner; the

Gulf Cooperation Council building (1987); and the King Abdulaziz Archival building (al-Darah) (1998), all in Riyadh. The current direction of ideas that al-Shihabi originally synthesized in the 1970s are evident in the NNCI Headquarters building (1999) and the Kingdom Complex, which includes a 330-meter-high tower to be completed in 2001.

A third noteworthy Saudi architecture firm, Mohammad Al-Naim and Farahat Tashkandi of Al-Nai, has emphasized the importance of continuity in cultural traditions in a changing world. This theme can be seen in their neighborhood layouts and land subdivision projects for MOMRA (1993) and in layouts for the Namar and Uraid neighborhoods (1994) in Riyadh. The team's design for municipal prototype houses attempted to revitalize the traditional Arab house, not through formalistic adaptation but by reconstituting essential values in new forms. Other work has included the School of Environmental Design building, KAU (1987), in Jeddah and the College of Architecture and Planning, KFU (2000), in Dammam. Mohammad Al-Naim and Farahat Tashkandi's work on the Al Abbas Mosque (1995) in Riyadh won them an award for transforming traditional aesthetic values to a more modern look.

Ziad Zaidan of Idea Center is another firm whose distinction lay in the team's Master Plan and Urban Design schemes for



Al-Faisaliah Center (2000), designed by Norman Foster, in Riyadh

© Saleh Al-Hathloul

Yanbu Industrial City, a contemporary settlement for 150,000 people aimed at combining state-of-the-art technology with the principles of Islamic town planning. Ziad Zaidan is also known for its Umm al-Qura University campus (1995) in Mecca, in association with Perkins and Will, a carefully considered campus plan creating a harmonious synthesis of old and new. Other projects have included the Asir Governorate Complex (1995) in Abha, adapting elements of Asir architectural tradition with modern materials and technology, and Aramco's Western Region Headquarters (1989) in Jeddah, for which the team won the American Institute of Architects' Award for Excellence in Architecture. Zaidan also served as architectural consultant for the Institute du Monde Arabe (1987) in

Paris, designed by Jean Nouvel and the Architecture Studio.

Abdulla Bokhari of Archi-Plan is a strong believer in the influence and importance of theories in design. Bokhari sees tradition as having no authority except as a platform for further transformation or as an ongoing experiment. This approach is best seen in his designs for the SANCST Cultural and Leisure Facilities Center (1989) and the UNDP Headquarters (2000), both in Riyadh.

Several regional architects have also produced important work in Saudi Arabia, including the contributions of Sami Anqawi, director of the Pilgrimage Research Center for many years and a practicing architect in Amar. His strong commitment to tradition is best reflected in the renovation of the Amar Office Building in Old Jeddah and in his design of the al-Yamani residence (1980s) in Mecca. Saleh Qadah's work in Asir is also worth noting for his ability to use traditional architectural features as part of modern designs. This was well demonstrated in Almiftah Village (1989) and in the Chamber of Commerce Building (1989), both in Abha.

In addition to these individual designers and design teams, the government-backed Arriyadh Development Authority (ADA) has also been a major contributor to the shaping of urban patterns and architecture styles in the kingdom. Among the most notable projects carried out by the ADA in the Riyadh area have been the development of the Diplomatic Quarter, a new town within the city; the MFA Staff Housing (1983); the development of the Justice Palace District (1985–2000); and the development of the King Abdulaziz Historic Center (1998). The award-winning quality of the ADA's projects is often demonstrated through magnificent architecture that marries traditional and modern forms.

In the political arena, Mohammad Said Farsi, the well-known mayor of Jeddah from the early 1970s to the mid-1980s, was also influential in the development of new trends in architecture and planning in the kingdom. An architect and planner, his efforts to preserve the old city and develop Jeddah's architectural tastes had wide-ranging effects on the architectural profession in Saudi Arabia.

In terms of architectural education, Ahmad Farid Moustafa was also extremely influential on the course of architecture and planning in the kingdom. Moustafa served as the first head of the Department of Architecture at King Saud University in the late 1960s. Later he was a founder and dean for the School of Architecture and Planning at King Faisal University. In these positions, he had a tremendous effect on the first generation of architectural students in Saudi Arabia. Adel Ismail and Mohammad Said Mousalli were others who played major roles in the development of architecture education, both through their teaching at King Saud University and through their involvement as advisers for government agencies.

Formal architecture education began in Saudi Arabia with the establishment of the Department of Architecture at King Saud University of Riyadh in 1967. Other schools followed: the College of Architecture and Planning at King Faisal University, Dammam (1975); the School of Environmental Design, King Abdulaziz University, Jeddah (1976); the College of Environmental Design, University of Petroleum and Minerals, Dammam (1979); and the Department of Islamic Architecture, Umm al-Qura University, Mecca (1983). Some of the first graduates of these universities in turn began teaching careers of their own in the 1980s. These have included Saleh Al-Hathloul, Mohammad Al-Hussayn, Mohammad bin Saleh, Tarik Al-Sulaiman, and Jameel Akbar. Such educators have had a broad effect on the field through teaching, writing, and involvement as jurors, reviewers, and evaluators of major projects.

The role of national professional organizations has also increased in importance. In 1982, the Engineering Committee was formed through the Chamber of Commerce to oversee and organize design and consulting practice. The Saudi Association for Architects and Planners (AL-UMRAN) was formed in 1989, and its membership now exceeds 1000. *Albenna* magazine, covering architectural and development issues, produced its first issue in February–March 1979.

In addition to these local influences, the work of international architects in Saudi Arabia has continued, and in recent years this has also become more responsive to local conditions. Among the many excellent examples of work by international design teams in Saudi Arabia have been the Haj Terminal (1982) at King Abdulaziz Airport in Jeddah by Skidmore, Owings, and Merrill, a 20th-century adaptation of traditional tent structures; the National Commercial Bank (1984) in Jeddah, also by Skidmore, Owings, and Merrill, a modern corporate headquarters successfully integrated into a traditional setting; the Ministry of Foreign Affairs (1984) in Riyadh by Henning Larsen, whose monumental formalism presents an intelligent response to changing opinions; and King Fahad International Stadium (1987) in Riyadh by Ain Friezer and Partners, a masterpiece of tent architecture.

Other examples include the Central Government Complex (early 1980s) in Taif by Leslie Martin, a complex that responds well to climatic requirements and blends with local architecture; Imam Moh'd Bin Saud Islamic University (1988) by Techni Beria; King Saud University, Al-Gassim Campus (1995), by Kenzo Tange Associates, K.Baytarian and Associates, and Somait Engineering Services, a 10,000-student campus based on a hierarchy of open spaces; and the Nuzul Hotel (1995) in Skaka by John Lingly, which efficiently uses passive cooling systems and local design methods.

Many other projects from the last 25 years also deserve recognition: the Riyadh TV Tower (1981), designed by ADIT of France; the Council of Ministers Building (early 1980s) in Jeddah by Kenzo Tange; the King Khalid International Airport Terminal (1983) in Riyadh by Hellmuth, Obata, and Kassabaum (HOK); and the King Fahad International Airport Terminal (1993) in Dammam by M. Yamasaki, who was the designer for the Dhahran Airport Terminal (1961).

Also of note have been Al-Ta'meer Center I (1999), designed by Arrowstreet, Inc., in association with Dar Al-Mimar (Badran and Abdul Halim), a festival market in the heart of Riyadh incorporating sustainable-design elements; Al-Khaleej Village (1990) in Dammam, an earlier, influential model for a seaside resort city; Sultan bin Abdulaziz City for Humanitarian Services (2000) in Riyadh by the OEO/HLW design partnership, a hospital and training complex; and Al-Faisaliah Center (2000) in Riyadh by Norman Foster, a 300-meter-high skyscraper to complement al-Khairia Center (1982) by Kenzo Tange.

Since the late 1970s, urban renewal has also become an important trend in the kingdom. Such urban design schemes were first developed for downtown Riyadh by Albini (1978) and Beeah (1983) and were subsequently revised by the ADA's staff. The rebuilding of the al-Muraba area in Riyadh (1998), an urban design by Beeah and Badran, will also create a cultural and historic center to complement Riyadh's city center. Other major urban-renewal programs have concerned further recent expansions of the holy mosques in Mecca and Medina. In Mecca, an urban design scheme (1986) by Dar Al-Handasah takes the Ka'bah as its center and proposes the continuation of prayer space on the ground level up to the first Ring Road. In Medina, the whole area of the old city has been encompassed in the Prophet mosque extension (1994), and the surrounding area up to the first ring road has been transformed into a gridded plan.

Thus, it is evident that various climates, regional materials, local vernacular traditions, and economic and technological development have significantly directed architecture and its practice in 20th-century Saudi Arabia. The first half of the century reflected centuries of building habits and cultural needs, whereas the second half showed the immediate and large-scale effect of economic prosperity in an internationally important region that adapted new buildings types and modern urban planning to suit a variety of modern needs.

SALEH AL-HATHLOUL

S*ee also* **Jeddah, Saudi Arabia; Ministry of Foreign Affairs, Riyadh, Saudi Arabia; Riyadh, Saudi Arabia**

Further Reading

Of the works cited below, King, Hariri-Rifai, and Talib provide a good overview of Saudi Arabia's traditional architecture. The works by Eben Saleh and Alkokani and by Nomachi document the historic development and the extensions of the two holy mosques in Mecca and Medina and their effect on the urban structure of the two cities. A record of most architecture projects in Saudi Arabia since the late 1970s appears in *Albenna Architecture Magazine.* The Aga Khan Award for Architecture books include good coverage of winning projects from Saudi Arabia.

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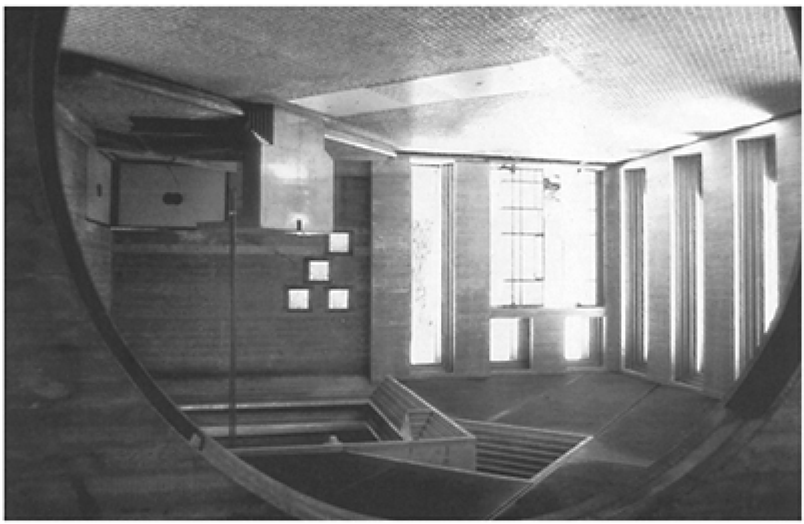
SCARPA, CARLO 1906–78

Architect, Italy

For much of his career a figure isolated and detached from the mainstream, Carlo Scarpa was recognized only after his death as one of the great architects of the 20th century. His work does not fit easily into standard genealogical accounts of modernist architecture. It is characterized by a virtuosity of light, color, and texture; an extraordinary refinement of detail; and complex manipulations of materials and geometry.



Chapel, Brion Tomb, San Vito d'Altivole, Italy (1972)

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Scarpa obtained a diploma as a teacher of architectural drawing from the Academy of Fine Arts in Venice in 1926, when he also began teaching at the Architectural Institute of Venice University. Before beginning his career as an architect, he gained an exceptional understanding of materials working as artistic director of Venini, one of the most prominent manufacturers of Venetian glass, from 1933 to 1947. He was influenced by Frank Lloyd Wright, but the sumptuous visual density of his work is rooted more in the traditions of Venetian craftsmanship and Viennese ornamentation, typified by Josef

Hoffmann and the *Wiener Werkstätte*. Scarpa taught at the IUAV from 1926 until his death, becoming director in 1972.

Scarpa designed numerous exhibitions in London, Paris, Rome, and Milan. For over 30 years, beginning in 1942, he consulted for the Venice Biennale. A major break through in his career was the 1948 "Paul Klee" exhibition, followed by a book pavilion in 1950. Among his greatest contributions to post-war Italian architecture was the reconstruction of several historic buildings as museums, most notably the Palazzo Abatellis (Palermo, 1953–54), the Museo di Castelvecchio (Verona, 1956–64), and Quirini-Stampalia (Venice, 1961–63), where he elevated restoration to the level of art form. The restructuring of the Museo Correr (1953–60) and the Ca' Foscari (1954–56) in Venice received acclaim. At the same time, he undertook the layout and installation of the first six rooms of the Uffizi in Florence (1954–56, with Ignazio Gardella and Giovanni Michelucci) and planned the extension to the gypsum museum in Possagno (1955–57). Other outstanding works include the Olivetti Showroom (Venice, 1957–58), and the Gavina Showroom (Bologna, 1961–63). The Banca Popolare di Verona (1973–80), his last large work, posthumously completed, suggests the directions he might have followed had he not died prematurely. Among his domestic works, the Veritti House (Udine, 1955–61) and Ottolenghi House (Bardolino, 1974–) are most notable. It is, however, Brion-Vega Tomb and Cemetery (San Vito d'Altivole, 1970–72) that best typifies Scarpa's enigmatic quality and his tendency to realize form as a condition of process.

Rejecting the neutral spaces of mainstream modernism, Scarpa created settings highlighting the uniqueness of objects. Container and content interact across history, manifesting a new attitude to the past and a break with modernism's utopian teleologies. His architectural interventions create an overall artwork that embraces painting and sculpture dialogically. Historical objects and contexts are no longer simply assimilated, juxtaposed, or contrasted but rather interpreted by the architecture itself. At the Castelvecchio, for example, Scarpa hauntingly entangles the principal threads of circulation and lines of vision around the

Entry and meditation pavilion, Brion Tomb, San Vito d'Altivole (1972)

equestrian figure of the Cangrande. At other times, the engagement amplifies the displays: in the extension to the Possagno museum for Canova's plaster casts a refined arrangement admits the changing daylight through slots and cutout cubes of sky, vivifying the chalky prototypes and walls.

Scarpa tended to approach his projects without fixed concepts. Instead, they grew out of personal interactions with clients, craftsmen, artists, and preexisting contexts. Designs were developed as processes of making, particularly in his unique mode of drawing that proceeded, like the fabric of the final buildings, in strata and palimpsests, and with meticulous attention to the smallest detail. In this sense, the works were both occasional and decorative: They were befitting celebrations or commemorations of occasions and persons—alien to both contemporary functionalist and later neorationalist approaches, but located within a respect for tradition.

Scarpa's interest in the facade points to an acceptance of convention in architecture and a special attention to civic concerns, as in the Banca Popolare di Verona. His work is grounded in the specificities of place and region but without fixation on local identity. It is ornamental, arising from a complex poetics of differentiation and junction of nodes and seams. The sheer complexity of his compositions embraces encryption, numerology, astrology and mathematical games, the play of allusion, and a diffusion of associations by the resonance of figures and motifs at multiple scales.

Scarpa was seen by many of his contemporaries as distanced from true modern architecture. His ways of working were regarded as archaic, as a reactionary indulgence in lost practices without future, obsessed with detail, precious materials, and luxurious artifice. The Venice Order of Architects sued him for unlawfully practicing as an architect, but he successfully defended the lawsuit. His nonchalance regarding the tasks of the contemporary world, the fact that he worked for museums, foundations, and private clients rather than for public administration, provoked ideological criticism. Although he enjoyed considerable respect as a designer and specialist in restoration and the interior design of museums and exhibitions, only Mazzariol and Zevi, his earliest defenders, promoted his importance as an architect.

Since his death nonmodern perceptions have highlighted and legitimized the metaphorical potential of Scarpa's work. Its dispersed, fragmentary nature and its perpetual capacity to defy geometric closure are acknowledged by Tafuri in his comparison with Umberto Eco's idea of the *opera aperta.* His composition by breaks and scattering anticipated the disjointed work of the deconstructivists. Detail has now become a source of interest to those concerned with ornament and tectonics alike—we are perhaps closer to him today than his contemporaries were. Scarpa's influence on subsequent architecture has been diffuse but indirect; his work is too singular to be directly emulated.

Ross JENNER

S*ee also* **Tafuri, Manfredo (Italy); Zevi, Bruno (Italy)**

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SCHAROUN, HANS 1893–1972

Architect, Germany

Although born in Bremen, Germany, on 20 September 1893, Hans Scharoun grew up in the town of Bremerhaven, Germany's major port just west of the industrial city of Hamburg. Exhibiting a fascination with machines and architecture in his earliest sketches and drawings, Scharoun took careful notice of the rapid changes he saw in the world around him, changes even more exaggerated in the activities of the port. Bremerhaven, Germany's gateway to the world, felt the impact of cultures beyond Germany's borders and was thus more cosmopolitan than much of the country. It was also a place in which new forms of technology and transport drove the city's development; in this context, new theories involving space and time were not abstract but quite real, leaving an imprint on the port's infrastructure and, consequently, the city's architecture. As remarked by Peter Blundell-Jones, a noted scholar of Scharoun's work, Scharoun appeared to have received the imprint of these ideas as well, for his architecture and planning ideas were anything but sentimental. From his earliest attempts at architecture and urban planning, Scharoun engaged the dynamics of economic exchange and technological development directly. Yet Scharoun's concept for architecture, or *Baukunst* (at the time German architects pointedly used, after Schinkel, the term *Baukunst,* or "building art," rather than "architecture" to describe their work), was not simply utilitarian but sought an expression of the Modern era. Scharoun's vision, one he shared with several other members of his generation, espoused a kind of functionalism—although not the functionalism promoted by several of his contemporaries, including the *Sachlichkeit* architects Hannes Meyer and Ludwig Hilberseimer. Rather, Scharoun emphasized the spiritual foundation of organic form, where the formation of the interior generated the exterior form.

Scharoun was accepted as a student of architecture at the Technische Hochschule in Berlin-Charlottenburg in 1912 and became well versed in engineering technologies, the primary emphasis of the architectural course at the time. He also worked as an assistant in the Berlin office of Paul Kruchen, an assistant at the Technische Hochschule and Scharoun's first real mentor. While on holiday from his studies, the young architect worked as a bricklayer's apprentice. The curriculum of the Technische Hochschule did not engage his imagination; unlike contemporary architectural education, there was little focus on design in most German architectural programs at the time. Nonetheless, Scharoun took part in numerous competitions, seeing them as opportunities in which he could develop and exercise his architectural ideas. When World War I broke out, Scharoun voluntarily entered military service, where he was eventually assigned to assist Kruchen, who had by then become a military architect. His early reputation as an architect was in fact based on these competitions; in comparison with other competition entrants, Scharoun's work was exceptionally progressive. The most significant of these was his competition entry for the planning of the cathedral area in Prenzlau, a project that led to an association with the noted Expressionist architect Bruno Taut and the architectural critic Adolf Behne, both of whom resided in Berlin. Both Taut and Behne were active in the utopian group *Arbeitsrat für Kunst* (Work Council for Art), an association of architects, writers, and artists founded immediately after the November 1918 revolution. The group, reflecting the burgeoning socialist sentiments of many cultural figures during the Weimar Republic, sought to recover an art that was "for the people" and vice versa, a people energized by their creative actions. In so doing, many of them not only dispensed with the past but, in utopist fashion, overlooked the difficulties of the present in favor of the possibility of future redemption. Seeing change and development as modern architecture's foundational premise, Scharoun quickly became an associate and advocate of the group, participating in Taut's "chain letters," a secretive, semianonymous correspondence known as the *Gläserne Kette* (Glass Chain). Scharoun's language and visionary sketches from the period, bursting with intense light, color, and contrasts and using Expressionist symbols, are infused with utopian visions shared by members of the group such as Wassily Luckhardt, Herman Finsterlin, and Walter Gropius. Typical Expressionist architectural programs, such as *Volkshaus* (House of the People) and *Stadtkrone* (Crown of the City or City's Crown), with titles such as "Monument to Joy" and "Crystal on the Sphere" (Luckhardt) and *Kultbau,* or "Cult-Building" (Scharoun), exposed the underlying influences of German nature mysticism and 19th-century German Romanticism. Although interested in fantasy and longing, Scharoun's legacy from the period centered around subtle aspects of architecture: daylighting (*Lichtführung,* literally "the control of daylight") and organic form.

Expressionism's resort to quasi-mystical (spiritual) issues and forms of nature was effectively subsumed into the development of functionalism in the 1920s. Ornament—the rendering of ideas in architecture through surface application and detail—gave way to the embrace of space and time, a shift dependent on changes in the ideas and methods of the physical and natural sciences. Accordingly, space—immaterial and implied—became the residence of Spirit *(Geist),* whereas form, perceived as plastic and mutable, was infused with references to organisms, growth, and change.

Scharoun's architectural work from this period mirrored his incorporation of these influences, and his associations with certain architects and artists (several of whom exhibited an interest in the a "constructed organicist" version of the post-Dada group *Neue Sachlichkeit,* or New Objectivity) grew. Among his closest associates were artists Kurt Schwitters, Hans Richter, and Theo van Doesburg, all of whom worked to sublimate the mechanics and demands of persistent change and spirit in their art. Scharoun's particular interest in painting and collage—at this time highly gestural and expressive, with a hint of attention to vernacular traditions—supported the architect's functionalist ethic. At the time, functionalism was both a method and a philosophy (or shared faith) whereby the spirit moves from within to without; accordingly, "form" is the result of spiritual expansion and expression moving out into the world. Scharoun's incorporation of fluid, complex forms and rhythms, coupled with his embrace of architecture's new technologies and materials, aided and abetted his general resistance to academic form. Rather than static works resting on the landscape hidden behind an ordered facade, Scharoun's architectural designs—his spaces and forms—remained fluid and organic, engaging the landscape directly in providing a place for the infusion of plant life within while extending space into the landscape itself.

Ironically, Hans Scharoun's reputation and significance as an architect increased just as political and social tensions led to the demise of the Weimar Republic and the rise of Fascism in Germany. In the mid-1920s, the "housing question" became a central focus for the development of modern architecture. Although a professor at the Kunstakademie in Breslau, Scharoun yearned for Berlin's cosmopolitan cultural arena, finally relocating to the city in 1927–28. It was a fortuitous move professionally, and he began to obtain various commissions (his association with Berlin developer Georg Jacobowitz was particularly fruitful). Scharoun also had the good fortune of participating with several of his former *Arbeitsrat* colleagues, collaborating on several planning and housing developments, including both the Modern Siemensstadt living/housing project (1928–31) and a single-family dwelling for the Weissenhofsiedlung Stuttgart, a housing exhibition organized by the Deutscher Werkbund, in 1927. Both projects, manifestos of "social housing," were "intended as…models for [a] new way of life." However, the die had been cast portending the rise of Fascism by the late 1920s, and options for further exploration of Modern cultural and social ideas diminished substantially.

Although he did not immigrate during the period—an option taken by many of his closest friends and associates—Scharoun suffered an internal exile throughout the late 1930s and 1940s. The last building of his "Weimar years," a house for industrialist Fritz Schminke on the border of Czechoslovakia built in 1933, showcases Scharoun's maturing architectural vision; light, material, structure, form, space, function, furniture, and landscape are fused into a seamless, organic whole. As German Fascism increased its hold, Scharoun's work went underground; exterior projections of his architectural ideas—formal and material play and movement—became hidden behind the mask of Nazism's mandated, antimodern "German vernacular." Nonetheless, Scharoun, in his design of small, residential projects, clearly maintains his developmental trajectory, exploring with even greater intensity the dynamics of interior space and light and exterior form. These projects—the Mohrmann House (1938) in Berlin-Lichtenrade and the Endell House (1939) in Berlin-Wannsee are primary examples—map the increasing internalization of his architectural work and effectively mirror Scharoun's internal exile.

Again ironically, it was during this same period that Scharoun's most significant intellectual relationship developed: Hugo Häring, 11 years Scharoun's senior, became Scharoun's principal mentor, a relationship that would continue until Häring's death. During the 1920s, Häring was known primarily for his architectural ideas and was, according to Blundell-Jones, considered more of a contemplative (theoretical) architect than a builder. During the years of fascist rule and World War II, Häring and Scharoun developed a close relationship—like Scharoun, he was also an internal exile—with the elder man fulfilling the role of mentor, Scharoun's "intellectual authority." Häring's architectural theories were quickly absorbed by Scharoun, who adopted them as explanations for his own architecture.

Immediately after the end of World War II, Scharoun was asked to help with the planning and rebuilding of Berlin and was appointed Berlin city architect until the city elections in 1946. Housing was a critical issue, and Scharoun began to work on numerous city-planning and apartment projects, including those associated with the Planungs-Kollektiv. His work in this area exhibited a concern for the entire built environment and its future viability. Incorporating the necessary functions of daily life within his planning schemes, Scharoun added public buildings, shopping areas, parks, schools, kindergartens, administrative offices, and cultural and recreational elements, including crafts workshops and spaces for weekly markets and provisions for small-scale industry and future growth. In addition, his intro-duction of a wide range of transportation systems (with pedestrian access being the most important) underlined Scharoun's attention to the human dimension of architecture.

Scharoun was able to build many of his designs after the war, including apartment complexes, schools, and theaters—all building programs that directly engaged issues pertaining to the human dimension and, even more specifically, the quality of life. As one of the remaining architects of his generation still active in West Germany, Scharoun continued to explore architectural themes that had governed his work throughout his career: fluid space and change, program flexibility, technological advances, the primacy of the interior uses as a determinant of form, the dynamic interaction of landscape and form, and contextual response. Although there are numerous examples, notable housing projects include his design for apartments in Berlin, his "Romeo and Juliet" housing project (1954–59) in Stuttgart, Charlottenburg-Nord (1950s–1960s), and the Böblingen Flats (1965) near Stuttgart. Scharoun was extremely interested in the relationship between architectural program, order, form, space, and light and the learning processes associated with educational programs, and he designed several schools, such as the Geschwister Scholl (1958–62) in Lünen, where he adopted an aggressive color program, and the Volksschule (1960–71) at Marl in Westphalia. Scharoun's theaters included the Kässel (1952), Mannheim (1953), and Zürich (1964) theater projects. The Wolfsburg Theatre (1965–1973), completed after Scharoun's death on 25 November 1972, absorbs the energy of the earlier projects and stands today as a testament to Scharoun's architectural genius. This is also the case in his design for the German Maritime Museum (1969–75), a project commissioned by the State of West Germany and located in Bremerhaven, where his earliest visions for a new architecture first took root. Likewise, his most famous building, the Berlin Philharmonie (begun in 1968 and completed in 1987), sublates many of the ideas found in his earliest architectural work, becoming something of a refined exemplar of Expressionist architecture. The programs for the Philharmonie and the later Chamber Music Hall appear as instruments themselves—fluid arrangements of myriad systems that lend themselves to Scharoun's improvisational approach to the making of form.

Among Scharoun's last projects, a State Library (1964–79) and a Musical Instruments Museum and Institute for Musical Research (1969–84), both sited immediately adjacent to both the Berlin Philharmonie and Mies van der Rohe's masterful National Gallery in Berlin, display the full range of Scharoun's vision. The created context is thoughtfully nuanced, with the grouping of buildings open and responsive not only to one another but to the entire city of (West) Berlin as well—a studied contrast in the closed conditions presented by the city's isolated context at the time. Completed after Scharoun's death, they represent not only the sum of one architect's vision but also, in returning to the opening themes of the 1910s and 1920s, the culmination of a generation's vision, a generation that, from the beginning, saw architecture as a form of redemption, a form of life that engaged and affirmed the dynamics of social interaction.

As an architect, Scharoun was prolific. The number of projects designed amounts to more than 300, the majority (238) of which were built despite the intervening years of Fascist rule and the post-World War II economic difficulties. Scharoun's insistence on a dynamic, "organic" architecture, in particular an architecture fully engaged in the rhythms of daily life, exhibits his concern for architecture as a form of life *(Lebensform)*. This idea encapsulates the sense of play and the use of fluid ordering systems in Scharoun's work; architecture did not exist as an object but rather functioned as an organism, a viable, developmental, and flexible network of associations and interrelationships.

ELIZABETH BURNS GAMARD

S*ee also* **Berlin, Germany; Berlin Philharmonic Concert Hall; Deutscher Werkbund; Häring, Hugo (Germany); Taut, Bruno (Germany); Weissenhofsiedlung, Deutscher Werkbund, Stuttgart (1927)**

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SCHINDLER, RUDOLPH M. 1887–1953

Architect, Austria and United States

Rudolph M.Schindler practiced in the Los Angeles area from 1920 until his death, producing a series of houses and apartment buildings that explored new concepts of form, materials, and space. Critical of the reigning machine-oriented orthodoxy of most advanced European and American modernists that became known as the International Style, Schindler's work is highly personal and individualistic.

Born in Vienna, Schindler studied structural engineering at the technical university, architecture under Otto Wagner at the academy, and informally with Adolf Loos. Inspired by Frank Lloyd Wright's Wasmuth publications, Schindler immigrated to the United States in 1914, met Louis Sullivan, and after repeated attempts secured employment with Frank Lloyd Wright and worked on several projects, including the Imperial Hotel. Wright sent Schindler to Los Angeles to supervise work on the Barnstall residence, known as Hollyhock. Schindler contributed a number of designs to Wright's project (studio residence A is generally credited to Schindler).

Schindler's earliest work, from 1921 to 1928, initially contained certain Wrightian mannerisms, but he also explored the possibilities of concrete and southern California's sybaritic living. His King's Road, or Schindler-Chase House (1921–22) in Hollywood was designed for two couples who shared common living spaces but who each had their own room and an open sleeping porch. The house is a series of interlocked tilt-slab concrete forms (which he derived from the American architect Irving Gill) paired with large openings, originally covered in canvas and later with sliding glass. Built on a slab, the building was in a sense a neutral container for the life within and without, with large indoor and outdoor fireplaces.

The Lovell Beach House (1922–26) in Newport Beach was composed of five poured-in-place concrete frames that carried what Schindler described as "space trays." Constructed of wood, the trays are multilevel and project beyond the end of the frames, creating a dynamic sense of space. With abstract forms that referred to pier pilings, Schindler's Lovell house was probably his best-known work.

Beginning around 1928, Schindler began to use the wooden stud frame; his architecture grew more cubic with flat, stucco-covered wall surfaces. Typically, his houses are enclosed on the street elevation and open to gardens or views. Fenestration is eccentric with varying shapes and sizes. With the C.H.Wolfe House (1928–29) on Catalina Island, Schindler posed the building as a series of boxes with open porches on a hillside, whereas the J.J.Buck House (1934) in Los Angeles spread across a lot as a series of interlocked stucco-covered forms. As with all of Schindler's work, the house was conceived as a total unit incorporating site, landscape, and furniture into the plan and the style.

Schindler's final phase, from 1935 on, becomes more expressionistic, with roofs and walls placed at eccentric angles, often resulting in radically dynamic space. The Guy C.Wilson House (1935–38) in Los Angeles has floor-to-ceiling glass walls poised 50 feet in the air and a butterfly roof that goes off at two angles. The S.T.Falk Apartment Building (1940) in Los Angeles, also on a steep site, features a series of overlapping geometries and bent forms; its volumes resemble precariously arranged boxes held in equilibrium. The Ellen Jansen (1949) and Adolphe

King’s Road House (architect’s house), West Hollywood (1922)

Tishler (1950) houses in Los Angeles appear almost unfinished with their collision of planes, forms, and beams. Spatially, Schindler’s late work defies verbal description, as color and a multiplicity of surfaces resound in different directions.

The eccentric character of Schindler’s work, his bohemian demeanor, and the Los Angeles location led to a dismissive attitude by eastern critics, who refused to acknowledge his contributions to modern architecture. Schindler pursued lectures, exhibitions, and publications of his work and was largely successful up to around 1949, when he was diagnosed with cancer. Since the mid-1960s, Schindler studies have blossomed, and his current status probably outranks that of his contemporary, Richard Neutra. Although critics and historians have attempted to define his work with reference to Wagner, Wright, Loos, De Stijl, and other movements, Schindler's oeuvre escapes classification. Schindler's major effect came at least three decades after his death in the work of Frank Gehry, Thom Mayne, and the Santa Monica School.

RICHARD GUY WILSON

S*ee also* **Brutalism; Gill, Irving (United States); Loos, Adolf (Austria); Neutra, Richard (Austria); Wagner, Otto (Austria); Wright, Frank Lloyd (United States)**

Biography

Born in Vienna, 10 September 1887. Graduated with degree in structural engineering, Imperial and Royal Technical University, 1911, and diploma in architecture under Otto Wagner at the Academy of Fine Arts, 1913, both in Vienna. Worked for Mayr and Mayer architects 1911–1914 in Vienna. Arrived in New York March 1914; worked as draftsman and designer for Ottenheimer, Stern, and Reichert in Chicago until 1917. Toured New Mexico, Arizona, and California in 1915; worked for Frank Lloyd Wright at Oak Park Studio, Taliesin, and Los Angeles, 1917–ca. 1922. Married Sophie Pauline Schindler, 29 August 1919; one child Mark Schindler, born 20 July 1922. Moved to Southern California, December 1920; lived in Los Angles and later Hollywood; became part of Hollywood's avant-garde community, securing patrons. Entered partnership ca. 1926–ca. 1928 with Richard Neutra under the name of Architecture Group for Industry and Commerce. Remained in independent practice until death on 22 August 1953.

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Lovell Beach House, Newport Beach, California, 1926
C.H.Wolfe House, Catalina Island, 1929
J.J.Buck House, Los Angeles, 1934
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S.T.Falk Apartment Building, Los Angeles, 1940
Ellen Jansen House, Los Angeles, 1949
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SCHLUMBERGER CAMBRIDGE RESEARCH CENTER

Cambridge, England

Designed by Michael Hopkins and Partners; Phase I completed 1985; Phase II completed 1993

The Schlumberger complex is located in a research park at the northwest edge of Cambridge, England. Schlumberger, a global company that provides technical services to support the exploration, drilling, and production of oil, is also a notable patron of architecture, having previously commissioned buildings by Philip Johnson and Renzo Piano. Michael Hopkins was selected for the Cambridge project from a shortlist of 20 international practices.

Phase I, commissioned in 1982 and completed in 1985, includes laboratories, offices for scientists, and a test station with a range of drilling pits used to simulate difficult and dangerous field conditions. Because of noise, dirt, and the risk of explosion, test stations traditionally had been isolated in separate buildings. However, both the preoccupations of Hopkins and the aspirations of Schlumberger led to a radically different approach. The test station is combined with a winter garden, which serves as both entrance hall and restaurant, to form a long north-south central spine that is flanked on the east and west by two slimmer bars comprised of laboratories overlooking the central space and offices with views out to the surrounding pastoral landscape. The natural slope of the site is utilized to sink the floor of the test station and service yard 2.5 meters below the winter garden. This lower level also provides an easily accessible services undercroft.

The efficient, rational plan gives little hint of the drama of the section. A tensile roof encloses the 24-meter-wide central zone, where a clear height of approximately 17 meters is provided above the drilling pits. Framed by an exposed steel structure of lattice columns and prismatic beams, raked booms and a network of tension rods support the translucent skin. The structure of the single-story offices and labs, a derivation of

Hopkins's Patera system, is also exoskeletal but, in contrast with the central spine, is more restrained. Anthony Hunt Associates designed the steel structure, and the lightweight structures unit of Ove Arup and Partners designed the fabric roof.

A zoned servicing strategy supports the contrasting spatial and structural characters of the central spine and flanking wings. The winter garden and test station, although weather tight, are conceived as quasi-external spaces; the labs are sealed spaces in which tightly controlled environmental conditions for research can be maintained; and the offices have opening windows and sunshading that can be adjusted by the occupants.

The building works as an icon in the heroic modernist tradition and, by addressing human needs, significantly advances the idea of the workplace. Transparency—with fully glazed walls between winter garden, test station, and labs and a glazed external envelope—creates a high degree of visual interaction both within the building and between the building and the outside world. An egalitarian workplace laced together by open meeting spaces and the generosity of the winter garden integrates disparate functions—clean and dirty, quiet and noisy, front and back of house. This social and programmatic integration is reiterated in the marriage of orthogonal and curvilinear geometries, of compressive and tensile structures, and of rational Miesian discipline with more exuberant expressionism.

This building for Schlumberger was Michael Hopkins's first use of a tensile fabric structure and the first large-scale architectural use of Teflon-coated fabric in the United Kingdom. Hopkins would further explore fabric structures in subsequent projects including the Mound Stand at Lord's Cricket Ground (1987), the amenity building and ventilation towers at Inland Revenue (1995), and the Younger Universe Pavilion in Edinburgh (1998).

As a product of systems-building thinking—inspired by the pioneering work of Ezra Ehrencrantz and developed in Hopkins's early association with Norman Foster—Hopkins designed Phase I as an open-ended, extendible system of prefabricated parts. However, oil research methods were changing rapidly. By the time Phase II was commissioned in 1990, Schlumberger was relying more on computer simulation, making the test station less central in its research program. Phase II is consequently a separate building that echoes Hopkins's 1988 Solid State Logic scheme near Oxford. Located to the south of Phase I, the extension plays the role of gatehouse, with two pavilions joined by an atrium that houses the reception area for the site and defines a central axial path to the winter garden. Each of the two-story pavilions is square in plan with offices for scientists at the perimeter surrounding labs, computer suites, conference rooms, and mechanical plant. Phases I and II are unified visually by similarly detailed glazed facades and conceptually by the integration of the rational and expressive sensibilities of Hopkins' work. However, the structure of Phase II, for which Buro Happold were consultants, is utterly different. The upper floor is prefabricated ferroconcrete used as permanent formwork for an in situ concrete slab. Recalling Pier Luigi Nervi's Gatti Wool Factory (1954) in Rome, the soffit is detailed to express clearly the patterns of structural stresses in the slab. An understated, light structure of air-filled pillows of clear PTFE (polytetra fluoroethylene) sheet spanning between simple steel beams encloses the central atrium.

The Schlumberger Cambridge Research Center is one of the emblematic projects of the so-called British High Tech movement led by Norman Foster, Richard Rogers, Nicholas

Grimshaw, and Michael Hopkins. However, like other buildings designed by Hopkins during the same period—notably the David Mellor Cudery Factory (1988), Bracken House (1992), Glyndebourne Opera House (1994), Inland Revenue, and the Emman-uel College Music Room (1995) the ferroconcrete used in Phase II of Schlumberger signals a shift away from the light steel and glass buildings of Hopkins's early career and the application of systems thinking and prefabrication to heavier, more traditional materials and methods of construction.

Phase I received the *Financial Times* Architecture Award in 1985 and a Royal Institute of British Architects (RIBA) National Award, a Civic Trust Award, and a Structural Steel Award in 1988. In 1993, Phase II received an RIBA Regional Award and was a finalist for the *Financial Times* Award.

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SCHOOL

School buildings have undergone tremendous change in the course of the 20th century. In part, these changes were driven by a dramatic increase in school enrollments, as children in industrialized nations were driven out of the workplace by new technologies and protective labor legislation, and compulsory school attendance laws become more commonplace. Even more important to the form of school buildings were new pedagogical theories advanced at the turn of the century, notably by Maria Montessori in Italy, John Dewey in the United States, and Karl Popper in Germany. Building on the ideas of the 19th-century kindergarten movement, these thinkers popularized the concept that children learn best by doing, rather than through rote memorization. Montessori emphasized the importance of the Prepared Environment, in which furnishings were sized and arranged to enhance the autonomy of young children. Dewey was equally influential in arguing that high schools should prepare students for life, and not just for college.

Kindergartens were among the first educational environments affected by these new pedagogical theories. In the United States and England they tended to take the form of a specially shaped classroom attached to a primary school, while in Europe the kindergarten tended to be a distinct building type. Those associated with the Waldorf School Movement (which began in 1919 when Rudolph Steiner started Die Freie Waldorfschule, for the children of the workers at the Waldorf-Astoria cigarette factory in Stuttgart) tended to favor organic forms that seemed to support Steiner's emphasis on cultivating higher mental faculties through the total harmony of the senses. More common in the 1920s and 1930s were kindergartens designed in a modern idiom, like the 1934 nursery school on the outskirts of Zürich where architect Hans Leuzinger provided direct access to the out-of-doors, ample daylighting, and light movable furniture scaled to young children.

Schools for older children took longer to address all of the implications of the new pedagogy. The regimented classroom (with chairs bolted into place facing the teacher's desk) remained the basic unit of school design, although educators and architects refined the arrangements of these rooms to insure that students could see the blackboard and hear the teacher's instructions. In the United States, the first architectural indication of the new educational theories involved the provision of facilities beyond the classroom: fully-equipped playgrounds, baths, gymnasia, art studios, scientific laboratories, shops for woodworking and handicrafts, and home economics classrooms. Auditoria and libraries were often included as well, to serve both students and the wider community. In order to make these amenities more affordable, the Gary, Indiana, school system introduced the platoon system (also called the Gary plan) in 1909. Aimed at using all school facilities at once, this system divided the student body into two platoons, each of which used conventional classrooms for academic subjects while the other was involved in special activities. Schools planned for this system typically included a large auditorium at the center of the building, with special classrooms grouped together on lower floors. After World War I, junior high schools (for grades 7–9) were also understood as a cost effective and developmentally appropriate means of providing adolescents with the manual training and home economics classrooms not used by students in the primary grades, where the focus remained on the acquisition of basic academic skills.

This new attention to the distinct needs of different age groups also extended to the architectural expression of early 20th-century schools in the United States. San Francisco school architect John J.Donovan, for one, argued that school architecture should anticipate the psychological responses of children; elementary schools "should reflect the spirit, quietness and refinement of a good home," while high schools "should have the character, repose, and presentation befitting the important work going forward within" (Donovan, 1921, 27–28). In practice, this meant that high schools retained a degree of monumentality, expressed in Colonial Revival or collegiate Gothic form in the late 1910s and 1920s, and later in Art Deco and Moderne styles associated with civic and commercial architecture. These two- and three-story buildings presented strongly symmetrical facades focused on a single main entrance set well above grade. In contrast, elementary schools minimized the building's scale. Not only did one-story buildings become more common, but many schools (like the Ashland School in St. Louis by William B.Ittner) provided two main entrances often at or near grade level. Articulated with Tudor Revival, Colonial Revival, or Mission Revival details, these buildings used historical vocabularies associated with domestic architecture to ease the child's transition from home to school.

In Europe, progressive educational reform often went hand in hand with attempts to bring students into closer communion with the natural landscape. Early in the twentieth century, open-air schools—with neither heating nor glazing—were built primarily for the tubercular children; the first of these was the Waldschule (Forest School) established in Charlottenburg, Germany in 1904. By the 1920s, however, open-air schools were recommended for non-tubercular children as well. In Frankfurt, Germany, architects working under the leadership of Ernst May in the 1920s designed decentralized schools called *Pavilionschule* (pavilion schools) or *Freiflachenschule* (open plan schools) with one-story wings disposed over large open sites to increase light and air circulation; the Niederursel School designed by Franz Schuster in 1928, may be the first of this type. Although there were some French pavilion schools (notably the open-air school in Suresnes designed by Eugène Beaudouin and Marcel Lods), France retained a tradition of density, building multistory blocks with outdoor space provided on rooftop terraces.

By the late 1930s, architects and educators increasingly worked together to develop new approaches to school design. In England, for instance, Walter Gropius and Maxwell Fry designed Impington Village College (Cambridgeshire, 1940) to house a school that educator Henry Morris envisioned as an innovative community center with its assembly hall, workshops, library and recreational facilities available to adults. Its loose asymmetrical plan increased natural lighting, improved cross ventilation, and provided direct access to the out-of-doors from each classroom, while its flat roofs and modern detailing eschewed any reference to traditional school architecture. In a similar vein, Perkins, Wheeler, and Will designed Crow Island Elementary School (Winnetka, Illinois, 1940) in close collaboration with teachers, using asymmetrical planning, low (9-foot) ceilings, generous glazing, and direct outdoor access from each classroom to make the school welcoming to young pupils.

In the postwar period, architects embraced industrial production techniques developed during the war as the best way to meet an acute demand for schools fueled by the baby boom. In England, the effort was pioneered in the architectural office of the Hertfordshire County Council, under the direction of Stirrat Johnson-Marshall. There in the late 1940s, county architects designed informally planned primary schools, like the Monkfrith School in East Barnet (1950, Mary Crowley and Oliver Cox, job architects), where daylighting from contiguous sides, warm-air heating systems, dispersed seating at movable tables, and bright colors set new standards for child-centered classrooms.

Another effort to link prefabrication, modular planning, and school design was the SCSD (School Construction Systems Development) system spearheaded by Ezra Ehrenkrantz and implemented in high schools throughout California beginning in 1962. Based on the coordinated manufacture of modular components, the SCSD system was primarily intended to lower school construction costs. Educators, however, were drawn to the system's potential for providing spaces that could be quickly reconfigured for individualized or group instruction. The trend toward open-plan schools (whether built on the SCSD system

Crow Island School, Winnetka, Illinois, designed by Eliel Saarinen with Perkins and Will (1939–49)

or not) developed rapidly in the 1960s and early 1970s, affecting half of the all schools built in the United States between 1967 and 1969 and ten percent of all elementary schools in use in the United Kingdom in 1985. The Mt. Hope, New Jersey, Elementary School (Perkins and Will, 1971) displays several characteristics of the type: a large floor plate (maximizing the building's enclosed area in order to minimize costs and enhance flexibility), heavy reliance on florescent lighting, open classrooms grouped on an upper level (allowing fixed equipment required in the cafeteria and gymnasium to remain on the ground level), movable furnishings used as classroom partitions, and spatial continuity between classrooms and circulation space. Although such schools avoided the rigidity of conventional classrooms, they also sacrificed daylighting and direct access to the out-of-doors. Open plans also introduced new noise and discipline problems, while the systems approach to school construction could result generic buildings with little architectural character.

The last two decades of the 20th century saw a reaction against the open plan school. The self-contained classroom returned, albeit with greater attention to providing a variety of seating arrangements. Irregular planning also re-emerged, and for the same reasons it had been popular in the 1930s and 1940s: to enhance natural lighting, improve access to the out-of-doors, and decrease noise levels. Finally, the child's reaction to the qualities of place reappeared as an issue of concern to architects. At the same time, new programmatic requirements—the need to incorporate computer technologies, a new emphasis—on project-based learning, renewed calls to integrate educational and community facilities—emerged to elicit new responses to this complex building type in the 21st century.

ABIGAIL A.VAN SLYCK

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SCHRÖDER-SCHRÄDER HOUSE

Designed by Gerrit Thomas Rietveld; completed 1924 Utrecht, Netherlands

The Schröder-Schräder House is an icon of early modern domestic architecture and is considered the greatest and most influential work of Gerrit Thomas Rietveld (1888–1964). Located in Utrecht at Prins Hendriklaan 50, the design is the result of the close collaboration between Rietveld and the client, Truus Schröder-Schräder (1889–1985), whose full contribution has only recently been recognized. They collaborated in 1921 in the design of a study for Mrs. Schröder-Schräder in her house on Biltstraat. In 1923, on the death of her husband, Frits Schröder, Mrs. Schröder-Schräder decided to build a small house for herself and her three children that would represent her ideas of a new, modern way of living.

Sitting at the end of a row of traditional Dutch houses, the Schröder-Schräder House is a balanced, asymmetrical composition of seemingly independent planes and lines. The ends of the elements slip past each other with balconies and roof planes also projecting from the body of the house as though not fully containing the space inside. Rietveld initially conceived of the house as constructed in concrete, and it was noted as such in some early publications. This proved to be too costly, and only the foundations and balconies are of concrete, and the walls are of traditional brick masonry with plaster. Both wood and steel are used for structural support, wood generally at the floors and steel for the balconies and flat roof.

Sheltered by the southeast balcony in the main entry to the house is a traditional Dutch door lacquered black. The ground floor is a composition of fixed walls in which essential functions have been carefully integrated into the design. Within the compact space of the entry hall, a coat closet, a telephone counter, and a place for mail delivery, as well as storage for the children's toys, are carefully composed and built-in. Also on the ground level is a small study with a built-in desk, bookshelves, and a door into the garden. Although the room behind the study was intended as a garage, Mrs. Schröder-Schräder never owned an automobile, and both Mrs. Schröder-Schräder and Rietveld periodically used this room as a studio. To the right of the entry hall is the kitchen with room for four people to dine. A small window and shelf for deliveries is built-in, as is a speaking tube to the living-dining area on the upper level. Accessed from the kitchen is a small cellar, and behind the kitchen is a maid's room. Mrs. Schröder-Schräder, however, never had a live-in servant, and this room was used primarily for reading. Closely linked to the site, the garage, kitchen, and study have their own doors to the garden, and spatial connections are made between the rooms with large transoms at the top of the walls.

Despite the fact that the drawings given to the building commission indicate the ground floor as the living area with the upper level noted as an "attic," this was never the intention. It is the upper level that most exemplifies Mrs. Schröder-Schräder's desire for an architecture to match her attitudes toward living. These ideas were manifested in an inherent freedom in the ability to change the layout to accommodate a variety of spatial configurations. A single, open room, the upper level can be divided by movable partitions that follow tracks in the floor and guides along the ceiling. Closing the partitions creates four smaller rooms that provided privacy for the children and Mrs. Schröder-Schräder and a shared living-dining area. The three bedrooms are equipped with built-in storage and a sink to promote self-sufficiency. A skylight above the stair provides access to the roof and fills the center of the upper level with light. The bath and toilet area along the party wall can be enclosed by movable partitions at the stair. Gerard van de Groenekan, Rietveld's assistant, constructed the built-in furniture; chairs and small tables were also of Rietveld's design. The living-dining area is a slightly larger space with a built-in table, storage, and a shelf for the children to do their homework. It was here that the lively discussions that Mrs. Schröder-Schräder envisioned occurred.

Rietveld created the interpenetration of spaces and the connection to the surrounding landscape by the dematerialization of boundaries either physically, as in the use of movable partitions, or through the use of color. Rietveld's offsetting of the support at the corner window in the living-dining room literally opens the space and creates a direct connection to the landscape. In turn, the colors of the floor and walls of the upper level define spaces not constricted by the placement of partitions.

The Schröder-Schräder House is often considered a quintessential example of De Stijl architectural principles. Theo van Doesburg, the founder of De Stijl, published the house several times in his journal *De Stijl*. However, the house was not initially acknowledged by the general Dutch press, despite its appearance in many influential European architecture magazines and Henry Russell Hitchcock's 1929 *Modern Architecture*. The 1950s brought a resurgence of interest in the house in conjunction with a growth in the popularity of Rietveld's work.

Rietveld moved to the house after the death of his wife and lived there until his own death in 1964. Over time, a number of changes were made to the house; a dumbwaiter was added from the kitchen to the upper living-dining area, and in 1935 a room was added on the roof to give Mrs. Schröder-Schräder more privacy from the many visitors who came to see the house. This room was later demolished. The original, rural context of the house also has changed with urban expansion and the construction of a bypass in 1964. Mrs. Schröder-Schräder established the Rietveld Schröder House Foundation in 1970 to assist in the maintenance and preservation of the house. Five years later, the foundation hired the architect Bertus Mulder to begin restoration of the interior and exterior of the house. The Schröder-Schräder House was opened to the public in 1987.

KATHERINE WHEELER BORUM

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SCOTT BROWN, DENISE 1931

Architect and theorist, United States

Controversial both for her ideas and for her prominence as a female theorist and practitioner in a period when few women architects succeeded, Denise Scott Brown has exercised a powerful influence on architecture and urbanism since the 1970s. Reconnecting form to its social meaning and emphasizing architecture's position within its cultural environment, her concerns have coupled with Robert Venturi's interest in historical precedent to produce an inclusive interpretation of architecture's context that incorporates social, economic, historic, and formal dimensions. Along with a shared aesthetic of simplification, juxtaposition, and deadpan irony, their theories have been central to the development of Postmodernism and the advancement of the architectural profession generally.

Scott Brown was born in 1931 in Nkana, Zambia, into a well-to-do Jewish household of Lithuanian and Latvian ancestry. After architectural studies at the University of Witwatersrand, Johannesburg, she earned a diploma at the Architectural Association in London in 1955 and was registered in the United Kingdom in 1956. Her teachers included Arthur Korn, a Bauhaus émigré and coauthor of the MARS plan for postwar London who emphasized the connections between social structure and urban form, and historian John Summerson, whose preoccupations with mannerism and Georgian urbanism contrasted with contemporary CIAM (Congrès Internationaux d'Architecture Moderne) and "townscape" planning ideas. Peter and Alison Smithson's focus on advertising, everyday experience, and neighborhood "association" also stimulated her interest in pop art and ordinary urban environments. At the University of Pennsylvania, she obtained masters degrees in city planning and architecture in 1960 and 1965, studying under sociologist Herbert Gans, a "participant-observer" of Levittown, who defended the aesthetic validity of popular culture, and planner David Crane, an originator of advocacy planning. An early article, "The Meaningful City" (1965), adapted Crane's articulation of three levels of urban meaning—"heraldic," "physiognomic," and "locational"—to urban design. Her multifaceted education generated a sophisticated understanding of the interaction between architectural form and social forces as well as the conviction that architects should foster rather than negate patterns of urban order arising from the aggregation of many individual social and economic decisions.

Scott Brown met Robert Venturi at the University of Pennsylvania in 1960. Sharing an anthropological attitude toward their aesthetic environment and an affinity for the local, the complex, and the irregular, they soon began collaborating, marrying in 1967 and formalizing their architectural partnership in 1968. Their visits to Las Vegas led to the publication of two seminal articles: "A Significance for A&P Parking Lots, or Learning from Las Vegas" (1968) and "Ugly and Ordinary Architecture, or the Decorated Shed, Parts I and II" (1971). Their studios on Las Vegas and Levittown at Yale in 1968 and 1970 employed interdisciplinary research and design methods and applied traditional categories of architectural analysis to everyday postwar urban forms. In *Learning from Las Vegas* (1972, with Steven Izenour), they argued that Las Vegas's extravagant signs and its large, low, generic buildings were extreme but informative models of current building practices, the avatars of a new, late Modern—or what was soon to be called Postmodern—vernacular. In an automobile-dominated culture, pedestrian-oriented, modernist "space" was less significant than "symbolism over vast space."

Carol M.Newman Library Renovation and Addition, Virginia Polytechnic Institute and State University (1971)

Photo © Mary Ann Sullivan

They invented two new terms—the *duck* and the *decorated shed*—to describe the operation of architectural symbolism. The duck's entire form was an image of an idea. The Las Vegas casino was a decorated shed: constructed conventionally and generically but with an ornamented, symbolic facade. In both, symbolic considerations dominated structural and functional ones. Drawing on linguistic theory as well as associational philosophy, Venturi and Scott Brown argued that architecture is understood by association to previous experience. Rather than emphasizing structural and functional "truth," therefore, buildings should make reference to what people already know: the conventions of vernacular as well as historical forms. Their insistence on the validity of the ordinary person's aesthetic choices contested modernism's belief that architecture should create both a better world and a "modern man" suited to live in it. Theorist and historian Kenneth Frampton's dispute with Scott Brown over this distinction between "is" and "ought" rested on a disagreement over the identity of architecture's audience: the worker to whom modern architecture had often been dedicated or the lower-middle class denizens of Gans's Levittown (Frampton, 1971; Venturi and Scott Brown, 1984).

Scott Brown's interest in the everyday environment also engendered a four-year investigation of the imagery of American suburbs. This research culminated in “Signs of Life” (1976), an exhibition of suburban, strip, and city imagery mounted at the Smithsonian Institution’s Renwick Galley in Washington, D.C. The exhibit consisted of three sections: the Home, three dioramas of typical American housing types; the Strip, neon signs and billboards, many especially constructed for the exhibit; and the Street, texts and images describing Main Street. Its deadpan presentation delighted the public but puzzled architects, who expected aesthetic judgments on American urbanism.

Scott Brown’s writing, which often delineates the connection between the personal and the theoretical, encompasses architectural and urban theory, preservation, education, and critiques of the “star system” in architecture. Her role as partner in charge of planning at Venturi, Scott Brown and Associates is equally significant. Ranging from facilities programming to the design of urban districts, Scott Brown’s work also includes important contributions to the firm’s architectural projects. Her involvement in the Sainsbury Wing of the National Gallery (1991) in London is especially notable. In 1992, she and Venturi were awarded the Presidential Medal of the Arts. Her plans, the recipients of many awards, emphasize user participation, sensitivity to existing urban fabric, practicability, and what she calls a “feminist, darning and mending” approach to evolutionary change (Gabor, 1995). They have sometimes generated controversy with their insertion of “pop” elements into existing fabrics. Her Philadelphia Crosstown Community Plan (1968) restored a oncevital, center-city commercial neighborhood that had undergone a steep decline in the 1960s, suffering from both the loss of its middle-class population and the city’s plan to cut a highway through it. Employing Edward Ruscha-style collages to illustrate existing character, her proposal mixed sensitive reuse with new construction and substituted one-way streets for the proposed expressway. Miami Beach’s Art Deco District (1978) was a thriving but run-down area inhabited by Eastern European Jewish retirees and Cuban immigrants. Scott Brown’s pragmatic approach, which included a color palette, inexpensive facade renovations, street furniture, and paving patterns, won a Progressive Architecture Urban Design Award in 1982.

Scott Brown’s innovative approach to studio teaching has influenced many contemporary planners and architects. She has taught at the University of Pennsylvania, at the University of California at Berkeley and Los Angeles, and at Yale, Harvard, and Rice Universities. In 1996, she won the Association of the Collegiate Schools of Architecture and the American Institute of Architects Topaz Award for outstanding architectural educators, the first woman to receive this award.

DEBORAH FAUSCH

Biography

Born Denise Lakofski in Nkana, Zambia, 3 October 1931; emigrated to the United States 1958; naturalized 1967. Attended the University of Witwatersrand, Johannesburg, South Africa 1948–51; studied under Arthur Korn at the Architectural Association School, London 1952–55; AA Diploma and Certificate in Tropical Architecture 1956; studied at the University of Pennsylvania, Philadelphia, under Louis I.Khan 1958–60; master’s degree in City Planning 1960; master’s degree in Architecture 1965. Married (1) architect

Robert Scott Brown 1955 (died 1959); (2) architect Robert Venturi 1967. Worked as a student architect with firms in Johannesburg and London 1946–52; architectural assistant to Enrö Goldfinger and Dennis Clarke Hall, London 1955–56; architectural assistant to Giuseppe Vaccaro, Rome 1956–57; architectural assistant to Cowin, DeBruyn, and Cook, Johannesburg 1957–58. Architect and planner, with Robert Venturi and John Rauch, Venturi and Rauch, Philadelphia 1967–80; partner, Venturi, Rauch and Scott Brown 1980–89; principal in charge of urban planning and design, Venturi, Scott Brown and Associates from 1989. Assistant professor, School of Fine Arts, University of Pennsylvania, Philadelphia 1960–65; visiting professor, School of Environmental Design, University of California, Berkeley 1965; associate professor, initiated urban design program, School of Architecture and Urban Planning, University of California, Los Angeles 1965–68; visiting professor in urban design, Yale University School of Architecture, New Haven, Connecticut 1967–70; visiting critic, Rice University, Houston, Texas 1969; member, Visiting Committee, School of Architecture and Urban Planning, Massachusetts Institute of Technology, Cambridge 1973–83; Regents Lecturer, University of California, Santa Barbara 1972; chair, Evaluation Committee for the Industrial Design Program, Philadelphia College of Art 1972; Baldwin Lecturer, Oberlin College, Ohio 1973; member, Advisory Committee, Temple University Department of Architecture, Philadelphia from 1980; member, Curriculum Committee, Philadelphia Jewish Children's Folkshul from 1980; visiting professor, University of Pennsylvania, School of Fine Arts, Philadelphia 1982 and 1983; Eliot Noyes Visiting Critic, Harvard University, Cambridge, Massachusetts 1989; member, advisory board, Department of Architecture, Carnegie Mellon University 1992–96; dean of the search committee, Department of Architecture, Washington University, St. Louis, Missouri 1992. Fellow, Morse College, Yale University 1970; member, Policy Panel, National Endowment for the Arts, Design Arts Program 1981–83; member, Board of the Society of Architectural Historians 1981–84; advisor, United States National Trust for Historic Preservation from 1981; Butler College Fellow, Princeton University, 1983; member, Capitol Preservation Committee, Commonwealth of Pennsylvania 1983–87; member, Board of Trustees, Chestnut Hill Academy 1985–89; member, Board of Directors, Central Philadelphia Development Corporation from 1985; member, Board of Directors, Urban Affairs Partnership, Philadelphia 1987–91; chair, American Institute of Architects 1993; member, Architectural Association, London; member, American Planning Association; member, Society of Architectural Historians; member, Society for College and University Planning; member, Royal Institute of British Architects. Commendatore, Order of Merit, Italy 1987.

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SCULLY, VINCENT, JR. 1920

Historian, United States

One of the most inspirational and influential educators of the 20th century, Vincent Scully, Jr., has been widely recognized as a leader of architectural historians and critics of the United States.

When he was admitted to Yale College from New Haven's Hillhouse High School in 1936, he was only 15. At the time, his primary interests were literary criticism and French, which would teach him Cartesian clarity and rigor and guide his search for facts and the clearness of things. After graduating with a B.A. in 1940, he attempted to enlist in the Royal Canadian Air Force and the U.S. Army Air Force but ultimately went into the U.S. Marine Corps, serving in both Europe and the Pacific. At the end of World War II, Scully returned to Yale as a graduate student of art history. Within the next three years, he received his M.A. (1947) and Ph.D. (1949) degrees from Yale. With the exception of a year of study in Rome (1951–52) and another year of traveling in Greece (1957–58), he would never leave his alma mater, where he has taught continuously from 1947 to the present, even following his official retirement in 1991 as Sterling Professor Emeritus of the History of Art.

At Yale, Scully benefited first from the teaching and later the collegiate friendship of several outstanding scholars and teachers in the history of art, including George Kubler, Charles Seymour, Jr., and Sumner McKnight Crosby, all of whom had in turn studied under the preeminent French humanist Henri Focillon. Focillon's conception of style in the visual arts and of the structure and behavior of historical time, best described in his seminal book *Vie des Formes* (1934), translated into English by Kubler as *The Life of Forms in Art* (1942), must have attracted Scully's attention in particular. Above all, Focillon's singular ability to penetrate beyond superficial phenomena to grasp the deeper relationships would leave a lasting impression on him.

Scully's dissertation, titled "The Cottage Style," was a brilliant reassessment of 19th-century American architecture, not a popular topic at the time. In it, he argued convincingly that late 19th-century domestic architecture in the United States "had clearly begun to demonstrate positive characteristics of originality and invention"—most noticeable in the work of architects such as Bruce Price; McKim, Mead and White; Henry Hobson Richardson; and Frank Lloyd Wright. Published as *The Shingle Style* in 1955, the book became an instant classic, and after multiple reprintings, it remains the definitive study on the subject. Not only would this work lead to a reevaluation of American domestic architecture between 1872 and 1889, but it would serve as a source of inspiration to 20th-century architects such as Robert A.M.Stern, Charles Moore, and Robert Venturi, whose domestic designs of the 1960s and 1970s marked a full-fledged revival of the American Shingle style.

Scully has covered an extraordinary range of topics in 19 books and some 200 articles, including chapters and essays in books, journals, and book reviews. Scully has explored the interaction of man, architecture, and the natural setting. Always considering architecture in its broadest sense as the creation by man of the built environment in relation to the natural environment, he examined ancient Greek architecture in *The Earth, the Temple, and the Gods* (1962), indigenous North American architecture in *Pueblo: Mountain, Village, Dance* (1975), and world architecture from prehistory to the present in *Architecture: The Natural and the Manmade* (1991).

His writings in recent years have deeply explored the theme of the preservation of the man-made in balance with the increasingly more fragile natural environment and the ways architecture must respond in a sensitive way to societal needs. Appropriately enough, when invited in 1995 by the National Endowment for the Humanities to deliver the Twenty-fourth Annual Jefferson Lecture in the humanities at the John F.Kennedy Center for the Performing Arts in Washington, D.C., his topic was "The Architecture of Community."

Even earlier, however, in *American Architecture and Urbanism* (1969), Scully had written critically about the ravages of urban renewal and the drama of poor neighborhoods that were so much affected across the nation during the 1950s and the following decades. As a witness to the destruction of important buildings in downtown New Haven, Scully wasted no time in becoming a spokesman for the cause of historic preservation. During many years, he has participated in preservation battles that have helped save important historic buildings. In 1999, his voice was a decisive factor in the reversed decision that stopped the demolition of four buildings at the rear of the Sterling Divinity Quadrangle of Yale.

Throughout his career, Scully has been the recipient of numerous awards and recognitions. Starting as a Junior Sterling Fellow while a graduate student at Yale, he was later also made Morse Fellow (1951–52), Senior Faculty Fellow (1962–63), and Paskus Fellow in History at Jonathan Edwards College (1955–68). As Fulbright Fellow, he traveled to Italy in 1951–52, and a Bollingen Fellowship allowed him to travel to Greece in 1957–58. He holds four honorary doctorate degrees, from the University of Hartford (1969), the New School for Social Research (1988), the University of Miami (1990) and Albertus Magnus College (1992). In 1986, he received the Association of Collegiate Schools of Architecture (ACSA)/(AIA) "Topaz" Award for Excellence in Architectural Education from the ACSA/American Institute of Architects (AIA) and in 1989 he was made an Honorary Fellow of the Royal Institute of British Architects. During the 1990s alone, he was honored with more than 15 major distinctions, including the "Golden Plate" Award from the American Academy of Achievement (1993), the American Academy of Rome Award (1994), the Lucy G.Moses Preservation Leadership Award from the New York Landmarks Conservancy (1994), the ACSA Tau Sigma Delta Gold Medal (1996), and the Byrnes-Sewall Prize for Teaching Excellence in Yale College (1997).

Scully has maintained close relationships with leading contemporary architects who have respected him as a critic. Indeed, in his writings the distinction between historian and critic have become blurred. As he puts it most eloquently in *American Architecture and Urbanism*, "Art history must therefore be conservative, experimental, and ethical. It loves old and new things, and it demands value. The line between history and criticism should therefore be difficult to draw in any field; in the modern field, it must be almost nonexistent."

HUMBERTO RODRÍGUEZ-CAMILLONI

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SEAGRAM BUILDING, NEW YORK

Designed by Ludwig Mies van der Rohe; completed 1958

New York, New York

Of all the American monuments to the International Style, it is the Seagram Building by Mies van der Rohe that fully defines the aesthetic and time of high modernism, the era of postwar corporate and urban consciousness. In glass, steel, and bronze, the Seagram symbolizes the bricks and mortar and martinis that were the 1950s.

The Seagram, a 40-story slab skyscraper of amber glass within a grid of bronze I beams, rises above a fountained plaza on Manhattan's Park Avenue. The body of the building, in typical Mies fashion, is supported by a templelike entry that is reminiscent, within a thoroughly modern composition, of the earliest post-and-lintel roots of archaic architecture. The design is of interest not only for the glass slab that rises suavely above mid-town Manhattan but also for the invention of the plaza fronting Park Avenue and the resulting relationship of urban architectural object to its opposition, void space, within the city grid. Architectural historian William H.Jordy, in his definitive analysis of the building, spoke of the Seagram as modern expression of "the potential of structure to create noble order, in the sense in which it created noble order in the past" coupled with "truth of its time."

For modernism, the Seagram is an ideal, perhaps even a Platonic ideal, of perfection and purity of form. It symbolizes the type form of the gridded glass skyscraper, emblem of the 20th century. The building has always seemed the epitome of form and function united in its most integrated and reductive sense, the clearest expression of Mies' edicts that "form follows function" and that architecture is "almost nothing." It is émigré Mies' American sublime manifestation of his German utopian renderings.

Like its creator, the Seagram is both simple and complex. The simplicity is the gridded steel frame with glass-curtain wall as a modern extension of the archaic building. The complexity is inherent in the expression of that simplicity through the applied bronze I beams, which, although they symbolically stand for the meaning of structure, are themselves unstructural. Thus, the aesthetic of truth-in-structure is expressed through an untruthfully convoluted visual metaphor.

Over the four decades since its design, the Seagram has drawn architecture and urban planning into a number of problems. The primary problem is the truth-in-structure problem, but other, more prosaic problems also exist. Unlike the ideal type-form buildings of the past, such as the Parthenon and the Pantheon, the Seagram as a type form was created within the fastest paced civilization in history. Thus, the Modern type form engenders its own imitation and reaction within its lifetime. Thinking

Seagram Building Plaza: New York City (1958)

Ezra Stoller © Esto

architects, after the Seagram, wrestled with the questions of, "Where can construction go after total reduction?" and "How can the art of architecture follow perfection of form?"

For the thoughtful architect, the Seagram has been inspirational, a standard against which tall buildings will always be judged. Less-gifted builders have simply lowered the standard set by Mies for the gridded glass-and-steel skyscraper. His work has been exploited, copied, and shortchanged as a standardized form by developers the world over, cheaply, in terms of both dollars and aesthetics. Thus, it is critical for an appreciation of early skyscraper design never to read the chronology of modern architecture backward, blaming the beautiful early type forms, such as the Seagram, for the debased works of later imitators.

A further problem engendered by the Seagram is inherent in the design of the slab versus the plaza. For this revolutionary design, revised zoning rules had to supersede the famous New York setback skyscraper law that had been passed to ensure that giant buildings would not block light and air within the crowded Manhattan grid. As the rules of the 1916 zoning law had dictated the aesthetics of the setback skyscraper, so now with the Seagram plan would new zoning standards allow for new forms in American architecture. The Seagram plan meant that skyscrapers could go straight up to higher elevations without setbacks, in giant continuous slabs. In exchange for height, the footprint of the building would cover only a small percentage of the site, allowing an open plaza to be created.

The assumption of city planners was that a public urban amenity would thus be created and financed through private corporate funding. Although the concept of a plaza of negative space could be fully animated by Mies, by a less-deft planner the modern plaza has all too often proven to be no urban amenity. Poor imitation of the Seagram plaza has led to urban plazas that are not, as Mies's is, confined voids in an aesthetic dialectical relationship with the solid form of a building but rather simply voids of leftover space. Planners have learned that it is better to maintain a continuous street setback than to disrupt it arbitrarily.

It is possible that the Seagram's influence on architectural style has been even wider than Mies could have expected, for the perfection and reduction of this building perhaps engendered the reactionary excesses of Postmodernism. After working with Mies on the Seagram, architect Philip Johnson left Mies but continued to react to the Miesian influence for decades. Johnson's prolific later ornamental Postmodernism, the antithesis of his own International Style tenets, may be read as a reactionary comment on his own work on the Seagram Building.

These problems, of course, are latter-day events for which Mies should not be held responsible. It is not to his detriment that he sought, through his type form for the modern skyscraper, to create perfect architectural form; nor is it his fault that the imitators of architecture so rarely comprehended the meaning of his architectural ideals. Mies would not have concerned himself with such problems, for his concerns were solely with the significance of his *Baukunst*.

LESLIE HUMM CORMIER

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SEARS TOWER, CHICAGO

Skidmore, Owings and Merrill; completed 1974 Chicago Illinois

The Sears Tower, today owned by a private investment firm and rented to a variety of office tenants, serves as a landmark and a symbol of the Chicago skyline. The building is seen from distant vistas in every direction in this flat, prairie-land city on the edge of Lake Michigan, thus creating the awareness of the dynamic presence of the Chicago skyline and urban environment.

During the period 1974–1997, the Sears Tower, at a height of 1454 feet and 110 stories, held the title of the world's tallest building encompassing 4.5 million gross square feet and 3.7 million square feet of net useable office space. In 1997 the Petronas Towers in Kuala Lumpur, Malaysia (designed by Cesar Pelli), although only 88 stories high, usurped that honor with a height of 1483 feet. The Sears Tower continues to provide the world's highest occupied floors.

The generation of the form and concept of the vertical tower is an interesting combination of client's program, site and technology. The Federal Aviation Administration who ruled that no building in Chicago could be higher than 2000 feet above sea level determined the height. The site is at an elevation of 546 feet and, thus, a final height of 1,454 feet was determined.

The initial goal was not to build the world's tallest building. Sears, Roebuck and Company determined that its floor space needs would eventually be 4.5 million gross square feet. Skidmore, Owings and Merrill (SOM), the architects, conducted a study that demonstrated the company could save 30% of walking time in a department if floor areas were stacked vertically and not arranged horizontally. Sears also determined that the ideal department size was 110,000 square feet and that its initial needs were for only 60 percent of the gross 4.5 million square feet. The remaining 40 percent would initially be rental space.

Following an initial concept of two separate towers, SOM began to develop a scheme that was a number of vertical buildings tied together to make one building. Fazlur Kahn, a structural engineer and partner in SOM, developed a system called "bundled tubes" for the Sears Tower. The solution was a system composed of nine structural bays each 75 feet by 75 feet in plan and independent of each other. Nine skyscrapers of varying heights are tied together in one building with the lateral wind loads resisted by the interlocked exterior tubes, cantilevered from the ground augmented by horizontal diaphragms. With this concept in place, it became possible to stop the tubes at any level without affecting the structural integrity. The result was a vertical form that is composed of a nine-tube base, floors 1 through 50; followed vertically by seven tubes on floors 51–65 where the northwest and southeast tubes were discontinued; followed vertically by floors 66–90, composed of five tubes in the shape of a cruciform in plan and finally the top floors 91–110 composed of two bundled tubes.

A building of this size and height is also strongly controlled by the vertical transportation system. In order to satisfy user expectations as to speed and comfort of movement, a point of density arrives wherein the ground floor elevators consume the entire entry floor. To facilitate the size and density of the Sears Tower, technologies involving double-deck elevators and high-speed express elevators were employed. The Tower's 103-cab system divides the building into three separate zones. Fourteen double-deck elevators carry passengers, non-stop to either the 33rd–34th floors or the 66th–67th floors where sky lobbies provide space for loading and unloading at two different floor levels. Once at these levels passengers can go to local floors via 63 single-deck elevator cabs. The 103rd floor is a public observation deck and serves large crowds by providing two express elevators, which connect the ground and top floors. These elevators travel at the rate of 1,800 feet per minute, reaching the summit in less than one minute.

The Sears Tower is the second in a series of three headquarters buildings for the company. The first building constructed in 1904 was located at Arthington and Homan Avenues in the Chicago West Side Lawndale community. It included a 14½-story tower and a campus of decentralized offices. It is still standing today. This environment produced a corporate culture

Sears Tower, Chicago (1974)

wherein a high degree of personal interaction occurred through chance meetings along daily pedestrian routes. The present Sears Tower replaced this earlier structure in 1974.

The downtown Sears Tower served the Sears Corporation until 1992 when a new headquarters was developed in Hoffman Estates in the Northwest suburbs of Chicago. This building, designed by Perkins and Wills, Architects, returned to the culture of the first building by creating a horizontal scheme that provided travel through atriums and public corridors to encourage informal conversations and relationships among employees and departments. The comparison of the three structures provides an enlightening overview of the direction and styles of corporate America as to office building design.

The exterior appearance of the tubes is a dark, uniform surface composed of black aluminum frames and bronze-tinted glare reducing glass. Although an aesthetic success on the Chicago skyline, it is much less attractive and inviting at ground level. Its great height is virtually imperceptible at its base. In 1985 to improve the relationship to the pedestrian and make it more inviting for those entering the building, a new atrium entry-way was created at the Wacker Street entrance and a new entry added at Jackson Boulevard. In 1992 when Sears Corporation moved to its new location in Hoffman Estates, the new owners determined to remodel the existing public spaces in a 70 million dollar project. The goal was to make the building more attractive to new tenants. New lobbies were added at the Franklin Street and Wacker Drive entrances.

Today the building is no longer the home of the Sears Corporation nor is it the world's tallest building, but it is still the dominant visual symbol on the Chicago skyline, a symbol of the spirit and style of this Midwestern community and an attraction to thousands of visitors each year.

JACK KREMERS

S*ee also* **Chicago (IL), United States; Petronas Towers, Kuala Lumpur; Skidmore, Owings, and Merrill (United States); Skyscraper**

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SEASIDE, FLORIDA

Seaside, Florida, is an 80–acre resort development on the Florida panhandle begun in 1981 by Robert and Daryl Davis. Unlike the conventional high-rises or apartment clusters lining the beach, Miami firm Andres Duany and Elizabeth Plater-Zyberk (DPZ) designed Seaside as a traditional, small southern town of private residences and public streets. Emblematic of what later became known as New Urbanism, Seaside's design was intended to produce a modest, mixed-income, mixed-use, pedestrian-oriented holiday community.

Although various postmodernist architects in the 1970s had been incorporating references to vernacular architecture into individual buildings and analyzing the figural relationships between public and private urban space, Seaside represented the first effort to reconfigure contemporary development in the form of a traditional American town. Its use of conventional suburban-planning tools—codes and master plans—for this purpose was unprecedented and has since stood as an alternative suburban development model to urban sprawl. Its popularity, ever-higher prices, and pronounced traditional styling have made it the subject of both tremendous praise and scorn. Along with later DPZ projects, Seaside's design revived interest among many allied disciplines in early 20th-century town-planning ideas, and its designers challenged the lack of attention to urbanism and public space in both conventional land-planning practices and contemporary avant-garde architectural design.

DPZ's interest in Team X ideas about using architecture to promote group social relations dovetailed with Robert Davis's desire not simply to develop the land he had inherited but to found a town and community that would be part traditional small town and part utopian social experiment. Together, the designers and the developer toured and measured traditional southern towns. In an effort to reproduce the towns' spatial quality and authentic variety, DPZ refrained from designing any of the buildings at Seaside themselves. Instead, through a *charrette* process, the firm developed a master plan and codes to direct individual property owners' design decisions. The design won a *Progressive Architecture* citation for urban planning in 1984.

Town of Seaside, Florida

© Elizabeth Plater-Zyberk

The master plan extends the existing streets of neighboring Seagrove across the site, locates a central green in an existing gorge, and straddles the two-lane coastal highway with commercial activities. Its central focus and loose grid recall City Beautiful projects from the 1920s. Unlike most coastal resorts, development along the 2800 feet of beach is low and minimal, allowing water views to extend deep into the site and preserving public access to the beach. There are approximately 300 residential lots, all of which are within a five-minute walk of the center. A church, a school, a post office, and the resort's recreational amenities are prominently scattered throughout the site, where they visually terminate vistas and serve as public or semipublic focal points to the various neighborhoods. Private buildings, however, are visually unified through required build-to lines, picket fences, percentage of porch frontage, number of stories, and general building type.

Every lot on the master plan is keyed to one of eight different, regionally based building types visually displayed in an easy-to-understand one-page urban code. North-south streets call for relatively deep setbacks from the street and “Florida cracker” low, porch-fronted “bungalows” so as to maximize public views of the Gulf of Mexico. East-west streets, however, with no ocean view, offer smaller, more affordable lots, coded for versions of the Charleston “single house”: taller and tight up to the street, with a side yard. A diagonal boulevard (located to preserve existing trees) has the largest lots, and “antebellum mansions” are able to serve as inns, apartments, or large single-family residences. Three- to five-story, mixed-use, arcaded party-wall buildings, similar to those found in New Orleans or Eufala, Alabama, line the central commercial area, whereas three-story townhouses above shops and workshops create another, quieter square behind it.

This diversity has been unified by a number of factors: the restriction of landscaping to indigenous plants, the encouragement of construction of rear cottages, the allowance of 215-square-foot towers, and an architectural code that allows for stylistic variation within strict limits. It establishes acceptable window proportions, roof pitches, materials, and a few mandatory construction details. Most of the homeowners have chosen to build in a more or less Victorian or classical style, although the overall emphasis on design has resulted in the commissioning of well-known contemporary designers including Steven Holl, Aldo Rossi, Machado & Silvetti, Mockbee and Coker, Deborah Berke, and Walter Chatham.

Counter to suburban privatization, Seaside consistently promotes the hierarchical importance of the public realm and com-

Town of Seaside, Florida (1979), designed by Duany and Plater-Zyberk munity building. The codes discipline the private buildings into spatially, visually, and socially defining the streets and squares as outdoor public rooms. Privileging the pedestrian over the car, they are narrow and brick paved. The provision of shops, office space, and a public junior high charter school in the town center has succeeded in encouraging walking. Front porches are required to be close enough to the street to allow for sociable interaction. There is a seasonal newspaper, and the Seaside Institute, a nonprofit educational organization, programs public events to engage the immediate community and the broader audience interested in New Urbanism.

The true community of Seaside however remains amorphous; there are very few year-round inhabitants at Seaside. Most of the homes are vacation properties rented out through the Seaside Rental Agency. Robert Davis argues that, as a resort, Seaside demonstrates to more visitors the virtues of living in a walkable community of small lots and shared public spaces. Critics point to Seaside as merely a simulation of community and public life as well as a commodified nostalgia for the sentimental past. To some critics, the seeming impossibility of dissent renders it a consensual tyranny rather than a democratic utopia, a point made in the 1997 film *The Truman Show,* which was shot on location in Seaside. Although such questions have in no way slowed the countless efforts to emulate Seaside, they point to the continued controversy surrounding New Urbanism and the questions it raises.

ELLEN DUNHAM-JONES

S*ee also* **Duany and Plater-Zyberk (United States); New Urbanism; Suburban Planning**

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SEIDLER, HARRY 1923

Architect, Australia

In his first published article in 1949, Harry Seidler laid out a philosophy incorporating relationships between modern European painting, the sculptural arts, and architecture. Its outline was derived from Walter Gropius's Harvard University Graduate School of Design program and directed almost exclusively to visual elements (mass, transparency, tension, polarity, and so on) that architecturally evolved in some measure from structural exploitation. Seidler's early houses were dedicated to these visual determinations but showed a noticeable diversity as a result of experimentations with structure knitted to easy formal architectonic considerations, such as plan and simple geometric shape.

The prize-winning house for his mother (1948–50) was first among works in the 1950s that immediately captured attention worldwide, notably in Europe and the Los Angeles magazine *Arts and Architecture*. They were recognized as an apogee of architectural refinement and dynamic sensibility as promoted by central European émigré designers.

With Gropius, Seidler discovered a language for architectural thought; with Josef Albers at Black Mountain College, he learned "to think in visual terms," and with Oscar Niemeyer he discovered form and mass, sun control, how to express structure, and attention to site conditions. His early work was derivative of Marcel Breuer (he does not apologize for this) but soon matured to reach a formal epitome in a block of apartments (1962) at Diamond Bay, Sydney.

A close collaboration with Italian structural engineer Pier Luigi Nervi beneficially changed Seidler's large and tall buildings designs. The Australia Square development (1962–67) in Sydney contains a round tower constructed of precast elements, repetitive floor to floor—a lesson in constructional efficiency that clarified expression by simplification. The tower stands on a stepped pedestrian plaza, open to but also partly screening surrounding streets and shared with a shorter rectangular office building sitting on giant sculpted piers. The Square set an urban design standard envied throughout the Western world.

Parallel to this experience, Seidler referred to the series of paintings by American postwar protominimalist painter Frank Stella that employed circular segments, and he reexamined Albers's free forms and the "richness" of Dutch-American Abstract Expressionist Willem de Kooning's nonobjective paintings. The result was the introduction of an overtly baroque character first explored tentatively for Condominium Apartments (1969–70) at Acapulco, Mexico.

The 1970s were an expansive period that saw the completion of a number of major commissions, including the Trade Group Office (1970–74) in Canberra, which employed Nervi's long-span, posttensional constructional system to a schemata based on the functional responses of Louis I. Kahn; the MLC Center (1971–75) in Sydney, a significant urban pedestrian precinct and office tower; and the Australian Embassy (1973–74) in Paris, with Breuer as local consultant, a bipartite scheme of conceptual maturity and constructional style that prevailed into the 1990s. Seidler maintained a variety of commissions ranging from medium-size houses to civic centers (such as Waverley, 1982–84, near Melbourne) to large urban-planning schemes. Of the latter, the QVI building (1987–91) in Perth, Western Australia, and Grosvenor Place (1982–88) in Sydney, with expansive pedestrian plazas and minimal site coverage by towers, are exceptional.

For the most part, Seidler's current architectural practice is directed to resolving formal and social issues raised by tall buildings in urban situations. Following on from the MLC Center, the most notable of these have been the lively Riverside Development (1983–86) in Brisbane, typical of his concrete structural system, sun control aesthetic, and the Albers-influenced two-and three-dimensional forms; the more angular Capita Center office tower (1984–89) in Sydney, with a full-height stepped central space open to the weather with occasional terraces land-scaped with 20-meter-high trees; and the elegantly sophisticated Hong Kong Club and Office Building (1980–84), whose baroque plan and interior spaces meld perfectly with an expressive and exposed-concrete structural system. The exclusive club occupies the lower 4 floors with 17 above for rental. Seidler has said that his desire to

> instill an aura of timeless serenity and yet elegance and pleasure led to the use of curvilinear geometry and forms throughout. …The curved forms, however, are used within the geometric disciplines imposed by structural considerations [and] harks back to…the Baroque era of the 17th and 18th centuries

This building's "poetic geometry" suggests how his Hong Kong and Shanghai Banking headquarters might have appeared if he, rather than Norman Foster, had won the competitive commission.

For the Vienna city government, Seidler has designed a complex of about 800 apartments in a 35-story triangular tower (similar to Lincoln Centre, 1996–98, in Kuala Lumpur) and seven blocks of four to eight stories in a terraced garden (1993-c.2001), each with views across the Danube to the old town. Diagonals, curves, and swirls exaggerate structure and function and act as counterpoints to rectilinear elevations. They are a further elaboration of forms found earlier, including the Horizon Apartment Tower (1990–98) at Darlinghurst, Sydney, that provides a vigorous alternative response to the glossy glass towers rising everywhere.

It is reasonable to compare Seidler's work with that of a graduate student colleague at Harvard, I.M.Pei. Both exhibit clarity of concept, a high level of sophistication, a love of fluid geometry and plain forms, a certain monumentality, a correct and economical use of expertly detailed materials, and a preference to boldly express structure.

Not from memory of days with Niemeyer but appearing as a reflective homage to the nonagenarian Brazilian's present-day white free forms is Seidler's Berman house (1996–c.2001). Sitting proud above a rugged stone and bush landscape, it is distinctly fresh, from a young inquiring mind.

In the cause of architecture, Seidler has transcended earlier, merely visual precepts to extend modernism (logically he believes) to avoid "transient fashion" and "'post-mod' cliches," as he puts it, and engage in a most lively, rational architecture. His honorary degrees, visiting teaching positions, and significant international awards attest to a continuing influence.

DONALD LESLIE JOHNSON

Biography

Born in Vienna, Austria, 25 June 1923; emigrated to Australia 1948; naturalized 1958. Attended the University of Manitoba, Winnipeg 1941–44; bachelor's degree in architecture 1944; studied at Harvard University under Walter Gropius and Marcel Breuer 1945–46; master's degree in architecture 1946; studied design under Josef Albers, Black Mountain College, Beria, North Carolina 1946. Chief assistant to Marcel Breuer, New York 1946–48; worked with Oscar Niemeyer, Rio de Janeiro 1948. Principal, Harry Seidler and Associates, Sydney from 1948; trustee, Art Gallery of New South Wales 1976–80. Visiting professor, Harvard Graduate School of Design 1976–77; councilor, University of New South Wales 1976–80; visiting professor, University of British Colombia, Vancouver 1977–78; Thomas Jefferson Professor of Architecture, University of Virginia, Charlottesville 1978; visiting professor, University of New South Wales, Sydney 1980; visiting professor, University of Sydney 1984. Honorary fellow, American Institute of Architects 1966; life fellow, Royal Australian Institute of Architects 1970; fellow, Australian Academy of Technical Sciences 1979; member, Académie d'Architecture, Paris 1982; academician, International Academy of Architecture, Sofia 1987. Officer, Order of the British Empire 1972; Companion, Order of Australia 1987.

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Williamson House, Mosman, New South Wales, 1951
RAIA Convention Exhibition and Model House, Sydney, 1954
Horwitz Office Building, Sydney, 1954
Lend Lease House Office, Sydney, 1961
Australia Square, Sydney, 1962–67
Diamond Bay Apartments, Sydney, 1962
NSW Government Stores, Alexandria, 1964–65
Seidler House, Killara, 1966–67
Condominium Apartments, Acapulco, Mexico, 1969–70
Trade Group Offices, Canberra, 1970–74
Harry Seidler Offices, Milsons Point, Sydney, 1971–73; extension 1988–94
MLC Center, Sydney, 1971–75

Australian Embassy, Paris, France, 1973–74
Hong Kong Club and Offices, Hong Kong, 1980–84
Waverley Civic Center, Melbourne, 1982–84
Grosvenor Place, Sydney, 1982–88
Hannes House, Cammeray, New South Wales, 1983–84
Riverside Development, Brisbane, 1983–86
Hilton Hotel, Brisbane, 1984–86
Capita Center, Sydney, 1984–89
Shell Headquarters, Melbourne, 1985–89
Phoenix Tower project, Sydney, 1987
QVI Office Tower, Perth, 1987–91
Waverley Art Gallery, Melbourne, 1988–89
IBM Tower, Sydney, 1990–91
Horizon Apartment Tower, Darlinghurst, Sydney, 1990–98
Olympic Housing 2000 (competition project), 1992
Farrell House, Sydney, 1993
Wohnpark Neue Donau (housing), Vienna, Austria, 1993–c.2001
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I*nternment: The Diaries of Harry Seidler, May 1940–October 1941,* edited by Janis Wilton, translated by Judith Winternitz, 1986
"A Perspective of Planning and Architectural Directions," *Architect* (Sydney) 27 (April 1987)
T*owers in the City,* 1988
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SEJIMA, KAZUYO 1956

Architect, Japan

Kazuyo Sejima's works are cool-headed depictions of the social alienation of her generation. She was born in Ibaraki prefecture, Japan, in 1956 and studied at Japan Women's University, receiving an undergraduate degree from the Housing Department in 1979 and a master's degree in architecture in 1981. On completing her studies, she joined the firm Toyo Ito Architect and Associates, where she worked from 1981 until she established her own office in 1987. While with Ito, her most notable contributions were as the project architect for Pao (1985), a set of furnishings to accommodate the nomadic, consumerist lifestyles of contemporary Japanese women. Although Sejima now repudiates this project, the interpretation of society that it represents remains closer to the outlook in her subsequent work than to Ito's. In particular, Sejima continues to place an emphasis on emotionally unencumbered movement supported by functional flexibility.

Sejima also acknowledges Ito's influence in her material vocabulary, especially translucent films on glass, bright aluminum finishes, and attenuated steel structures. However, a concern with light and reflectance has led Sejima to experiment with wrapping buildings in a broader palette of unusual components and to using novel approaches toward materials. Examples include polycarbonate panels at Y House (1994), S House (1996), and M House (1997); patterned films applied to clear glass, with written characters at the N Museum (1997), leaflike patterns at the Koga Municipal Park Cafe (1998), or a rough striping referring to wood grain at the O Museum (1999); and reflective louvers intended to create a collage of images by mirroring the sky and the ground against the backdrop of interior activities at Hitachi Reflé (1998). Aesthetically, these materials combine with flat, white surfaces to create an architecture that is luminous and photogenic, contributing to her early recognition abroad.

Sejima's 1990 design for a corporate residence, the Saishunkan Seiyaku Women's Dormitory (part of a series of well-publicized projects in the "Kumamoto Artpolis"), brought her instantaneously to international attention. She impassively proposed an architectural embodiment of the disciplined communal lifestyles of the women employee residents, eschewing private space in favor of a polished, airy communal area. Limited sleeping areas for four are ordered with military precision behind frosted glass, after Sejima's earlier proposals for a single large sleeping space proved too shocking.

Residential work remains Sejima's most provocative. She describes herself as designing for a new genus of family, one not always blood relatives or having any sort of consistent structure or stability. Because of this, her designs lack sentimentality, studiously avoiding privileging a location that celebrates the family unit, such as the hearth or kitchen. Rather, her housing is organized in a way more reminiscent of corporate environments: members of the household come together mostly in corridors, while on the move, and individual private rooms, intended as bedrooms, have the uniformity and barrenness of offices. These rooms often have folding doors or pivoted shutters that allow the line between the common and private rooms to be adjusted. She thus further reduces the private character of individual rooms: the walls between sleeping spaces and more conventionally public areas are more or less permeable, as users like.

Critics fear that Sejima's unruffled celebration of homogeneity is coldly prescient. Less well recognized is that she mitigates these qualities by creating a defensive boundary between residents and the outside, an approach that she shares with other Japanese architects, such as Tadao Ando. In her work since 1993, this intention has been reflected in establishing a core living space with little connection to the exterior and has resulted in buildings where major spaces are below ground or where the exterior envelope is almost entirely translucent, cutting off any views beyond the building envelope. Although Westerners often see such designs as unusually harsh, they fit comfortably within conventional Japanese residential expectations. However, in recent nonresidential projects, Sejima has returned to an approach seen in her earliest residential designs, extending interior space into the landscape.

Much of Sejima's work to date has been commissioned by architects or clients associated with the arts community, and her museum and studio spaces are also notable. The Multi-Media Studio (1996) and N Museum have the same purity seen in Sejima's residential work, especially in their minimalism and contextual detachment. Sejima's proposal for an addition to the Sydney Museum of Art (1997) is her first overseas commission, although the project has stalled. (A theater and culture center for Almere, the Netherlands, designed in 1999, may ultimately be completed first.) Notably, in Sejima's oeuvre, retail and corporate facilities are unremarkable, in part because the strategies that make her residential work extraordinary are more commonplace in the building type.

Although sometimes described as ahistoric because of the abstraction of her work, Sejima identifies closely with modernism but intensifies its formal effects. Ito's work has been a crucial foil for her: the remarkable Platform I (1988) and Platform II (1990) seem to have been designed in response to Ito's Silver Hut (1984), whereas the Villa in the Forest (1994) builds on Ito's White U (1976). Notably, Silver Hut and White U were for Ito's family and among his most challenging early works, whereas Sejima was able to go further in her very first projects, with nonfamilial clients. Conventional prototypes also serve as inspiration: in the Gifu Kitagata Apartments (Phase I, 1998), a public housing complex, Sejima acknowledges the influence of Le Corbusier's Unite d'Habitation and Espirit Nouveau. Al-though there are no direct connections, Sejima's abstraction also leads to her being identified with the Shinohara School.

Because Sejima emphasizes the intuitive side of her design process, the disciplined structural innovations found in her buildings are less often noted. In the Police Box at Chofu Station (1994), for example, Sejima worked with the eminent engineer Matsui Gengo, using a cylindrical room to create lateral stability while allowing for an uninterrupted glass surface running the length of the roof and opposite exterior walls. Her Koga Municipal Park Cafe is enclosed with a strikingly thin roof and nearly nonexistent walls, the result of recent collaborations with Mutsuro Sasaki. This project will perhaps begin to draw more attention to Sejima's structural sophistication.

Almost since the inception of the office, Ryue Nishizawa has worked closely with Sejima. Recently, the two architects have begun to characterize all projects since the beginning of the Multi-Media Studio in 1995 as the works of the firm Kazuyo Sejima and Ryue Nishizawa and Associates, although these have often been published only in Sejima's name. Although Sejima and Nishizawa intend to continue their collaborations, Nishizawa also established his own firm in 1998. Both have said that they will design projects independently of the partnership.

DANA BUNTROCK

Biography

Born in Ibaraki prefecture, Japan, 1956. Attended Japan Women's University, Tokyo; master's degree in architecture, 1981. Worked in the office of Toyo Ito Architect and Associates, Tokyo, 1981–87. In private practice, Kazuyo Sejima and Associates, Tokyo, from 1987; in collaboration with Ryue Nishizawa from 1995. Has served as lecturer at Japan Women's University and at the Technical Institute of Tokyo.

Selected Works

Platform I, Katsu'ura, Chiba prefecture, 1988
Platform II, Kita Koma (Gun), Yamanashi prefecture, 1990
Saishunkan Seiyaku Women's Dormitory, Kumamoto City, Kumamoto prefecture, 1991
Pachinko Parlor I, Hitachi, Ibaraki prefecture, 1993
Pachinko Parlor II, Hitachi Naka, Ibaraki prefecture, 1993
Villa in the Forest, Chino, Nagano prefecture, 1994
Police Box at Chofu Station, Chofu City, Tokyo, 1994
Pachinko Parlor III, Hitachi Ohta, Ibaraki prefecture, 1996
Multi-Media Studio, Oogaki, Gifu prefecture, 1996
S House, Okayama City, Okayama prefecture, 1996
N Museum, Nakahachi, Wakayama prefecture, 1997
M House, Shibuya Ward, Tokyo, 1997
K Head Office, Hitachi, Ibaraki prefecture, 1997
Gifu Kitagata Apartments, Phase 1, Motosu, Gifu prefecture, 1998
Koga Municipal Park Cafe, Koga, Ibaraki prefecture, 1998
Hitachi Reflé/Hitachi No'ushiku Station Facilities, Ushiku, Ibaraki prefecture, 1998
O Museum, Iida, Nagano prefecture, 1999

Selected Publications

Sejima's own writings are limited to brief formal descriptions of her works found in magazines and journals. One interesting exception is "Sejima Kazuyo—Nishizawa Ryue to no Taiwa" (A Conversation with Kazuyo Sejima and Ryue Nishizawa), *Kenchiku Bunka* 54, no. 632 (June 1999) (special issue entitled "Mutsuro Sasaki: Vision of Structure").

Further Reading

Sejima tends to speak simply of her work, emphasizing design strategies and formal resolution. In addition, she is still young, and so little is available on her work in any language. Japanese-language sources elaborate on her theoretical positions, while English-language sources are mostly based on photographs of her built work, in keeping with Sejima's own emphasis on execution over ideas.

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SERT, JOSEP LLUÍS 1902–83

Architect and urban planner, United States

The career of Josep Lluís Sert and the ascendancy of modern architecture enjoyed a fortunate simultaneity, for Sert emigrated to the United States just in time for the height of his career to be synchronized with the American building boom and European postwar rebuilding. Advancing the causes of the elder modernists who had preceded him, with a freedom of aesthetic expression that they had had to eschew for functionalism, Sert built buildings where they had often been confined to theorizing. True to his utopian modernist roots as an early member of the Congrés Internationaux d'Architecture Moderne (CIAM), Sert's oeuvre focused on the planning of public architecture for socially significant projects. For Sert, however, aesthetics were never secondary to functionalism, and thus the integration of the arts with architecture became an important tenet of his modernism.

Associated with liberal causes in Spain, Sert debuted internationally at the Paris World's Fair of 1937 with his design for the Pavilion for the Spanish Republic, housing Picasso's *Guernica.* As a Catalonian refugee, the youthful Sert then followed an itinerant life, renouncing his homeland; moving to Paris, where he worked with Le Corbusier, to New York; and eventually attending Harvard University, where he followed Walter Gropius as head of the design school, concurrently establishing his own firm of Sert, Jackson and Gourley.

Sert had thrown down the gaundet of modern urban planning with his seminal text for the CIAM, *Can Our Cities Survive?* (1942), calling for the basic human rights to fresh air, sunlight, space, and healthful environs. His ability to quantify such quality-of-life issues set Sert at the apex of the fundamentals of modern urban planning, just as his emotional commitment to a humane environment, coupled with a very rationally applied methodology, made his the first really effective synthesis of the early modernists' theories. Sert's lifelong contribution was to fuse rationalism with humanity and creativity.

Sert built his first socially significant project, the Barcelona Anti-Tubercular Dispensary (1935, extant), to fight disease not only medically but also socially, for it provided a poor population with a small but restorative environment. The double-winged structure encloses a treed open courtyard, creating a miniature open space in a dense city sector. Sert's functional and imaginative solution raised the work to the level of oasis amid urban chaos.

If "oasis" is the ancient image recalled by Sert's modern urbanism, then "temple" reflects his architecture for art and human spirit, the first of which was his Spanish Pavilion (1937), a tentlike, lightweight structure appropriate to its ephemeral existence as exposition architecture. The simplicity of Sert's reductivist statement—post and lintel with stretched tent above—echoed richly of the archaic spiritual temple. Processional up the modern machined entrance ramp climaxed with Picasso's modern interpretation of the ancient tragedy of war, *Guernica,* deftly moving the viewer between abstraction and reality, from world's fair to world war.

With the Spanish Pavilion, Sert embarked on an artistic journey that increasingly drew his most intense personal expression. The integration of art, architecture, and spirit via the archaic experience of processional; the light and space hinted at in this early work; and the meditative possibilities of architecture would have their mature expression in Sert's late museums of art. His style evolved, retaining its Mediterranean roots for more than

The Fundació Miró, (Joan Miró Center for the Study of Contemporary Art), Barcelona

Photo © Mary Ann Sullivan

six decades: a thoughtful architecture of primary colors against pure white, agglomerative massing of cubic forms, functionally derived flat pattern, and intense interest in space and light.

Sert understood aesthetic dialectics, moving elegantly from art to architecture, from architecture to nature, and from vernacular materials to the modern machined world, always the modernist émigré drawn back to ancient echoes. In Sertian space, vacant walls of poured concrete are held in a striking aesthetic tension to his signature saturated colors, the solidity of his cubic forms is juxtaposed with the void space of courtyards, and silence is always at the center of action.

In major international works commissioned at the height of his American career, from the late 1950s into the early 1970s—the Fondation Maeght (1964, Provence, France), the Fondation Miró (1975, Barcelona, Spain), and the Center for the Study of World Religions (1958, Cambridge, Massachusetts)—Sert was able to give free rein at last to his innate artistic and spiritual nature.

Processional and vista are important in these late Sertian works for art and spirit. As if these were sacred sites, the Maeght and Miró museums are approached via long, winding hill roads, integrated with the natural topography, white cubes amid landscape. The Fondation Miró is vaulted, and the Fondation Maeght is topped by an inverted Le Corbusian roof, whose origins can also be traced back to Sert's own oeuvre in the white awning above his Spanish Pavilion. Each art museum is com-posed of a series of masses of cubic forms, like an indigenous hill town, built of positive and negative spaces, in clusters resembling Iberian atrium houses. These modern compositions become visual meditations on the accretions of time, space, and stucco.

For Sert, the active and the contemplative, the sacred and the secular, and the integration of the arts with architecture were all significant pursuits of modernism. At Harvard University, Sert left a legacy of buildings and plans exploring these themes, in the Science Center (1970), Peabody Terrace (1964), an unrealized campus plan, and the Carpenter Center for the Visual Arts (1963), a project in which he was affiliated with his friend Le Corbusier.

The Harvard Center for the Study of World Religions, however, speaks most clearly of Sert the man and his vision. One room of this work might be considered a summation of Sert's oeuvre: the meditation room, the metaphorical center of the design. Here Sert planned for art, architecture, and spirit to be mutually enhancing in an empty room of blank white walls illuminated by a sole natural light source. In this silent statement of space, light, peace, and the universal imagery of spirit, Sert achieved a unity of beliefs with artistic form, of form with spirit. Here, in Sert's words, truly is "a different monumentality."

LESLIE HUMM CORMIER

Biography

Born in Barcelona, 1 July 1902; emigrated to the United States 1939; naturalized 1951. Studied at the Escuela Superior de Arquitectura, Barcelona; master's degree in architecture 1929. Assistant to Le Corbusier and Pierre Jeanneret, Paris 1929–31; established GATCPAC, a group of architects affiliated with CIAM 1930–36. Private practice, Barcelona 1931–37. Lived in Paris from 1937–39. Founder and partner with Paul Lester Wiener and Paul Schulz, Town Planning Associates, New York 1939–57; private practice, Cambridge, Massachusetts from 1957; partner, with Huson Jackson and Ronald Gourley, Sert, Jackson and Gourley 1958–63; partner, Sert, Jackson and Associates from 1963. Professor of city planning, Yale University, New Haven, Connecticut 1944–45; professor of architecture and dean of the Graduate School of Design, 1953–69, consultant to the Harvard Planning Office, 1956–69, emeritus professor, from 1969, Harvard University, Cambridge, Massachusetts; Thomas Jefferson

Memorial Foundation Professor of Architecture, University of Virginia, Charlottesville 1970–71; member, Advisory Council, Princeton University School of Architecture and Urban Planning, New Jersey 1972–74. Member, board of directors and planning committee, Citizens Housing Council of New York 1945; president of CIAM 1947–56; chairman, Planning Board of Cambridge, Massachusetts 1957; chairman, American Institute of Architects Committee on the National Capital 1964; fellow, American Institute of Architects; member, National Institute of Arts and Letters; member, American Academy of Arts and Sciences; honorary member, Royal Architectural Institute, Canada; honorary member, Royal Society of Arts, London; honorary member, Royal Institute of British Architects; honorary member, Académie Royale, Belgium; honorary member, Akademie der Künste, Berlin; honorary member, Royal Academy of Arts, London; honorary member, Society of Architects, Mexico; honorary member; Institute of Urbanism, Peru; honorary member, Académie d'Architecture, France; honorary member, Sociedad de Arquitectos, Columbia. Gold Medal, French Academy of Architecture 1975; Gold Medal, American Institute of Architects 1981. Died in Barcelona, 15 March 1983.

Selected Works

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Joan Miró Studio, Palma, Majorca, 1955

Center for the Study of World Religions, Cambridge, Massachusetts 1958

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Further Reading

The Sert Archive at the Graduate School of Design, Harvard University, is the most complete view of Sert the man and the architect. The archive includes works of architecture and urban planning, professional and personal correspondence, and photographs. Particularly interesting are documents concerning Sert's circle of artistic friends, including Le Corbusier, Picasso, Braque, Miró, and Calder. Readers will note that the spelling of Sert's first and middle names varies throughout his career, as he chose to identify his name with either its Catalonian or Spanish roots at different times.

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SHANGHAI WORLD FINANCIAL CENTER

Designed by Kohn Pedersen Fox, to be completed in 2007
Shanghai, China

Designed by the American architectural firm Kohn Pedersen Fox in 1994 for the Japan-based Mori Building Development Co., the Shanghai World Financial Center will rise to a projected height of 500 meters, making it the tallest building in the world by nearly 50 meters. The building is part of a global paradigm shift that has occurred over the last decade, resulting in the world's tallest buildings, traditionally located in Chicago or New York, now emerging in rapidly developing parts of Asia. Cesar Pelli's Twin Towers in Kuala Lumpar were the first to announce this trend, and the Shanghai World Financial Center (which is significantly taller than Twin Towers) is clearly destined to establish itself as China (and Asia's) tallest building.

Construction of the 94-story structure began in August 1997, and the first stage of construction, involving the structural groundwork, was completed in October 1998. The financial crisis that crippled Asian markets in the late 1990s forced a temporary halt to construction, during which time financial backing was secured to recommence construction of the tower. Following a range of delays, the tower, in a slightly modified form, is now to be completed by 2007 in time for the Beijing Olympics in the following year. Key changes to the design resulted in an increase in height from 460 meters to a new projected height of 500 meters.

The building occupies a site on Pudong Road adjacent to the recently completed Jin Mao Tower in the rapidly developing Lujiazhui financial and trade district in Pudong. This area has been dedicated to development by the Chinese government and is intended to become the Asian epicenter for international trade and banking. The Shanghai World Financial Center is the second of a planned trilogy of high-rise towers in the area. The program provides for a total of nearly 320,000 square meters of useable area, with a combination of ground-floor retail, commercial office space, hotel suites, and an observation deck at the top of the building.

The design of the tower represents a transition by Kohn Pedersen Fox from the extravagant Post-modern towers that characterized the firm throughout the 1980s toward the more streamlined and technological aesthetic that dominates their recent architecture. Such a shift demonstrates a nostalgia for the clean forms of modernism, diminishing the role of the façade of the tower in favor of more refined and monumental geometric forms. This is evident in the design of the tower, which takes the form of a chiseled wedge, carved by two sweeping arcs and punctuated dramatically at the apex by a circular void 50-meters in diameter. The diminishing proportion of the floor-plates formed by the tapered block allows for commercial office space at the lower levels and hotel suites above in the more longitudinally proportioned zones of the building. An observation deck is to be located on a bridge across the dynamic circular void at a height of 380 meters.

The tower is square at the base, tapering to a single line at the apex oriented along the diagonal of the ground-floor plate. The sweeping arcs give the tower a twisted, animated form providing unique views of the tower from different vantage points throughout the city. This is most noticeable from the historical Bund area on the opposite side of the Huang Pu River, which bends around the Pudong area and provides the primary sites for viewing the building in the skyline. The circular void that dominates the top of the tower is the same diameter as the sphere atop the nearby Oriental Pearl TV tower, initiating a solid-void dialogue with the adjacent landmark, which the twisting form of the tower addresses. The circular cutout is intended pragmatically to reduce the considerable wind-loads on the building, especially significant in typhoon-stricken Shanghai. It also contains thinly veiled references to traditional Chinese architecture and the circular moon-gate that adorns many temples and gardens across China. The geometry of the square and the circle that is pervasive throughout the tower is intrinsic to Chinese philosophy, symbolic generally of the earth and the sky and ideas of unity and harmony.

Juxtaposed against the monolithic tower is a fractured podium, which responds to the disparate urban cacophony of Pudong, induced by several years of rampant development. Because of setback restrictions, the tower is confined to the center of the site, dissected by a triangular shaft that slices through the building at ground level and forms the entry to the lift-core. Based on the geometry of a perfect circle, from which the square floorplate of the tower projects, the podium wraps around the rear of the building, peeling back to reveal the intersection of the tower with the ground at the front, north-western edge of the site. This gesture addresses the main road of the Lujiazui district and contains a landscaped public space protected by an enveloping shield of trees. The southern and western sides of the tower are bounded by a landscaped public garden that links several parts of the urban Lujiazui district and connects the three projected towers. A large area of on-grade car parking is located on the southeastern side of the tower, screened from the parkland by a natural earth-berm.

The lower portions of the building are to be clad in a combination of smooth and heavily rusticated granite. This is juxtaposed against the lightly reflective glass and stainless steel of the tower, anchoring the composition at the base and celebrating the lightweight elegance of the glass and steel as it disappears into the sky. The original design called for a steel structure cased in concrete, using slender perimeter columns at 3.6-meter intervals to transmit lateral loads and the reinforced concrete core to transport loads to the ground. This was later rationalized to use steel-reinforced concrete perimeter columns of the same size and spacing but to bolster the structure with a second concrete tube around the central core. The columns are interconnected by horizontal steel trusses and diagonal perimeter bracing throughout the tower, which binds the columns vertically.

Until its completion, it is difficult to gauge the significance of the building within the broader architectural context. The design attempts to bridge the chasm between the latent forces of ancient Chinese culture and the volatile global economy of modern Asia through the understated clarity of late modernism. As a result, the tower announces a new phase in the architectural language of Kohn Pedersen Fox and a new direction in Asian high-rise construction, but judgment of the success of the building must wait until the completion of construction.

MICHAEL CHAPMAN

S*ee also* **China; Kohn Pedersen Fox; Skyscraper**

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SHAW, HOWARD VAN DOREN 1869–1926

Architect, United States

Howard Van Doren Shaw is best known for his eclectic yet sophisticated designs for country houses, churches, commercial centers, and residential developments in and around Chicago. An admirer of all things British, Shaw often combined elements associated with Gothic, Tudor, Georgian and Arts and Crafts architecture to provide buildings for such notable clients as Joseph Ryerson and Gustavus Swift. While Shaw knew and admired progressive architects like Frank Lloyd Wright, and even sometimes employed Prairie School motifs in his own work, he was inspired more by the works of contemporary British architects like Edwin Lutyens to fulfill the needs of Chicago's more conservative clientele.

Shaw was born into a family of considerable wealth and social prominence, and raised in Chicago's fashionable Prairie Avenue neighborhood. In 1890 he entered the Massachusetts Institute of Technology, the most distinguished school of architecture in the country at the time. At MIT Shaw was exposed to a curriculum modeled on the Ecole des Beaux Arts in Paris, which stressed the importance of adapting the rules and forms of classical and

731 S.Plymouth Building (1897), Chicago, Illinois. Designed by Howard Van Doren Shaw

Photo © GreatBuildings.com

medieval architecture to modern structures. Shaw completed the demanding two-year curriculum in only one year, returning to Chicago in 1891 to work in the office of Jenney and Mundie. The firm's principal partner, Major William Le Baron Jenney, best known as the architect of the first skyscraper, the Home Insurance Building of 1884, undoubtedly refined Shaw's knowledge of engineering and the design of tall structures.

Shaw's first major commission was for the Lakeside Press Building in Chicago (1897–99), the earliest of several structures Shaw would undertake for Chicago's printing and publishing industry. In most ways the seven-story building is a typical late 19th century "Chicago Style" skyscraper, though it was adorned with medieval English details and equipped with reinforced open-shell concrete floors and an innovative system of delivering water throughout the building in case of fire. The building's fire resistance and aesthetic success led to Shaw's selection to design the Henneberry Press Building in Chicago (1902), remarkable for its vast glass façade under a shallow pediment, and an impressive Beaux Arts style structure for Ginn and Company Publishers (1907). The culmination of Shaw works for Chicago's printing establishment was a massive Gothic style factory for R.R.Donnelley and Sons (1911–29).

While Shaw designed many other commercial structures, the bulk of his practice was centered on the production of fine coun-try houses, especially for well-to-do clients in fashionable Lake Forest. Shaw built an extraordinary house there for himself, “Ragdale” (1898), a structure reflecting the architect’s keen interest in the British Arts and Crafts work of C.F.A. Voysey. Passionate about details and quality construction, Shaw built much of Ragdale himself, proving in the process to be a skillful carpenter, mason, roofer, painter and landscape designer. Known for his insistence of high quality workmanship, Shaw designed and carefully supervised the construction of over twenty houses in Lake Forest alone by 1915. He employed mostly Tudor styles at first, as in the house for John Bradley (1898), and then Georgian, as in the house for A.A.Sprague (1907). But Shaw was also capable of building a Florentine palace, as he did for Edward Ryerson (1906), and a Mediterranean villa, like the one built for Donald McLennan (1912). Whatever the style, though, Shaw plans typically revealed his training in the methods of the Ecole des Beaux Arts: generously proportioned rooms were aligned along axes that extended to geometrically defined gardens and lawns.

In 1915 Shaw turned his attention to small-scale urban planning when he became part owner and sole architect for Market Square in Lake Forest. The first planned shopping center in the country, Market Square revitalized a dilapidated section of town by integrating commercial and residential quarters, coordinating both pedestrian and automotive traffic, and wedding various English, Dutch and German architectural motifs to create a charming “old world” village square. The idea of combining small-scale residential and commercial buildings around a common, landscaped square also served as the focus for Shaw’s design of Marktown (1917), a residential development for the workers of the Mark Corporation of East Chicago, Indiana. With its creative mix of forty different English-style cottages, Marktown proved to be one of the most sophisticated adaptations of British Garden City Movement planning in America.

Even at the height of his career Shaw maintained a fairly small office of apprentices and draftsmen, most notably David Adler. Shaw was gracious in social situations, a member of several civic organizations, and noted for his sense of humor. Despite persistent ill health, he traveled frequently to Europe to collect ideas and artifacts for his clients. His love for the arts was manifested by his considerable devotion to the Chicago Art Institute, for which he served as a long-time trustee and part-time architect. Appropriately, his own house, Ragdale, has served since 1976 as home to the famous Ragdale Foundation of writers, artists, and composers.

Most of what remains of Shaw’s letters, manuscripts, and drawings can be found today in the Chicago Art Institute’s Ryerson and Burnham Libraries, which were designed by Shaw himself from 1919–22.

GAVIN EDWARD TOWNSEND

S*ee also* **Arts and Crafts Movement; Craftsman Style; Garden City Movement; Lutyens, Edwin (England); Voysey, Charles F.A. (England)**

Biography

Born in Chicago, Illinois, May 7, 1869. Son of Theodore Shaw, a successful dry goods wholesaler whose connections with Chicago’s business community would lead to some of his son’s later architectural commissions. Attended Harvard School for Boys in Kenwood, Chicago; left Chicago during his junior year to attend Yale University, received a Bachelor of Arts in 1890; studied architecture at the Massachusetts Institute of Technology, 1890–91. Worked in the Chicago firm of Jenney & Mundie, Traveled throughout Europe 1892–93. Left for Europe in 1892; spent a year sketching and photographing buildings in Spain, France, Italy, Germany and especially England; returned to United States in 1893; married Frances Wells, 20 April 1893 and established his own practice later that year. Trustee of the Art Institute of Chicago 1904–26. Served as second vice president of the Illinois chapter of the AIA in 1905 and was elected a Fellow of the AIA in 1907. Received the AIA Gold Medal in 1926 and died of pernicious anemia May 6, 1926.

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Prentiss Loomis Coonley House, Lake Forest, 1908
Durand Commons, Lake Forest College, Lake Forest, 1909
Finley Barrell House, Lake Forest, 1909
Walter D. Douglas House, 3900 Walden Rd., Deep Haven, Minnesota, 1909
R.R.Donnelley & Sons Co Building, Chicago, 1911–29
Fourth Presbyterian Church (with Cram, Goodhue and Ferguson), Chicago, 1911–37
Gustavus F. Swift Jr. House, Chicago, 1913
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Marktown, East Chicago-Whiting, Indiana, 1917
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SHEKHTEL, FEDOR 1859–1926

Architect, Russia

Among Russian architects at the turn of the 20th century, Fedor Shekhtel is unique not only in the range of accomplishment over some three decades but also in the degree to which his work embodied the cultural aspirations of his era. As no other architect, Shekhtel enlarged and gave coherent expression to the creative possibilities of the modern style, yet after 1908 he retreated from modernism to a reworking of traditional forms in Russian architecture.

Shekhtel was born and raised in a middle-class environment in the Volga town of Saratov. His father was a civil engineer of

House for Stepan Riabushinskii (1902), designed by Fedor Shekhtel

German extraction, and his mother, Maria, came from a distinguished merchant family, the Zhegins, whose connections extended into the merchant elite of Moscow. After the death of his father, Shekhtel moved with his family to Moscow around 1875. Having spent a year (1876–77) in the third class at Moscow's School of Painting, Sculpture, and Architecture, he began private work that combined his love for architecture and theater with the design of sets for impresarios such as Mikhail Lentovskii.

During the 1880s, Shekhtel served his apprenticeship in the offices of Alexander Kaminskii and Konstantin Terskii, architects for Moscow's merchant elite in the 1870s.

By the end of the 1880s, Shekhtel had designed and built his first independent projects, including the exuberantly eclectic mansion for S.P. von Dervis (1889) at the estate of Kiritsy near Riazan. In 1894, Shekhtel received certification as a "technician-builder" for his design of a large neo-Gothic townhouse for Zinaida Morozova, wife of the industrialist Savva Morozov. The design, which dates from 1893, was some three years in construction; and although both the interior and the exterior display the ostentatious striving for effect typical of that time, Shekhtel also used the style to explore the dynamic relation between interior space and its projection in the design of the exterior.

From this use of Gothic stylization as a path to structural innovation, Shekhtel moved to a radically modern idiom in his house for Stepan Riabushinskii (1902) near the Nikita Gates in central Moscow. Begun in 1900, the Riabushinskii house displays a stylistic affinity with houses designed by Olbrich at the Matildenhöhe community, yet it also incorporates the emphasis on decorative arts pioneered at Abramtsevo, the Arts and Crafts colony established in the 1870s on the country estate of railroad magnate Savva Mamontov. Shekhtel defined the exterior as a play of contrasting elements, angular and sinuous, precise in line and complex in decorative form. In designing the interior of the house, Shekhtel approached the limits of the free-form possibilities of the modern style. The central space, extending the entire height of the structure and containing the main stairway, serves as a core around which most of the rooms are grouped. The stairway itself is one of the most theatrical moments in Russian modernism, a frozen wave of polished gray aggregate cascading from the upper story to the bottom landing. His other major residence of the period, designed in 1901 for Alexandra Derozhinskaia, wife of a wealthy Moscow industrialist, represents a rejection of elaborate decoration in favor of a monumental definition of mass and space.

In public architecture, Shekhtel defined some of Moscow's most important spaces with buildings such as the Moscow Art Theater (1902), with its superb interior detailing, and the rebuilding of the Yaroslavl Railway Station (1902), with traditional decorative elements in a modernized interpretation known

Detail of staircase, House for Stepan Riabushinskii

© William C.Brumfield

as the "neo-Russian" style. This style was prefigured by Shekhtel's designs for large wooden pavilions at the 1901 Glasgow Exposition.

In commercial architecture at the turn of the 20th century, Shekhtel developed the multi-storied arch, with spandrel beams and plate glass, as a defining tectonic element in two commercial structures: the headquarters for the Kuznetsov porcelain firm (1898–99) and the Arshinov Store in Kitai-gorod (1899), with its facade of glazed green brick. A more picturesque approach was adopted in his "chateau" style for the main office of the A.A.Levenson Printing Works on Mamontov Lane (1900), behind which was a printing plant in a modern, functional design.

On a much larger scale, Shekhtel's building for the Moscow Insurance Society on Old Square (1901) represents a shift from the Renaissance detail and arched facades of his earlier commercial buildings to an orthogonal, grid framework of brick and reinforced concrete. Although the Insurance Society building—more commonly known as "Boiars' Court," named after the hotel situated in the building—retains a number of stucco decorative devices, the rationalism of its design signaled the beginning of the modern era in Moscow's financial district.

The clearest expression of the new rationalist approach in Shekhtel's work occurred in commercial buildings such as the Riabushinskii Brothers Bank (1903) in the center of Moscow's financial district and the office and printing works (1907) of the Riabushinskii newspaper *Utro Rossii* (Russia's Morning). The main facades of both consisted of a plate-glass grid with a surface of high-quality pressed brick and no ornament, although the corners are rounded and articulated—a characteristic feature of Shekhtel's large commercial projects, such as the building for the Moscow Merchants' Society (1909) and the Shamshin apartment building (1909).

In the final phase of his career, Shekhtel turned to new interpretations of retrospective styles, such as the neoclassical revival for his own house in Moscow (1909) and the museum dedicated to his close friend Anton Chekhov in Taganrog (1910). His design for the Old Believers Church (1910) in Balakovo (Samara province) is a sensitive fusion of traditional motifs within a modern structure.

In the union of modern form and function that characterized the main body of this work, Shekhtel suggested the spirit of a new economic order in Moscow. Although that order, as well as his professional practice, collapsed in the aftermath of war and revolution, Shekhtel remained in Moscow with his family and continued to teach until his death in 1926. A cautious revival of his legacy began in the 1960s, and he is now considered one of the leading cultural figures of Russia's "Silver Age."

WILLIAM C. BRUMFIELD

S*ee also* **Olbrich, Josef Maria (Austria); Russia and Soviet Union**

Biography

Born in Saratov, Russia, 16 July 1859. Studied in the faculty of architecture, Moscow College of Painting, Sculpture, and Architecture 1876–77. Worked as an illustrator and theater designer, did stage design for the Moscow Arts Theater. Taught composition, Stroganov School of Applied Arts, Moscow 1896–1917; taught at the Free Studios, Moscow (previously the Stroganov School) from 1918. President, Moscow Architectural Society 1908–22; jury member on early Soviet competitions, including the Palace of Labor 1922. Died in Moscow, 26 June 1926.

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Moscow Art Theater, 1902
Yaroslavl Railway Station, Moscow, 1902
Riabushinskii Brothers Bank, Moscow, 1903
"Utro Rossii" Printing Works, Moscow, 1907
Moscow Merchants' Society Building, 1909
Shamshin Apartment Building, Moscow, 1909
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SHINOHARA, KAZUO 1925

Architect, Japan

Regularly described as a "philosopher of architecture," Kazuo Shinohara is as well known for his writing as he is for his designs. Despite producing barely 50 buildings in almost as many years, each of his works has been exquisitely crafted to express a particular philosophical position. Rather than discussing these buildings in isolation, Shinohara presents them as models of how he believes architecture should respond to the modern world. Through his writing and teaching, Shinohara influenced an entire generation of post-World War II Japanese architects, including Toyo Ito, Itsuko Hasegawa, and Issei Sakamoto, who were known collectively in the 1970s as the "Shinohara school."

Kazuo Shinohara was born in Shizuoka prefecture in Japan in 1925 and entered the Department of Architecture at the Tokyo Institute of Technology at the age of 22. Following graduation in 1953, Shinohara became an associate of the same institution, where he remained for the following 40 years, being appointed associate professor in 1962, professor in 1970, and professor emeritus in 1986. Shinohara completed a doctorate on spatial composition in traditional Japanese architecture in 1967. Ironically, it was after the completion of this research that he began to reject the ordered spaces of the Japanese vernacular that characterized so many of his early designs in favor of a more complex and technological approach to design.

Two themes, order and chaos, distinguish Shinohara's early architectural works and writings from his later ones. The shift between these two extremes, from a preoccupation with order toward a fascination with disorder, took place between 1967 and 1970, although traces of Shinohara's growing interest in chaos are apparent as early as 1964. Prior to 1967, Shinohara describes his designs, including such projects as the House in Kugayama (1954), the House in Chigasaki (1960), and the House in Komae (1960), as distinctly ordered and traditional. These projects, which are named after the locations in which they are sited, are characterized by largely symmetrical spatial compositions that are variants of historic Japanese house types.

Following these works, Shinohara began to refine his approach to geometry and structure to even greater levels of abstraction. This growth in design method is seen in the Umbrella House (1961), the House in White (1966), and the Suzusho House (1968), all of which feature simple geometric forms, white walls, and exposed-timber beams. Despite the success of these buildings, in the years that followed, Shinohara began to question the role played by the house in the city and the importance of order and symmetry. In the Incomplete House (1970) and the House in Itoshima (1976) on the Genkainada Sea, symmetry still governs the exterior of the dwelling, but inside the pure, hierarchical planning that distinguishes so many of his early works has been eroded. This shift is even more apparent in Shinohara's Uehara House (1976) in Tokyo, which features a stark concrete exterior perforated with irregularly spaced geometric windows. This house, which is supported on a system of Y-shaped concrete columns, is asymmetrical in both plan and section and does not possess the same polished finish of many of his early works. The Uehara House is one of Shinohara's first designs that expresses the dual desire to isolate the interior from the exterior and to recognize the complexity of modern life in the arrangement of spaces and forms. Shinohara describes these intermediate works as possessing a "savage" or "barbarous" quality that is a result not only of his use of raw concrete but also of his newly developed interest in the irregular geometry of nature.

For Shinohara, both the dream of utopia that preceded World War II and the influx of modern architecture in Japan that followed in its aftermath were doomed to failure because they did not take account of the need for complexity in urban space. It was only in modernism's aftermath that people began to see that cities such as Tokyo possess a natural complexity that is intrinsic to its vitality. Shinohara describes the urban chaos of Tokyo as being paradigmatic of "the beauty of progressive anarchy," a concept that for him relates to the sense of energy and disorder often encountered in urban spaces. The Ukiyo-e Museum (1982), Shinohara's first nonresidential building, attempts to capture this chimerical urban beauty in its facades through an irregular composition of squares, triangles, and arcs. Internally, the museum is a mixture of contrasts, smooth floors are juxtaposed against rough concrete walls, and natural finishes compete with vibrant red and green window frames.

By 1987, Shinohara had begun to openly argue that "chaos is a basic condition of the city" and that if architecture is to respond to this chaos, it must adopt a new guise that is informed by both technology and the sciences of complexity. He maintains that architects must focus their attention on machines (particularly computers, the F-14 fighter plane, and the *Apollo 11* lunar landing craft). Because modern machines are highly adaptable to complex environments, Shinohara proposes that they are suitable metaphors for design in an increasingly unpredictable world. Shinohara calls this approach to architecture, which he documented in his 1988 article "Chaos and Machine," Modern-next. Although Shinohara has developed this philosophy of design in a number of projects, including the Hanegi Complex (1988) in Tokyo and the inverted triangle of the Police Station (1990) in Kumamoto, it is his Centennial Hall (1987) in Tokyo that has become iconic for the way in which it expresses his philosophy of design. Externally, the Centennial Hall is visually reminiscent of sections of an aircraft. The building is formed about a horizontal, metal-clad, half cylinder that intersects two rectangular blocks at a point high above the street level. The half cylinder is the literal evocation of the machine of Modern-next. The static silver, gray, and white rectangular prisms provide connection between the ground and the sky. The elaborate interlocking of these forms renders the overall building volume difficult to read against the chaos of the surrounding city. For Shinohara, this is the only way that architecture can capture the essential vitality of the modern world.

MICHAEL J.OSTWALD

Biography

Born in Shizuoka, Japan, 2 April 1925. Received a bachelor's degree in engineering from the Institute of Technology, Tokyo 1953; earned a doctorate in engineering 1967. Served in the Japanese Army, Japan and Korea 1945. In private practice, Tokyo from 1954; established a studio at the Tokyo Institute of Technology 1962. Instructor 1953–62, associate professor 1962–69, professor of architecture 1970–85, and professor emeritus from 1986, Tokyo Institute of Technology; visiting professor of architecture, Yale University, New Haven, Connecticut 1984; visiting professor of architecture, Technische Universität, Vienna 1986. Honorary fellow, American Institute of Architects 1988.

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SHOPPING CENTER

Two trends were crucial for the development and success of the shopping center: decentralization at the urban scale and increasingly sophisticated techniques of advertising and display that encouraged the purchase of goods. In this sense the department stores, such as the famous Bon Marché of Paris (ca. 1862) and the much larger Marshall Field’s store of Chicago (ca. 1880) prefigured the 20th-century shopping center and its later manifestation, the shopping mall. The French example was particularly important because it was fashioned as a place of “democratic luxury,” where goods were presented to the clientele in the exciting manner of world’s fair displays. The shopping center did not become identifiable as a distinct building type, however, until the 1920s. The 18th- and 19th-century arcades, and the late 19th-century department stores were not the precedents of this building type, per se, although they certainly influenced retail architecture and the culture of consumption. Until the 1930s in the United States, where it first materialized, a shopping center was nothing more than a term denoting an assemblage of businesses, usually situated “downtown.” In fact, downtown centers that sported a cluster of businesses, stores, and a department store were considered the definition of a shopping core. Outlying districts that offered shops and businesses might also have been considered a shopping center, but these types of gathered buildings and spaces were not coordinated or planned as one. By 1930, however, developers and architects created identifiable centers incorporating business factors as well as architectural issues. The premeditated nature of this new landscape intervention marks the shopping center’s most salient characteristic as a distinct building type.

The typology developed out of a larger effort to decentralize the urban nucleus, a trend that originated in the previous century. The five-unit block built as an integral component of the residential community at Riverside, Illinois, in 1870 is perhaps a more useful precedent than, say, the Marshall Field’s store. Just as Riverside was an early prototype of what would become a more powerful 20th-century movement to the suburb, so too was its store building. As cities in the second half of the 19th century grew in terms of density, land area, and pollution, the demand for neighborhoods in pseudopastoral settings increased. Streetcar lines made such suburban communities viable, as resi-dents could maintain ties to the city while remaining in what they considered to be a healthy environment. As a method of enticing homebuyers, American developers found it necessary to build a retail facility as part of these new communities. For such early neighborhoods to be viable, residents had to feel many of their shopping necessities could be met without trekking downtown.

Market Square in Lake Forest, Illinois, was an important and early example, built in 1916 to cater to some of Chicago's wealthiest families. Designed by Howard Van Doren Shaw with the collaboration of real estate magnate Arthur Aldis, this was far more than a mere retail building. It was part of a larger commercial project that cost more than half a million dollars and was raised by investors as well as by bonds, resulting in twenty-eight stores, twelve office suites, thirty apartments, and sundry other community facilities. Built adjacent to existing merchants, the project was intended to offer a true center for shopping, one that proved financially profitable as well as aesthetically unobjectionable. The design team that matched a business mind with an architect went a long way to assuring the project's success and was largely responsible for the way the plan provided for automobile access and parking. The main street was widened to facilitate parking for the growing number of Lake Forest residents with automobiles. The collection of shops was U-shaped, and patrons could park their cars in the tree-lined open space of the U. No distinction was made between cars in motion and parked autos in this lot ornamented by a fountain, but delivery vehicles used separate rear-side courts for service. Lauded as an application of the City Beautiful movement to commercial architecture, Market Square proved influential.

Consumer culture and the display of goods were revolutionized during this same period, as architects like Morris Lapidus devised increasingly seductive techniques for displaying goods for sale. Storefront windows grew until the façade became one large display, signs were built overhead the size of entire buildings, and the scale of the storefront was increased to catch the eye of the motorist at a distance. Meanwhile, shopping had been a point of application for developments in psychoanalysis, as the task of the psychologist in the first half of the century resembled that of the advertising firm's attempts to divine the buying impulse. Eventually, these shopping complexes grew so large, and attendant parking lots were in turn so vast, developers and architects were forced to experiment with organizational plans. The scheme that proved most successful was a plan arranged around a pedestrian path often lined with grass and shaded by trees, so that consumers would leave their cars behind as they strolled along on a new interior shopping experience. Other schemes included the cruciform plan, a clustered or doughnut shaped plan, and circular plans where shops all faced a common green space. The pedestrian path was often punctuated with fountains or sculpture, whereas these shopping centers were surrounded by massive parking lots that wrapped around the backs of the stores in such a way that a customer could park near any given store. Perceptually disconnected from the street, this "mall" was an environment unto itself. As historian Richard Longstreth noted, "Once divorced from their cars and walking amid what seems like an entirely different world, customers tended to spend greater blocks of time meandering, meeting friends, having meals, and buying goods."

Northgate, built just outside Seattle in 1950, was one of the first malls to open in the United States. Its 800,000 square feet of shops, anchored by a large department store, were designed along a two-story, 1500-foot-long pedestrian path dubbed the "Miracle Mall." In 1956, a fully enclosed mall in Minnesota called Southdale opened. Designed by Victor Gruen, who believed that malls held the potential for restoring social space to a socially bankrupt society, the enclosure allowed for climate control so that shoppers would not be deterred by heat, cold, or snow. The success of these malls was profound, as by 1960 department store owners no longer had faith in the stand-alone branch store as a viable business proposition. The dominance of the mall also had an ironic effect on the role of the architect in the retail market, because such large-scale projects, financed and built in one swoop as one integrated building and under single ownership, handed the architect greater influence in the design process. After the 1970s, when the completely enclosed pedestrian path became standard, architects were allowed even greater design control over such projects.

The influence of American practices was also felt abroad. The first mall in Great Britain, for example, opened at Brent Cross in 1976. It was an 800,000-square-foot complex boasting 82 tenants, 4000 employees, and 3500 parking spaces. Site selection and planning began in 1959, and before its opening, the investment company negotiated a 125-year lease. For much of the century, the department store in Great Britain, once a native product in the early 19th century, had been influenced by American display techniques. These methods, coupled with the power of advertising, customer surveillance, and changes in departmental organization, proved to have an effect beyond the shopping center's precincts. The new space of consumption ascribed explicit cultural meaning to gender roles and greatly influenced the appropriate modes of heterosocial conduct. Although the gender of shopping changed in the last quarter of the century, as men proved as vulnerable as women to mass marketing and seductive advertising strategies, the truly remarkable aspect of the shopping center was the way social space was transformed into a consumer experience. By the end of the century, it was common for sites intended for other purposes to be reconfigured as consumer opportunities, such as railway stations, hotel lobbies, airports, and even museums that entice patrons to shop.

JERRY WHITE

S*ee also* **Chicago School; Gruen, Victor David (United States); Lapidus, Morris (United States); Shaw, Howard Van Doren (United States); Suburban Planning**

Further Reading

Richard Longstreth's *City Center to Regional Mall* is the best work on the origins of the shopping mall. Although it lacks an analysis of the culture of consumption, it is an excellent investigation of the architectural and business aspects of the Southern California shopping center. A whole host of works theorizing the consumer experience along lines of class, gender, and race can be had, and a useful revue of this work can be found in either Bill Lancaster's *The Department Store: A Social History,* or Miller's

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SHRINE OF THE BOOK

Designed by Frederick Kiesler and Armand Bartos; completed 1965
Jerusalem, Israel

The Shrine of the Book is a small, domed pavilion on the grounds of the Israeli Museum complex in Jerusalem. It was built by two architects living in the United States—Frederick Kiesler and his former student Armand Bartos—to house the Dead Sea Scrolls, seven ancient manuscripts dating from the era of the Jewish revolts against the Romans nearly 2,000 years ago. For Kiesler, who had achieved great prominence in New York as an artist and architectural theorist but who had completed only a handful of built commissions, the shrine provided an opportunity to construct his masterpiece.

The story of the discovery of the Dead Sea Scrolls is intimately tied up with the history of the establishment of the state of Israel. In the summer of 1947, a Bedouin shepherd boy stumbled into a cave near the town of Qumran and inside discovered clay jars containing parchments sewn together into long scrolls wrapped in linen. In November of that year, Dr. Elazar Sukenik, the head of Hebrew University's Department of Archaeology, was approached by an antiquities dealer eager to sell the newly discovered documents. Although the next day the United Nations was scheduled to vote on the partition of Palestine, Dr. Sukenik, realizing that the fragment he viewed through a barbed-wire fence was almost 1,000 years older than the oldest known, disregarded the violence around him and traveled to Bethlehem to make the purchase. As he studied the scrolls that night in his living room, the radio brought the news that the UN motion had carried and that the state of Israel was to be reborn.

All told, the Bedouin shepherd had discovered seven scrolls, of which Dr. Sukenik had purchased three. The remaining four scrolls were acquired by the metropolitan of the Syrian Orthodox Monastery of Saint Mark in the Old City of Jerusalem, who had shipped them to New York in search of a better price. Although Dr. Sukenik died believing them lost, his son, General Yigael Yadin, also an archaeologist, was on a 1954 speaking tour in the United States when a journalist called his attention to an obscure, seven-line classified advertisement in the *Wall Street Journal* offering "Four Dead Sea Scrolls for Sale." Yadin moved quickly to secure the scrolls from the vault of the Waldorf Astoria, purchasing them with the financial backing of New York industrialist Samuel Gottesman, Armand Bartos's father-in-law. Following Gottesman's death in 1956, the D.S. and R.H. Gottesman Foundation agreed to provide the funds for the construction of the Shrine of the Book in Jerusalem.

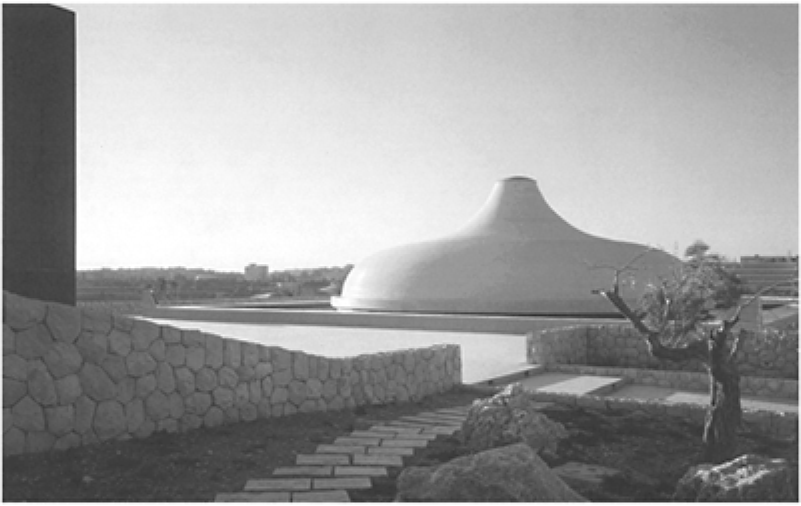
From its inception, the architectural program for the Shrine of the Book was symbolically overdetermined. First were the scrolls themselves, breathtaking in historical, archaeological, and religious significance. For Jews, often called "the people of the book," the discovery of a manuscript written so near to biblical times was theologically earthshaking. Second was the coincidence between the discovery of the scrolls and the founding of the state of Israel. Both the parchments and the nation had lain dormant from the fall of the second Jewish state until the resurrection of the third. The scrolls provided a link between those Jews whose revolt had been crushed by the Romans and those who founded a new nation, bathing legitimacy on their territorial claims. Third was Kiesler's own struggle to practice architecture in a manner consistent with his critiques of the then-dominant International Style. Against its ethos of rationalism and transparency, Kiesler unleashed his surrealist passions for the mythological, the sexualized, the poetical, and the primal. What better commission for Kiesler than a sacred shrine to ancient scrolls, scratched from the prehistoric earth, that awed "the somnolent religious world of cathedrals" and recounted a "war between the sons of light and the sons of darkness"?

Kiesler and Bartos flew to Jerusalem in October 1957 and met with Mazar Ben Zvi, the president of Hebrew University. As Kiesler recounts the events that followed in his journal *Inside the Endless House,* he persuaded the university to enlarge its ambitions and construct a monumental sanctuary for the shrine on the new Givat Ram Campus (then under construction). On the flight back to New York, using a pencil nub on the back of an envelope from his jacket pocket, Kiesler scratched a double-parabolic dome, "a plastic representation of 'rebirth.'"

By late December 1957, preliminary drawings of the dome were complete. The scheme called for a unified centralized chamber, partially buried in the ground, in which the manuscripts and related artifacts would be displayed. The dome would fill the lobby of the planned cubic library building, and its throat and tip would peek out of the roof. Predictably, the campus architects objected, and the Shrine of the Book was removed to a second site outside the library, to be entered via a subterranean corridor. By 1959, detailed drawings were completed for this scheme, but in the fall of that year, the site was moved again, this time to the new campus of the Israel Museum. Kiesler and Bartos's design process seems to have been essentially additive, and the dome and corridor were transferred to the new location. Because they no longer had the strong mass of the library to play against, the architects added a freestanding basalt wall to balance the composition.

Some ancillary office and library space was also added. Although Kiesler is credited with the design sketches and poetic ideas, Bartos remained in Israel during most of the construction and provided the essential on-site refinements and supervision.

The Shrine of the Book is composed of five primary pieces arranged in a linear sequence. A visit to the shrine begins with a transverse walk across a stone entry plaza. To the right, the massive white-tiled dome hovers in a rectilinear pool of water,



Shrine of the Book, Jerusalem, designed by Armand Bartos and Frederick Kiesler (1965)

Ezra Stoller © Esto

and to left, the black wall looms overhead. Walking between these dueling giants, the visitor turns and descends an open staircase to a sunken court. On one side of the court are supporting offices, and to the other is the entrance to the shrine. Once inside the lobby, the black wall reappears, but this time punctured with an opening at its base. As one passes through that opening and its tubular gates, a dark passage descends slowly through a sequence of asymmetrical arches. Display cases on the side walls provide the primary illumination. At the end of this hall, another staircase climbs upward into the ribbed open dome, which swings its concentrically corrugated surface from almost 80 feet at its base to just 6 at its throat. Desert sunlight pours down from a transparent monocular void at the apex. Surrounding the periphery are more display cases, and atop a central platform is a vertical shaft ringed with the unfurled “Book of Isaiah.” Below is a subterranean corridor lined with rough-hewn stones, claustrophobic and cavelike, in which nontextual artifacts are entombed. A single passage leads out from the dome and back to the surface.

Not surprisingly, the double-parabolic dome proved difficult to build. Kiesler was adamant that the dome be both monolithic and homogeneous—one vessel programmatically, structurally, and aesthetically—and he vetoed all designs that had it resting atop some form of cylindrical base or that used a system of structural ribs. Although a difficult challenge for the shrine's builder, Hillel Fefferman, Kiesler prevailed, and the dome was built as a cast-in-place single concrete shell. The ribbing on the interior prevented acoustical problems, and exterior tiles afforded its elegant white finish. A small exterior lip protrudes from the side of the dome just atop the reflecting pool, providing an illusion of buoyancy.

In accordance with Kiesler's invocations of the primal, the Shrine of the Book attempted to choreograph the four elements of the ancients. A literal penetration into the earth is expressed materially through strata of progressively roughening and darkening masonry. At the deepest point in the complex, an axis is opened through the eye of the dome, linking the depths of the archaeological past with the bright skies of the heavens. On the surface, a pool of water surrounds the dome, small jets sprinkle its exterior, and a trough of water encircles the base of the black wall. Plans for an even more dramatic jet of water that would have shot up from the central shaft and out of the dome's eye were abandoned when unexpected backsplash could not be solved. Similarly, Kiesler's plans for a flaming trough of fuel to cap the massive black wall were also abandoned, although torches were installed for the opening ceremonies in 1965.

The importance of the shrine was recognized even before its completion, and it was immediately seen to be Kiesler's long-delayed masterpiece, a triumphant success crowning a lifetime of deferred hopes and unrealized visions. It was awarded the Gold Medal by the Architectural League of New York and is now considered by the Israeli government to be one of its national treasures. Still, perhaps the greatest testimony to Kiesler and to his lifelong struggle for poetic expression in architecture is the fact that the Shrine of the Book continues to demand to be interpreted symbolically. Some are compelled by the relationship to the scrolls themselves, reading the white dome as the lid of a pottery jar and the shrine as a great cave, engaged together in a battle of light against the darkness of the basalt wall. Others see the shrine as a symbol of rebirth; just as the Hebrew nation was reborn after 2,000 years of exile, bringing an ancient language and people back to Jerusalem, so, too, does the shrine emerge from the ground like a great dormant seed. Others are drawn to shrine's mysterious sexuality—seeing in the dome a female breast and traveling a dark passage into a great protective womb, violated only by the episodic sprays from the tall central shaft. Others draw parallels with the dream of Jacob's ladder, the staffs of the Jewish Torah, or the Roman Pantheon. Ultimately, the significance of the Shrine of the Book does not lie in the selection of one of these readings over another. Rather, by speaking mythologically, by simply opening up a field of symbolic interpretation, Kiesler's shrine sidestepped modern architecture's dilemma of the monument and created a sacred building as rewarding to, the heart, and the spirit as it is to the mind.

RONN M.DANIEL

Further Reading

An excellent introduction to the Dead Sea Scrolls appears in Pearlman. The best pictorial description of the Shrine is found in *The Shrine of the Book,* and the most complete history of the design's evolution is in Cohl. Also interesting are Kiesler's essays and poems on the Shrine.

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SIRÉN, HEIKKI (1918–) AND KAIJA SIRÉN (1920–)

Architects, Finland

The husband-and-wife partnership Arkkitehtitoimisto Kaija ja Heikki Sirén was established in Helsinki in 1949. In 1985, they retired, and their son Jukka Sirén took charge and continued the work of the firm. Heikki Sirén's father, Johann Sigfrid Sirén, designed the Parliament (1924–30) in Helsinki, which marked the climax of late Finnish classicism. Both Heikki (1918–) and Kaija (1920–) studied under Professor Sirén at Technical University in Helsinki. Born 20 years after Alvar Aalto, Heikki Sirén belonged to the next generation, which was equally inspired and, at the same time, overshadowed by Aalto.

The elder J.S.Sirén's disciplined academic classicism emphasized the importance of a clear plan as demonstrating the synthesis of the problem. The pair gained world recognition with the Chapel of the Technical University at Otaniemi, west of Helsinki, in 1957. No other single work ever matched the recognition that it achieved worldwide for its brilliant classical simplicity allied to a uniquely Finnish identification with trees and the forest. This concept echoed the primitive values of a forest people by its daring selection of a forest clearing outside the chapel as the core site of spirituality and redemption.

Its classicism was so well disguised beneath the chapel's vernacular references that it is easily missed. However, on closer analysis the clarity of plan is the secret foundation of the chapel's underlying simplicity and experiential impact. The modest mode of building in brick and timber exploited the Finnish tradition of wooden houses with their spacious yards. In one respect, the chapel's simplicity is confusing. The building derives its power from the synthesis of several sources, including the Finnish identification and rootedness in nature found in the medieval Finnish national epic the *Kalevala,* the Siréns' obvious admiration of anonymous indigenous architecture, and the notion that architecture creates the "stage" for human life.

The arrangement of an entry courtyard preceding the chapel separated the sacred from the profane. The chapel had its cross outside, a feature that is reminiscent of a proscenium theater with the glass wall replacing the proscenium arch and the forest clearing now reconstituted as a sacred stage. The cross set in the landscape was not new—Gunnar Asplund used it for his 1940 Forest Crematorium at Sockenvägen—but what is different in the Sirén version is the visual coupling of the cross with the chapel. Subsequently, Tadao Ando repeated the outside cross formula in his Church on the Water (1988) at Tomamu on Hokkaido.

Many people are attracted by the ultimate simplicity of the Siréns' architectural features. At the chapel, for example, the entry screen of horizontal timber poles in the courtyard permits the outside to be visible and thus transmits metaphysical ideas of considerable weight that mirror a Finnish identity linked at many levels to nature. Nature belongs to a pantheistic religious experience imbued by a kind of rich poverty.

Prior to the chapel, the small stage of the Finnish National Theatre (1954) in Helsinki had been the Siréns' first and most noteworthy work. It was completed as an annex to the theater building and the new auditorium and had a lobby and restaurant on the ground floor. The interior spaces were reflected on the outside in the openings formed in the dark clinker elevation, which provides a suitable backdrop to adjacent Kaisaniemi Park. The Kontiontie terrace houses (1954) at Tapiola were built with black-stained prefabricated wooden elevation units inserted between white blades of masonry to produce a starkly striking effect in the winter landscape.

From this time, the work of the pair includes the Students' Restaurant (1952) at Otaniemi, the Concert Hall (1954) at Lahti, and a multistory apartment house, Otaniemi (1956). Both the Aamivalkea School (1957) at Tapiola and the school (1958) at Espoo employed a simple steel-frame and in-fill aesthetic in-spired by Mies van der Rohe, but these were carried out with a flare for mating the cubic masses to their sites. The Town Hall (1967) at Kankaanpää and the Villa Punjo (1967) at Espoo testify to the Siréns' capacity to unite their buildings with forest settings by a simple juxtaposition of a finely tuned classical simplicity and rhythmic succession of masses.

The Siréns were unsuccessful when they entered architectural competitions. In 1974, they won the Linz Brucknerhaus Concert Hall competition and the 1978 competition for a Conference Palace (1984) for Baghdad, Iraq. The elegant radial arrangement of the Linz auditorium, with the foyer running around the circumference and overlooking the river, was reinforced by a warm timber interior of considerable elegance.

The Baghdad Conference Palace was faced in a bluish-glazed tile outside, selected out of respect for Babylonian tradition, with the parapet of the concrete-unit external wall curved inward so as to direct the hot outside air up between the glass-and-aluminium fenestration and behind the screening concrete blades. The planning of the three-story Conference Palace concentrated the auditoriums and foyers within a single compact rectangular volume that was plainly expressed outside. As a consequence, the focus is directed inside on the lobbies and foyers, all grouped around the large multiuse auditorium. One of the aims was to remove any suggestion of superficial regional ornamentation and, thus, to focus on such fundamental ideas as a disciplined floor plan and a monumentality for the overall massing.

The Siréns' holiday retreat (1966) on the island of Lingonsö exemplifies their respect for tradition. The cottage, sauna, and annex house are linked by raised walkways. These were built using an experimental prototype of prefabricated timber that was borrowed from a traditional solid-log sauna system. Wood was selected for its weathering properties to ensure that the buildings settled into the landscape gradually. In 1967, a sea chapel was added to the group for meditating, relaxing, and sunbathing. Mounted on an elementary horizontal timber platform on the bare shore rock, with round logs at the corners and overhanging beams to support the flat roof, the sea chapel at Lingonsö is an instance of a deliberately primitive yet highly refined temple beside the sea.

By remaining rooted in their Finnish heritage, the Siréns gained the confidence to explore other entirely different traditions without running into accusations of cliché or pastiche. This proves, as if any proof is required, the maturity and depth of their commitment to respecting and creatively drawing on the resources of their Finnish heritage.

PHILIP DREW

Biographies

Heikki Sirén
Born in Helsinki, 5 October 1918; son of architect J.S.Sirén. Studied under J.S.Sirén at the Technische Hochschule, Helsinki; degree in architecture 1946. Married Kaija Anna-Maija Helena Tuominen, architect, 1944:4 children. Worked in the office of professor J.S.Sirén, Helsinki 1944–48. Partner, Arkkitehtitoimisto Kaija ja Heikki Sirén, Helsinki from 1949. Special teacher of architecture, Technische Hochschule, Helsinki 1957-58; guest lecturer, Technische Hochschule, Trondheim 1960; director, architectural seminar, Technische Hochschule, Vienna 1966. Member, Finnish Academy of Technical Sciences 1971; foreign member, Académie d'Architecture, Paris 1983; honorary fellow, American Institute of Architects 1986; honorary member, Finnish Architects Association 1992.

Kaija Sirén
Born in Kotka, Finland, 12 October 1920. Studied under J.S. Sirén at the Technische Hochschule, Helsinki; degree in architecture 1948. Married Heikki Sirén, architect, 1944:4 children. Partner, Arkkitehtitoimisto Kaija ja Heikki Sirén, Helsinki from 1949. Foreign member, Académie d'Architecture, Paris 1983.

Selected Works

Students' Restaurant, Otaniemi, 1952
Finnish National Theater, Helsinki, 1954
Kontiontie Terrace Houses, Tapiola, 1954
Concert Hall, Lahti, 1954
Aamivalkea School, Tapiola, 1957 Multistory Apartment House, Otaniemi, 1956
Chapel of the Technical University, Otaniemi, 1957
School, Espoo, 1958
The Siréns' Holiday Retreat, Island of Lingonsö, 1966
Town Hall, Kankaanpää, 1967

Villa Punjo, Espoo 1967
Conference Palace, Baghdad, 1984

Further Reading

The Sirens have suffered more than most from the general isolation of the Finnish language. For information on individual buildings, consult the Finnish magazine *Arkkitehti* (Helsinki) or the Paris journal *Architecture d'aujourd'hui,* which followed and published their work. As a general introduction consult Helander and Rista.

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SIZA, ÁLVARO 1933

Architect, Portugal

Portuguese architect Álvaro Siza (Álvaro Joaquim Melo Siza Viera), is one of the best-known Portuguese architects of the 20th century. Although Siza produced numerous projects for clients in Portugal (houses, schools, and other institutions), it was not until the 1980s that he began to receive recognition through exhibitions and commissions in other European countries.

Siza's architecture is strongly rooted in the Modern movement, but incorporates a subjective approach to concept and design, seeking alternative interpretations of modernism. Siza has stated, "Architecture is increasingly a problem of use and reference to models…. My architecture does not have a preestablished language and does not establish a language. It is a response to a concrete problem, a situation in transformation in which I participate."

The geographic and climatic conditions of the place of Siza's architecture are of profound importance to this thinking in addition to cultural and social concerns. In Siza's oeuvre sensitivity to context does not result in nostalgic historicism or critical regionalism. It is rather a unique approach to a universal language transformed to respond to a local situation. His built works strive to integrate conflicting demands and affinities, often embodying points of tension that exist in a delicate balance.

For Siza, a building is at the same time autonomous and responsive, unified and diversified. He eschews using technology for technology's sake and employs local materials such as stucco, brick, and stone—all traditional building materials that he uses to create abstract compositions.

His swimming pools (1966) located in Leça de Palmeira, a small town near Porto, were his first projects to receive acclaim outside Portugal. These seaside pools easily make the transition from man-made concrete to the natural rock formations, creating sublime bathing pools. The changing rooms are in an unobtrusive pavilion of concrete with wood roofs that guide the visitor through a corridor-like space before opening on to the expansive sea.

The Pinto e Sotto Maior Bank (1974) in Oliveira de Azmeis, a small town in northern Portugal, is very representative of his early work. This small building does not adopt the formal architectural vocabulary of the place but rather creates a dialogue with its surroundings. The curved, glass facade looks out on to the square, however, creating a formal juxtaposition with the traditional forms of the square. Another bank building, the Borges and Irmao Bank (1986) in Vila do Conde, Portugal, takes a similar approach. It is both a separate entity and a participant in the townscape, respecting the scale of its surroundings. From the outside, little is revealed of the character of the interior. However, the space flows because of the visual connection between floors.

In 1977, following the revolution in Portugal, the local government of Evora commissioned Siza to plan a housing project in the rural outskirts of the town. It was to be one of several that he would do for the national housing association, consisting of 1,200 low-cost row houses, some one-story and some two-story units, all with courtyards. The layout of the new section gave order to an area at the periphery of the town while connecting it with existing housing areas.

During the 1980s, Siza was asked to undertake increasingly larger institutional projects, such as the School of Architecture (1992) at Porto University in Porto, the Teachers Training College (1991) at Setubal, and the Centro Galiziano (Museum of Modern Art, 1994) in Santiago de Compostela, Spain, located within the historical city.

This Centro Galiziano building fits into a complicated and historic site employing concepts of integration and contrast. The reductive, elongated form of the museum—produced by two adjacent wings—seeks to create classical order in an area that had suffered decline. The granite exterior contrasts with the stark white interior. Once again, Siza has approached the work with sensitivity to context without relinquishing the autonomy and strength of the new construction. Other notable museum projects include the addition to the Serralves Foundation and Museum in Porto (1999), the renovation and extension to the Stedelijk Museum in Amsterdam (1997), and the Manzana del Revellín Cultural Centre in Ceuta, Portugal (1997).

Other outstanding, widely published projects of Siza's include the Aveiro University Library at Aveiro, Portugal (1994); the Vitra Factory at Weil-am-Rein, Germany (1994);

Schlesisches Tor Apartments at Kreuzberg, Germany (1983); the Portuguese Pavilion at Expo ‘98 in Lisbon, Portugal (1998); the Santa Maria Church in Marco de Canavezes, Portugal (1997).

MARTHA THORNE

S*ee also* **Tavora, Fernando (Portugal)**

Biography

Born in 25 June 1933 in Matosinhos, just north of Porto in Portugal. Studied architecture at University of Porto, School of Architecture (1949–55). Opened his own atelier in Porto (1954) and began his career by designing smaller works, mainly residences in the late 1950s–1960s. Collaborated with Portuguese architect Fernando Tavora (1955–58); began teaching at University of Porto (1966); became full professor (1976–present); has taught and lectured outside Portugal at Harvard University, the École Poytechnique of Lausanne, Switzerland, and Los Andes University of Bogota. Awarded the Pritzker Architecture Prize (1992).

Selected Works

Swimming pools, Leça de Palmeira, Portugal, 1966
Alves Santos House, Póvoa do Varzim, Portugal, 1969
Pinto e Sotto Maior Bank, Oliveira de Azmeis, Portugal, 1974
J.M. Teixeira House, Taipas Guimaraes, Portugal, 1980
Borges and Irmao Bank, Vila do Conde, Portugal, 1986
“Joao de Deus” Kindergarten, Peñafiel, Portugal, 1988
Residential complex Schilderswijk West, The Hague, Netherlands, 1988
School of Architecture, Porto University in Porto, 1992
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SKIDMORE, OWINGS AND MERRILL

Architecture firm, United States

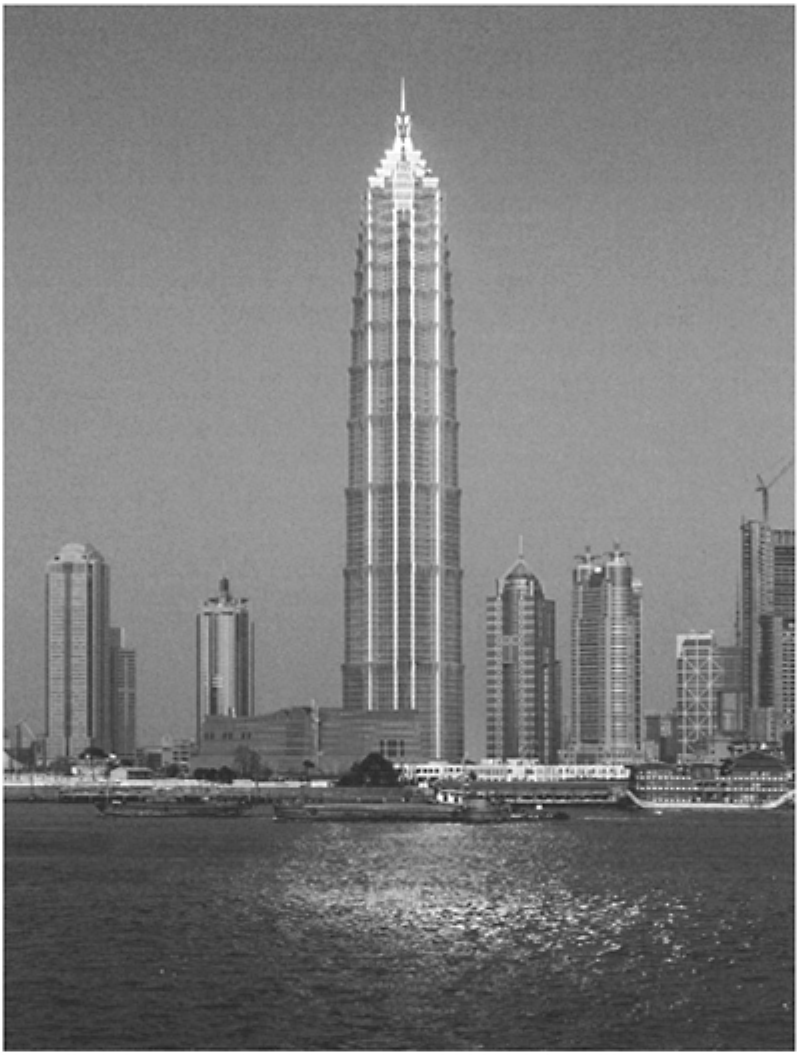
An early proponent of the International Style, the architectural firm of Skidmore, Owings and Merrill (SOM) was best noted for its technical innovations in skyscraper design, especially during the 1950s, 1960s, and 1970s. The "glass box" aesthetic, derived from Mies van der Rohe, for SOM became an experiment in which, although the general style and form remained quite consistent and even somewhat bland, subtle modifications and structural enhancements were progressively undertaken. SOM's version of corporate architecture dominated the field of high-rise building during this period, even after competing up-and-coming firms introduced more progressive design concepts and seemingly left SOM a dinosaur living off past laurels. Yet owing to its vast resources, stability, and reputation, the firm was able to maintain a consistently strong position with corporate clients, even after the retirement of the founding partners and key designers.

Founded in Chicago in 1936, SOM emerged during troubled economic times and with few early building projects. Law-renceburg, Indiana, native Louis Skidmore (1897–1962) graduated with an architectural degree from the Massachusetts Institute of Technology (MIT) in 1924. After working for Maginnius and Walsh for two years, Skidmore won the prestigious Rotch Traveling Fellowship in 1926 and spent the next three years in Europe. While in Paris, he met and married Eloise Owings, sister of his future partner Nathaniel Owings (1903–84). Owings, a native of Indianapolis, had attended the architectural school at the University of Illinois at Urbana in 1921. After becoming ill and passing up an appointment to West Point, Owings eventually graduated with a bachelor of arts degree in architecture from Cornell University in 1927. The first major work of the brothers-in-law was for the 1933 Century of Progress International Exposition in Chicago, of which Skidmore was named assistant to the general manager. Their collaborative effort consequently led to the opening of a second office in New York in 1937, and a partnership strengthened by the addition in 1939 of another MIT graduate, John Merrill (1896–1975). Merrill, born in St. Paul, Minnesota, had attended the University of Wisconsin at Madison for two years before joining the U.S. Army during World War I. After his graduation from MIT, Merrill had worked in Chicago for Granger and Bollenbacher and had done some work for the U.S. Housing Administration.

Even though projects were few during the pre-World War II period, the firm's capability to skillfully provide both solid architectural and engineering design led to a major commission in 1942. SOM was chosen to plan and design on 60,000 acres in eastern Tennessee an entire community, Oak Ridge, as part of the U.S. government's secret nuclear production program. In this town, which eventually grew from a population of zero to 75,000 by its completion in 1946, the production of uranium for the Manhattan Project occurred. After the war, an increasing number of projects began flowing in, and the firm gained a reputation for proficient if not extraordinary design work. It was the personal and professional relationships developed by the founding partners during this era that led to substantial work later and wide recognition for their planning abilities. In that context, Owings was appointed chairman of the Chicago Plan Commission from 1948 to 1951.

The firm's reputation was elevated to a new level with its first major skyscraper commission, the highly acclaimed Lever House (1951) in New York City, designed by Gordon Bunshaft (1909–90) for the Lever Brothers Soap Company. The 24-story green glass curtain-walled and stainless-steel structure reflected in its design not only New York's changing zoning laws that now permitted slab skyscrapers without setbacks but also the emergence of corporate modernism in the United States. Here, the form of Le Corbusier met the surface treatment of Mies van der Rohe, resulting in a modestly scaled structure in sharp contrast with the solid masonry of its neighbors.

SOM followed up the Lever House with another corporate commission, the Inland Steel Building (1958) in Chicago, one of the first high-rise buildings constructed in the Windy City after the Depression. With Walter Netsch (1920–) as chief designer, this 19-story glass box with accompanying 25-story stainless-steel service tower exemplifies Miesian abstraction. The architects separated the service core from the office block through a stark contrast between metal and glass sheathing. Soon a trademark of SOM, it was repeated most notably in the Crown Zellerbach Building (1959) in San Francisco. The firm replicated the glass box skyscraper model in buildings of varying heights, including the Manufacturers' Trust Company (1954), the Union Carbide Building (1960), and Chase Manhattan Bank (1961), all in New York. In 1961, the awarding of the AIA's first Architecture Firm Award solidified SOM's position as a premier architectural firm.



Sin Mao Tower, China (1998)

© China Jin Mao Group. Photo courtesy Skidmore, Owings and Merrill, Chicago

During the 1970s, the firm reacted to changing economic conditions that required multi-purpose megastructures, literally vertical cities in the sky. Two of its best-known structures of this type were constructed in Chicago, both designed by Bruce Graham (1925–) and engineered by Fazlur Khan (1929–82). The John Hancock Center (1970) is by far the most satisfying. This multi-purpose 100-story structure of black anodized aluminum with tinted bronze glass rises 1,107 feet as a single tapered shaft. It combines retail, commercial, and residential functions into one colossal building. In order to combat wind and gravity loads, large cross bracing was used on the building's exterior, a technique that had been employed slightly earlier by SOM in the Alcoa Building (1968) in San Francisco, although there to provide stability against seismic disturbances, not wind pressure. The cross bracing at the John Hancock Center became the building's decoration, its exoskeleton exploited in a very sculptural manner.

The Sears Tower (1974) in Chicago was for many years the tallest building in the world at 1,454 feet. The black aluminum sheathing and dark smoked glass, without the benefit of even the smallest degree of sculptural articulation, exhibits coldness and a lack of human scale or interaction. Still, the general aesthetic of both the Sears Tower and the John Hancock Center can be best understood within the context of contemporary minimalist sculpture and viewed as a continuation of SOM's exploration of Miesian ideals.

While the firm's skyscraper commissions progressively increased in the 1960s and 1970s, other types of projects also came its way, most significantly the campus design and buildings for the United States Air Force Academy (1962) in Colorado Springs. The school's Cadet Chapel offered SOM a rare opportunity to design a religious structure, and Netsch responded with a unique approach, constructing three chapels (one Protestant, one Jewish, and one Catholic, each of a varying aesthetic) under one roof. Certainly one of the most expressionistic and symbolic of SOM's works, the outward appearance abstractly references forms associated with aircraft and flying. Shortly after this commission, SOM began working on another campus plan, this time for the University of Illinois at Chicago Center (1965).

The firm was not restricted to skyscraper or campus planning projects. Indeed, SOM's work spanned the entire range of architectural forms. Some of its key designs include the technically sophisticated McMath Solar Telescope at Kitt Peak (1962) in Tucson, Arizona, where a cooled mixture of glycol and water circulates through a specially designed "skin" that absorbs the sun's rays and prevents the generation of disruptive thermal currents on the telescope's surface. The environmentally conscious Weyerhaeuser Headquarters (1971) in Tacoma, Washington, with its five long horizontal ivy-covered terraces, contains the same amount of square footage as a 35-story skyscraper, approximately 354,000 square feet. The Haj Terminal (1982) in Jeddah, Saudi Arabia, was designed using a Teflon-coated fiberglass membrane in forms that references the tents set up by the million-plus pilgrims passing through the airport during the yearly pilgrimage to Mecca. Bunshaft's three-story concrete Hirschhorn Museum and Sculpture Garden (1974) in Washington, D.C., devoted to housing modern art, appears as a modernist's response to Frank Lloyd Wright's Guggenheim Museum in New York, lifted up on massive *pilotis* as per the Le Corbusier model.

It is important to note that the firm's three founders actually designed few of SOM's hallmark buildings. They developed and led an architectural firm modeled on a corporate organization. Branch offices were opened in a number of cities with design principals in charge of each office. Instead of the more typical hierarchical arrangement of power, authority within SOM was arranged in a linear fashion, as each office head theoretically had equal voice in how the firm was run. A stipulation in the founding partners' agreement required retirement at age 65 for each principal, thus prompting a constant renewal of the firm's direction and focus.

With such an arrangement, it is not surprising that SOM's designs exhibit a good deal of diversity and quality, particularly during the 1970s and beyond. The firm grew to an immense size in terms of both employees and offices. In addition to the original Chicago and New York offices, a San Francisco office was opened in 1946 when the firm took on the design of Subic Bay Naval Base in the Philippines and the Monterey Naval Postgraduate School. In 1967, the Washington, D.C., office was established to handle the firm's work on the master plan of the Washington Mall. Other new offices were established in Los Angeles and Miami. Not all the new offices survived, however, as the firm constantly reacted to changing economic and building trends. Those offices founded in Denver, Portland, and Boston were eventually closed in 1987, Houston's closed in 1988, and new offices were opened in the late 1980s in London and Hong Kong, as construction boomed in those areas.

Netsch once bitingly complained that SOM in the 1980s was producing "Reagan architecture for Reagan times." The rejuvenation of design that the founding partners had intended thus did not always come to pass. In fact, once SOM had reached its pinnacle in the early 1970s with the visually satisfying John Hancock Center and the record-breaking height of the Sears Tower, the firm had the luxury of essentially sitting back and waiting for clients to come forward. Still, several fine structures were designed by SOM in the 1980s, including Bunshaft's post-modern National Commercial Bank (1984) in Jeddah, Saudi Arabia, and the United Gulf Bank (1987) in Manama, Bahrain.

Because of its huge size and ability to provide numerous services ranging from interiors to transportation planning, corporate SOM could easily service clients' needs and provide one-stop shopping. The size of the firm particularly suited the requirements of developers in the 1980s, as the focus moved from single high-rise structures to large-scale complex city developments, such as Rowes Wharf (1987) in Boston, World Wide Plaza (1989) in New York, and Canary Wharf (1991) in London. This trend continued into the 1990s, except that the location for building more often than not was in the Pacific Rim. Among SOM's more recent projects are the 88-story Jin Mao Tower (1998) in Shanghai and the Korea World Trade Center (1999) in Seoul. The firm also won a competition to design a master plan for Saigon South, a new community designed for one million inhabitants south of Ho Chi Minh City, Vietnam.

VALERIE S. GRASH

See also **Bunshaft, Gordon (United States); Corbusier, Le (Jeanneret, Charles-Édouard) (France); Glass; Glass Skyscraper (1920–21); Guggenheim Museum, New York City; Haj Terminal, Jeddah Airport; International Style; International Style Exhibition, New York (1932); Lever House, New York City; Mies van der Rohe, Ludwig (Germany); Sears Tower, Chicago; U.S. Air Force Chapel, Colorado Springs**

Biographies

Louis Skidmore

Born in Lawrenceburg, Indiana, 8 April 1897. Graduated from Bradley Polytechnic Institute (now Bradley University), Peoria, Illinois 1917; studied at the Massachusetts

Institute of Technology, Cambridge 1921–24; bachelor's degree in architecture 1924; visiting scholar, American Academy, Rome 1927. Worked for Maginnius and Walsh, Chicago 1924–26; chief of design and assistant to the general manager, Century of Progress Exposition, Chicago 1929–35. President, New York Building Congress; chairman, advisory council of the School of Architecture, Princeton, New Jersey; consultant architect to the United Nations, New York; consultant architect, University of Michigan, Ann Arbor; fellow, American Institute of Architects. Awarded Gold Medal, American Institute of Architects 1957. Died in Winter Haven, Florida, 27 September 1962.

Nathaniel A.Owings

Born in Indianapolis, Indiana, 5 February 1903. Studied at the University of Illinois, Urbana 1921–22; attended Cornell University 1927. Chairman, Chicago Planning Commission 1948–51; vice-chairman, California Highway Scenic Roads Commission 1964–67; chairman, Temporary Commission on the Design of Pennsylvania Avenue, Washington, D.C. 1964–73; member, 1966–70, and chairman, 1970–72, United States Secretary of the Interior's Advisory Board on the National Parks, Historic Sites, Buildings, and Monuments, Washington, D.C.; chairman, Urban Design Concept Team for the United States Interstate Highway System 1967–70; member, Permanent Commission on the Design of Pennsylvania Avenue 1973–82; trustee, American Academy, Rome; fellow, American Institute of Architects. Awarded Gold Medal, American Institute of Architects 1983. Died in Santa Fe, New Mexico, 13 June 1984.

John O.Merrill

Born in St. Paul, Minnesota, 10 August 1896. Attended the University of Wisconsin, Madison 1914–16; studied at the Massachusetts Institute of Technology, Cambridge 1919–21; bachelor's degree in architecture 1921. Worked for Granger and Bollenbacher, Chicago; chief architect for the Midwest States, United States Housing Administration 1939. Director, Chicago Building Code Revision Commission 1947–49; fellow, American Institute of Architects; president, Chicago chapter, American Institute of Architects. Died in Chicago, 13 June 1975.

Skidmore, Owings and Merrill

Established as Skidmore and Owings in Chicago 1936; New York office opened 1937; became Skidmore, Owings and Merrill in 1939; branch offices in San Francisco, Los Angeles, Washington, D.C., Miami, London, and Hong Kong; the firm continues today under the same name.

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Crown Zellerbach Corporation Headquarters, San Francisco, 1959

Union Carbide Building, New York, 1960
Chase Manhattan Bank, New York, 1961
United States Air Force Academy, Colorado Springs, 1962
McMath Solar Telescope, Kitt Peak, Tucson, Arizona, 1962
University of Illinois, Chicago Circle, 1965
Alcoa Building, San Francisco, 1968
John Hancock Center, Chicago, 1970
Weyerhaeuser Headquarters, Tacoma, Washington, 1971
Sears Tower, Chicago, 1974
Hirshhorn Museum and Sculpture Garden, Smithsonian Institution, Washington, D.C., 1974
Haj Terminal, King Abdul Aziz International Airport, Jeddah, Saudi Arabia, 1982
National Commercial Bank, Jeddah, 1984
United Gulf Bank, Manama, Bahrain, 1987
Rowes Wharf Multi-Purpose Complex, Boston, 1987
World Wide Plaza, New York, 1989
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Jin Mao Tower, Shanghai, 1998
Korea World Trade Center, Seoul, 1999

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SKYSCRAPER

As the archetypal urban commercial building, the 20th-century skyscraper exhibited continual structural innovation and stylistic exploration. Historicism and eclecticism moved in and out of fashion throughout the century, interspersed with periods of a new "modern" aesthetic that exploited the pure form created by the steel-frame and glass curtain wall. In addition to concerns for ornamentation, constant competition to create taller structures not only demonstrated the desire of patrons and architects to physically outdo one another in creating a landmark structure but also reflected changing economic conditions and building patterns within particular cities. Importantly, not every skyscraper was constructed in an attempt to outdo its neighbor, and not every high-rise building exhibited innovation. Critically successful structures in terms of aesthetics were also not always profitable. Mitigating factors such as material and technical innovation, zoning regulations, economic climate, and the client's purpose for construction affected the skyscraper's success as much as the designer or engineer did.

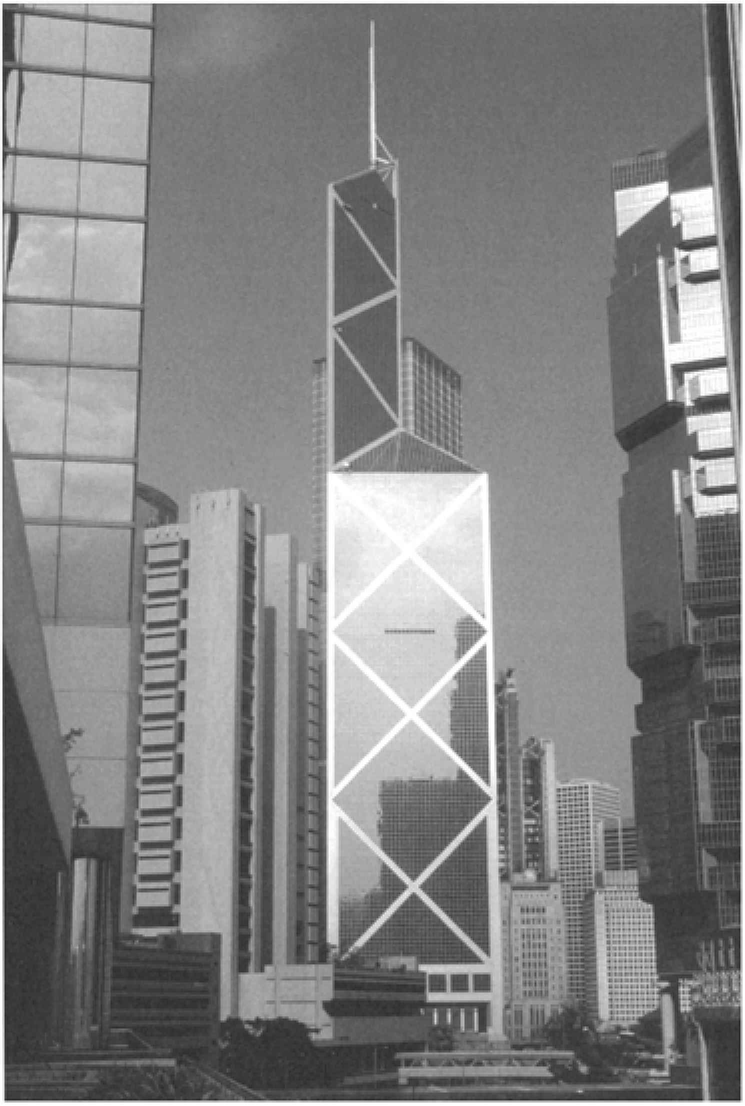
In the 19th century, the earliest high-rise buildings tended to simply be mere enlargements of traditional forms, such as the tower, progressively adding stories and increasing height without adequately addressing the aesthetic of a tall structure. Designers such as Louis Sullivan, John Wellborn Root, and George B. Post eventually tackled this problem, theoretically and in practice, by considering the nature of skyscraper form itself as a new building type. When combined with advances in engineering and materials, the skyscraper thus became not only a monument to modern progress but also a symbolic link to the historical past, a past that the United States lacked and sought to evoke or, perhaps, to distance itself from.

Two perceived "schools" of skyscraper design embodied these purposes. The Chicago School, with its emphasis on structural rationality and economy, personified what was new about skyscraper design in the United States, breaking from historical ornament or form. Speculative commercial construction thrived in Chicago after the devastating fire of 1871 and dictated a simpler, more cost-effective method of exterior articulation as well as making the best use of available land for office space. On the other hand, in New York, corporate commissions had always demanded more ornamentation and more historical references, all in an attempt to present a landmark structure that would elevate and promote its occupants. Businesses such as insurance companies and newspapers employed elaborate styles that not only were self-promoting but also galvanized civic pride.

Although the Chicago School made an indelible impression on many American cities and especially on European modernists, it was the Beaux-Arts-inspired style popular in New York that dominated skyscraper construction as the 20th century dawned. Ironically, the World's Columbian Exposition of 1893 in Chicago, with its gleaming White City image personifying monumentality and strength, prompted this classical interest and, according to Louis Sullivan, set back architectural design by decades. Like the great mercantile princes of the Italian Renaissance, businessmen turned to Beaux-Arts-trained or-inspired architects to construct buildings that, by appropriating a classicized style, implied power and respectability. Not surprisingly, the most popular high-rise design firm at the beginning of the century was D.H.Burnham and Company, founded by the man responsible for the plan of the White City. Its successor firm, Graham, Anderson, Probst and White, continued this domination well into the 1910s.

A typical Beaux-Arts skyscraper consisted of either a simple yet ornamented tower block, such as Burnham's Flatiron Building (1903) in New York, or a basic office block aggrandized with an elaborate tower, such as Ernest Flagg's Singer Building (1908) in New York, with its Second Empire mansard roof that was dramatically lit at night, or Napoleon Le Brun's Metropolitan Life Insurance Company Building (1909) in New York, a direct but much taller copy of the campanile of St. Marco in Venice. Corporate commissions, such as the Singer and Met Life buildings, served as physical advertisements for the companies that commissioned them, even if those businesses occupied only a small amount of office space within each structure. Like the great medieval cathedrals of Europe, competition for prestige led companies to request towering structures that dominated their immediate environment as well as the city as a whole.

Cass Gilbert's Woolworth Building (1913) in New York turned appropriately enough to Gothic style for inspiration, a style that more naturally emphasized verticality. As the company was so decentralized, Woolworth actually used less than two stories of office space; thus, it was not functional need but rather advertising and ego that created this "Cathedral of Commerce," emphasized by the Napoleonic imagery in Woolworth's office and other ornamentation. Individual patrons such as Woolworth were replaced after World War II by corporate entities with far less interest in displaying so personal a building program. Instead, the building material and form more directly referenced the product sold by the company, such as the aluminum curtain walls of Wallace K.Harrison and Max Abramovitz's Alcoa Building (1953) in Pittsburgh and the plate-glass Gothic-inspired



Bank of China Tower, by I.M.Pei, Hong Kong

PPG Place (1984), also in Pittsburgh, by Philip Johnson and John Burgee.

In the first half of the century, two key moments in skyscraper design need to be mentioned. The first was Graham, Anderson, Probst and White's Equitable Building (1915) in New York, not for any innovation but rather for the impact that its massive scale and glut of office space had on New York. It was the stimulus for the famous 1916 zoning ordinance that necessitated setback construction, a requirement that other cities soon adopted and an aesthetic that was endorsed by architects through the 1920s and 1930s in the Art Deco and art moderne styles. The other event was the 1922 Chicago Tribune Building Competition, which brought forth all the design variety and visionary dreams of American and European architects regarding the skyscraper form.

European cities neither desired nor needed skyscrapers in the pre-World War II era; thus, European architects created paper dreams of skyscraper cities. Futurist Antonio Sant' Elia's Città Nuova project (1914) and German Expressionist Bruno Taut's Alpine Architektur (1919) embraced modern technology and materials, albeit in an impractical manner. Greater contributions were to be made later by Ludwig Mies van der Rohe, but his Friedrichstrasse Office Building project (1921) in Berlin revealed a logical conclusion to the Chicago School in design with its honeycomb repetition of office stories and its lack of applied ornament. Even Russian Constructivists, such as the Vesnin Brothers in their Pravada Building project (1924) in Moscow, understood the underlying dictums of decorative purity based on technical form, not historical precedents.

When the *Chicago Tribune* newspaper staged an architectural competition to design "the most beautiful building in the world" for its headquarters, nearly 300 entries from 23 different countries were submitted. Entries ranged from the sublime (Walter Gropius' design revealing both an understanding of the Chicago School's functionality and the asymmetry of De Stijl) to the ridiculous (Adolf Loos' oversize Doric column). The winning entry, by Raymond Hood and John Mead Howells, continued the Gothic revival visible in the Woolworth Building, with the 1485 "Butter Tower" from Rouen Cathedral as a direct design source and flying buttresses used decoratively, not structurally, on the spire. Considering the winning entry, the clients apparently desired established aesthetics, not innovation. However, second-place winner Eliel Saarinen's design turned out to be vastly more influential than Hood and Howells' design, especially among Art Deco and art moderne designers of the 1920s and 1930s who appreciated his ziggurat approach in massing and the unbroken vertical emphasis in the building's line.

Theoretical works by Hugh Ferriss (The Metropolis of Tomorrow, 1929) and Claude Bragdon (The Frozen Fountain, 1932) lauded the setback style as visionary and dynamic, yet in practical application it simply became necessary. Cities such as New York, Los Angeles, Chicago, Pittsburgh, Boston, and others recognized the potential (and, as in the case of the Equitable Building, the very real) damage that out-of-scale skyscrapers caused to neighboring buildings and the business district as a whole. These problems were not limited to blocking light and creating cavernous environs but were related directly to economics, such as devaluating commercial office rental prices by creating an overabundance of office space. Thus, the setback style became an aesthetic reality in large part because of zoning regulations.

Considering the necessity of setbacks, American architects soon adopted and learned from Eliel Saarinen's *Chicago Tribune* design. Even Raymond Hood modified his Gothic decor into a setback style for his American Radiator Building (1924) in New York and eventually moved beyond medievalism in his McGraw-Hill Building (1930), also in New York. Whether "modernizing" forms of Gothic or exploring the stepped-back form and geometric patterns of pre-Columbian architecture, both Art Deco and art moderne were styles created with big business in mind. Visually engaging works, not austere corporate images, drew the public's attention and created landmark buildings. A perfect example of this phenomenon is William Van Alen's Chrysler Building (1930) in New York, with its modernized gargoyles resembling automotive hood ornaments and the great telescoping stainless-steel arches at its spire. The building visually represented the company as advertisement and, as it became the tallest structure in the world at 1048 feet, symbolized the company's strength through its dominance of the New York skyline.

Unfortunately, the Chrysler Building's claim to fame did not last for long, as Shreve, Lamb and Harmon's more restrained Empire State Building (1931) in New York soon outdistanced its competitor at 1250 feet in height. Not a corporate commission but rather a speculative construction, the Empire State Building was far less theatrical than the Chrysler Building. Still, its mere size guaranteed its landmark status. It also displayed an impractical but reverent appreciation for modern air travel, as its spire was fancifully designed to be a mooring dock for dirigibles. This romanticized vision of the skyscraper, in its ornamentation and form, reflected well the giddiness of the jazz age and the economic prosperity of American business, a situation that all too quickly ended in 1929 with the stock market crash and the beginning of the Great Depression.

In the 1930s, new construction of skyscrapers slowed and then virtually halted. Yet, with political upheaval and war brewing in Europe, architects who had only dreamed of skyscrapers arrived in the United States as exiles, including Walter Gropius, Le Corbusier, and Mies van der Rohe. Their theoretical European modernism took root in the architecture schools in which they taught, such as at Harvard University, the Massachusetts Institute of Technology, and the Armour Institute of Technology (later the Illinois Institute of Technology). A full rethinking of the skyscraper began by which its external form became expressive of its internal functions and the structure's form and materials became the ornamentation. The earliest expression of this new aesthetic was George Howe and William Lescaze's Philadelphia Savings Fund Society Building (1932) in Philadelphia, with its elevator core pulled out at the back of the building and its glass curtain wall, steel-framed office tower cantilevered above the entrance block. Traditional materials, such as polished granite, brick, and limestone, were used, but the look was entirely new and not necessarily welcomed by the architectural establishment. Nevertheless, the International Style had taken root and continued to strengthen through midcentury.

Modernism, as preached by Mies van der Rohe, was a reductive architecture with a strong underlying classical sensibility. Mies's maxim "Less is more" personified his belief that pure austere form should serve as all the necessary decoration. His Lake Shore Drive Apartments (1952) in Chicago, although not a commercial but a residential venture, demonstrated his tenets for high-rise construction. The black-painted prefabricated steel-frame and clear-glass windows simply encased the interior space without expressing internal function. There is no projecting cornice, no grand entrance, and no elements characteristic of the typical tripartite skyscraper design. He would repeat this formula in the corporate Seagram Building (1958) in New York, done with Philip Johnson, and in numerous commercial, residential, educational, and other high-rise designs.

Designers who came in contact with Mies, affected by his commanding personality and strength of convictions, embraced his tenets and adopted them in their own interpretations of the Miesian glass box. For example, Eero Saarinen's CBS Building (1965) in New York took a more sculptural approach to modernism, as the vertical granite piers projected out from the wall surface and all sense of human reference in scale was denied through the building's abstraction. The structure startlingly isolated itself from its environment yet worked well as pure design. However, not all designers were as talented as Saarinen was, and in the 1950s, 1960s, and 1970s, cities, towns, and college campuses were polluted with poorly constructed and downright ugly Miesian copies gone awry.

The most successful Miesian-inspired firm was Skidmore, Owings and Merrill. Their early masterpiece, Lever House (1952) in New York, designed by Gordon Bunshaft, celebrated light and openness, revealing a significant influence of Le Corbusier as well, with the *pilotis,* or stilts, raising the main office tower off the humanly oriented space below. Eventually, the firm developed a more sculptural version of Miesian-inspired modernism, as visible in the John Hancock Building (1970) in Chicago, with its structural yet decorative external cross bracing and tapered form.

Their next major commission, the unsatisfying Sears Building (1974) in Chicago, fell victim to the ever-present corporate need to construct physically dominating, out-of-scale skyscrapers. At 1454 feet and 110 stories, the Sears Building became the tallest building in the world, yet its bundled setbacks, when combined with the Miesian aesthetic, resulted in a very bland structure. Minoru Yamasaki's 1350-foot-tall World Trade Center (1976) in New York had no more success, as its twin towers (which thankfully played off each other) appeared ready to capsize Manhattan, perched as they were on the edge of the island. Cesar Pelli's Petrona Towers (1998) in Kuala Lumpur, at 1483 feet, finally topped the massive heights attained by both these structures.

Not all architects or critics appreciated the International Style and modernism as preached by architects such as Mies van der Rohe and Skidmore, Owings and Merrill. The International Style could be, just as the term implied, a form used in any location because it had no cultural or historical ornamentation that would affect its contextual use. Frank Lloyd Wright in particular railed against "soulless" architecture that neglected cultural context or interaction with its direct urban environment. Concerned as he was for "small-town" development, Wright rarely attempted skyscraper design, and when he did, it was usually undersized, such as the 15-story Price Tower (1955) in Bartlesville, Oklahoma. Only once did Wright attempt the stratospheric proportions popular with corporate patrons: his 1956 project for a Mile High Skyscraper for Chicago, a soaring structure that was as impractical then as it is today. In his scheme, the skyscraper was not placed in competition with other high-rise buildings in an urban environment; rather, it rose isolated in the countryside. Ironically, Wright's vision of the dominance of suburban America was to become a reality as people increasingly migrated from the city center to suburban developments in the post-World War II era.

Business interests moved with them. Increasingly, corporate headquarters took the form of low, sprawling structures with green lawns and miles of employee parking lots. The trademark corporate skyscraper was increasingly becoming a thing of the past, yet those that did stay and built in the cities understood the need to contextualize their presence. Thus, the stark, crisp modernism of Hugh Stubbins Associates' Citicorp Center (1978) in New York and I.M.Pei and Henry Cobb's John Hancock Tower (1975) in

Boston increasingly battled a Postmodernism aesthetic that reintroduced historicism and context. Plazas, gardens, and other public spaces became an important aspect of the design, as much as the buildings' materials, ornamentation, and form.

Begun in 1978, many consider Johnson and Burgee's AT&T Building (1984) in New York the first Postmodern skyscraper, with its broken pediment (Chippendale-like) top and emphasis on its pink-granite stone walls. The reintroduction of rich, colorful materials as well as the appropriation of a wide variety of historical forms characterized Postmodern design. It could be playful and fun, such as Michael Graves's Portland Building (1982) in Portland, Oregon, with its miniature Acropolis on top, demonstrating not only the abstract way in which history could be referenced but also the new emphasis on the skyscraper top lost during the modernist years. Postmodernism could also be elegant and austere, as represented by the work of Kohn Pedersen Fox, arguably the most successful skyscraper design firm of the late 1970s, 1980s, and 1990s. Their 333 Wacker Drive (1983) in Chicago responded to its site and surrounding environs with its curving green-glass curtain wall and specific design elements that alluded to nearby landmarks.

By attempting to integrate their buildings firmly into the urban environment, Postmodern architects brought back an appreciation for historicism and traditional materials that modernists had rejected in favor of pursuing pure form and modern materials. Both "schools" continued to exist at the end of the century and adapted to changing client needs, particularly in the 1980s, when skyscrapers increasingly became part of larger urban development plans with a wide variety of buildings clustered together. This usage differed from the traditional isolating nature of the skyscraper, which, whether corporate commission or speculative investment, had historically been multiuse structures themselves. They not only provided company headquarters but also housed financial institutions, retail establishments, offices for professionals, and residential units. Now those roles were being delegated to individual components within the greater complex.

The slanted focus on American skyscrapers during the 20th century accurately reflects where the most significant construction and designs were occurring, a situation that did change during the century's final two decades. Thriving economic markets in oil-rich Middle Eastern countries in the 1980s and in Pacific Rim countries during the 1990s led to a boom market in high-rise construction in those areas. Europe additionally presented increasing skyscraper opportunities for builders, particularly in Germany and other former Soviet-bloc countries after the collapse of the Berlin Wall and the USSR. Still, clients in these countries turned primarily to American architectural firms such as Skidmore, Owings and Merrill (National Commercial Bank, 1984, Jeddah, Saudi Arabia), I.M.Pei (Bank of China Tower, 1989, Hong Kong), Kohn Pedersen Fox (Westendstrasse 1/DB Bank Headquarters, 1993, Frankfurt), and Cesar Pelli.

It can be argued that in the 20th century, architects explored the full range of aesthetic, stylistic, material, and structural possibilities for the skyscraper form. The design tastes and innovations that dominated the earliest high-rise buildings in the 19th century either mutated into various expressions of historicism or evolved into pure form with the aid of European modernists. However, understanding these factors provides only a fraction of the skyscraper story. More specific studies of the economic and business climates of individual cities, particularly beyond Chicago and New York, and how that affected skyscraper design and construction have yet to be undertaken.

VALERIE S.GRASH

Further Reading

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SMITH, CHLOETHIEL WOODARD 1910–92

Architect and urban planner, United States

In her designs, Chloethiel Woodard Smith strove to combine functionalism and aesthetics. Her concerns with "quality over quantity" and "improving the collective neglect," as she described her goals, were strongly influenced by Lewis Mumford and her work for the Federal Housing Administration (FHA). Smith met Mumford during her undergraduate studies and corresponded with him until his 1990 death. After completing her M.Arch. in 1933, Smith spent two years working for different architectural firms before accepting the position as chief of research at the FHA in 1935. She worked for that organization until 1939. Consequently, she spent most of her career in Washington, D.C., and was a significant force in shaping the American capitol in the 1950s and 1960s.

Her projects in Washington include the E Street Expressway, office buildings, and residential communities. Smith managed the unequaled feat of securing commissions from three different developers to build three of the four office buildings at a prominent intersection in a major American city: the corner of Connecticut Avenue and L Street in Washington, D.C. Although they are competent modernist designs, the three corporate structures at Chloethiel's corner, as it is affectionately known, do not reflect Smith's best work. Her most inspired designs and those for which she is best known are her residential communities. Among these are two that helped to revive southwest Washington: Capitol Park and Harbour Square.

Both Capitol Park and Harbour Square reflect Smith's determination to "add something more" to the urban environment through the use of varied designs, landscaping, control of automobile traffic, and providing support facilities instead of adhering to stylistic dogma. In Capitol Park (1965–67), designed in partnership with Nicholas Satterlee, Smith characteristically relied on landscaping and miniparks to connect the different building types to one another and their surroundings. The changes of scale within both the landscaping and the structures—five Le Corbusian high-rise apartment buildings and wood-framed townhouses—provide diversity within unity. To further avoid monotony, the facades of the high-rises are varied, and the exteriors of the townhouses are painted in different pastel colors. In order to accommodate the different types of housing, streets are not laid out along a grid pattern. They are arranged to allow easy access to the housing. The automobile is accommodated yet does not determine the plan. Smith also provided quality-of-life facilities, such as laundries and swimming pools. A 1964 promotional brochure for Capitol Park described it as "The New Town in the City." "New Town" was the phrase that Smith preferred for her urban-renewal projects such as Capitol Park.

Therefore, "New Town" was applied also to the 1966 Harbour Square development by Chloethiel Woodard Smith and Associates. Although similar support services were included, at Harbour Square Smith's approach to the integration of contemporary and traditional forms was different from the one she utilized in Capitol Park. Seven historic houses from the 1770s were incorporated into a row of new townhouses. These are balanced by high-rise apartment blocks. Smith placed all the new buildings on the ground to relate them to the historic structures. Automobiles are not allowed into Harbour Square, although access to the underground parking is convenient. Variety is provided through the use of different building types, courtyards, and landscaping. In Harbour Square, Smith again made the new development compatible with its surroundings by respecting the historic fabric and strategic landscaping.

Smith's innovative approach to the use of historic forms, her insistence that support services be included, and the automobile corralled contributed to the success of LaClede Township (1966–67) in St. Louis. In this federal housing project, two-and three-story wood-frame houses are arranged along streets accentuated by traffic circles. Although Smith was strongly criticized for designing a housing project closely resembling the clutter of buildings that had been cleared for it, LaClede Town was truly an urban-renewal project, unlike Capitol Park and Harbour Square, which were urban-removal projects. LaClede demonstrates Smith's belief it is possible to provide affordable, quality, and pleasing housing despite the residents' income levels. As such, LaClede stands in direct contrast to the purely modernist design of another St. Louis housing project, Pruitt Igoe, by Minoru Yamasaki, which was completed in 1954 and demolished in 1972. Furthermore, in her reliance on traditional housing forms at LaClede, Smith was anticipating such New Urbanist towns as Seaside and Celebration, albeit for completely different residents. She understood that well-designed and well-built homes, support facilities such as the delicatessen, art gallery, and controversial pub, and links to the surrounding areas are more capable than high mortgages of instilling community pride. At LaClede, Smith strongly demonstrated well-designed public housing could provide a positive environment while meeting government regulations.

Smith's belief that good design resulted from many factors and not simple adherence to stylistic dogma manifested itself early in her career. For example, in 1939 she organized the exhibition "Washington, The Planned City without a Plan," in which she criticized the Washington Planning Commission for continuing to follow the L'Enfant and McMillan plans. She advocated that these plans were outdated and unable to meet the needs of a modern city. Her criticism was so shocking that the Washington chapter of the American Institute of Architects (AIA) Retracted its sponsorship. Less problematic were her articles about the spread of the International Style to South America. Instead of belittling South American architects for importing the European style, she discussed the positive aspects of South American modernism within its sociopolitical context.

These articles constitute one aspect of her international career. Although the majority of Smith's career was spent in Washington, she also lived and worked in Canada and Bolivia. Her familiarity with South America and her responsiveness to local conditions were instrumental in securing the commission for the American Embassy Chancery and Residence (1959) in Asuncion, Paraguay.

Smith's international projects were well received, but her most critically acclaimed work was in the United States. She included the American Embassy in Paraguay and Capitol Park among her most successful designs and surprisingly did not list LaClede Town. It is difficult to understand by what criteria an architect judges her own work. As early as 1960, Smith's colleagues gave their approval by electing her a fellow to the AIA.

Her colleagues were expressing their confidence in her unflinching commitment to good architecture and urban planning. They would not be disappointed. In 1960, Smith was slightly past the midpoint of her 49-year career, and her best work was yet to come.

LORETTA LORANCE

Biography

Born 2 February 1910 in Peoria, Illinois. B.Arch. with honors, University of Oregon, Eugene, 1932; M.Arch. in City Planning, Washington University, St. Louis, Missouri, 1933. Worked for architectural firms in New York, Seattle, and Portland, Oregon, 1933–35; chief of research and planning, Federal Housing Administration, Washington, D.C., 1935–39; organized exhibition "City for Living" in Montreal 1940–41; wrote articles, consulted, taught at University of San Andres, La Paz, Bolivia, 1942–45; received Guggenheim Fellowship to study modern architecture in South America, 1944; partner in Smith, Keyes, Sattelee and Lethbridge, Washington, D.C., 1951–56; partner in Satterlee and Smith, Washington, D.C., 1956–63; principal of Chloethiel Woodard Smith and Associates, Washington, D.C., 1963–82. Elected a fellow to the American Institute of Architects, 1960. Died in Washington, D.C., 1992.

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SMITHSON, PETER, (1923–) AND SMITHSON, ALISON, (1928–93)

Architecture firm, England

Alison and Peter Smithson were, until 1993, principals of their own London-based architectural practice and together were responsible for some of the most influential writings and buildings in 20th-century British architecture. Their work is characterized by the breadth of their projects, which range from city planning to furniture design. Their involvement with the Pop art movement in 1950s London and, later, as cofounders of the influential Team X group that grew out of the Congrès Internationaux d'Architecture Moderne (CIAM), established their place within modern postwar architecture in Britain.

The firm built their early reputation on a winning competition design, the Hunstanton School (1954) in Norfolk, inspired by the early Chicago School buildings of Mies van der Rohe. This rectilinear pavilion in brick, steel, and glass became the first built landmark of a new movement known as the New Brutalism (or simply Brutalism) in England. The Economist Building (actually three buildings around a raised plaza built in concrete but faced in Portland stone) followed in London in 1964. The Smithsons then designed two buildings in disparate settings: student accommodations for St. Hilda's College, Oxford (1970), in essence a scaled-down version of one of the earlier Economist "towers" but sensitively contextualized, and the housing at Robin Hood Gardens (1970), sandwiched between highways in the east end of London and itself a fragment of their influential competition project for Golden Lane (1952).

A number of competition entries from the early 1950s established the Smithsons among a new avant-garde of architects eager to transcend the limits of the International Style without betraying the rationality and rigor of modernist principles. The Smithsons's solution was radical although contradictory: on the one hand, their work made reference to anthropological patterns of human association and settlement, and on the other, advocated the embrace of new industrial technologies.

The Smithsons' involvement with a movement of British Pop artists known as the Independent Group at the Institute of Contemporary Arts (ICA) provided an opportunity to present their work to an audience of avant-garde artists, curators, critics, theorists, and other architects. The multimedia exhibitions "A Parallel of Life and Art" (ICA, 1953) and "This is Tomorrow" (Whitechapel Gallery, 1956) included the Smithsons' work. The latter included a primitive hut surrounded by a sand-covered protected territory, accompanied by a symbolic collection of relics, or "found objects"—reminders of human activity as well as machine-age technologies. The concept of the house as the focus of post-war domesticity and commodity fetishism provided the theme for the Smithsons' "House of the Future" entry constructed for the Ideal Homes Exhibition in London (1956). The Smithsons organic styling and built-in furniture, using molded plastic and fiberglass construction, produced a startling contrast to the traditional brick-and-timber palette of the prevailing residential architecture.

Other projects diverted from the individualism of the home to consider large-scale movement patterns in city centers. Like Golden Lane, the Smithsons' project for the Sheffield University competition (1953) used pedestrian circulation as its major ordering device. This strategy was extrapolated in the Berlin Haupstadt competition (1958), in which an elevated pedestrian network bridges the existing roadways. This project represented the desire to imagine a new scale of urban architecture, one more suited to the increased speed of movement and the loss of engagement between inhabitants and their immediate surroundings. These goals dovetailed with the work and concerns of

Team X, a group that included other European architects such as Ralph Erskine, Giancarlo di Carlo, and Aldo van Eyck. As editor of the *Team X Primer* (published initially in *Architectural Design* in 1962), Alison Smithson articulated statements of theory alongside diagrams and drawings of architectural projects that analyzed the crucial nature of architectural context and the continuity of historic living patterns. Nonetheless, the *Primer* illustrates proposals, such as the London Roads Study (1959), that appear to disregard existing buildings and topographies.

By the 1970s, a shift in the Smithsons's work acknowledged these earlier contradictions, most clearly manifest in the campus buildings at the University of Bath. The Smithsons defined the Bath architecture as Team X structures—through what they termed "mat-building"—with blocks arranged along a raised pedestrian deck above a ground-level service road. The inherent incompleteness of this extendable structure provided a challenge to the Smithsons's sensibility, demanding that they create at least a suggestion of stability and closure to an otherwise infinite system. The Bath buildings presented new themes not previously seen in their built work: the notion of "conglomerate ordering," referring to volumetric masses wrapped in a unifying skin; the building as "climate register," expressing its relation to the external environment; the concern for the sensory pleasure to be gained from concrete materials; and the sensitivity to inhabitation, making the building exquisitely appropriate to its function. All these notions find built expression, having been briefly outlined in their earlier writings, and thus, the Bath buildings represent a culmination of a long career of challenging and thoughtful practice.

JONATHAN A.HALE

S*ee also* **Brutalism; Team X (Netherlands)**

Hunstanton Secondary School (1954), Norfolk, England. Designed by Peter and Alison Smithson.

Biographies

Peter Smithson
Born in Stockton-on-Tees, County Durham, England, 18 September 1923. Attended the University of Durham School of Architecture 1939–42 and 1945–47; studied at the University of Durham Department of Town Planning 1946–48; attended the Royal Academy Schools, London 1948. Married Alison Gill 1949:3 children. Served in the British Army, India and Burma 1943–45. Temporary technical assistant, London County Council Architects Department 1949–50. Lecturer, Architectural Association, London. Founder and member, Independent Group, Institute of Contemporary Arts; associated with Team X.

Alison Smithson
Born Alison Margaret Gill in Sheffield, England, 22 June 1928. Studied at the University of Durham School of Architecture 1944–49. Married Peter Smithson 1949:3 children. Temporary technical assistant, London County Council Architects Department 1949–50. Lecturer, Architectural Association, London. Founder and member, Independent Group, Institute of Contemporary Arts; associated with Team X. Died in London, 16 August 1993.

Peter and Alison Smithson
Met in the University of Durham; established a partnership in London 1950.

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SOCIAL SECURITY COMPLEX, ISTANBUL

Designed by Sedad Hakkí Eldem; completed 1970 Istanbul, Turkey

The Social Security Complex, in the historic Zeyrek district of Istanbul, was commissioned by the Turkish Social Security Agency (Sosyal Sigortalar Kurumu, hereafter SSK), which is the public health care and retirement office for blue-collar workers. Rental offices and stores made up the bulk of the initial proposal, which also comprised a health clinic, a bank, and a restaurant in addition to a cafeteria and an unbuilt coffee kiosk. After winning an Aga Khan Award for Architecture in 1986, the complex gained international recognition as well.

Designed and built between 1962 and 1970 by Sedad Hakkí Eldem, the significance of the project comes primarily from its being, as stated in the Aga Khan jury report, one of the first examples of contextualist architecture, which combines local architectural and urban forms with the universal norms of modern architecture. It was an attempt for a synthesis of traditional Turkish architecture and modern materials and techniques without jeopardizing the requirements of a modern office building.

When the competition for the SSK was held in 1962, the monolithic, glass-sheathed block of the International Style was becoming susceptible to criticism because of its homogenizing qualities. Accordingly, quests for locally and contextually sensitive architectures were under way both in Turkey and elsewhere in the West. It should suffice to remember the "vernacular" shift that occurred in the work of someone such as Le Corbusier, who had earlier been a proponent of a universal machine civilization. Likewise, by the 1960s, especially in Italy, the potential contribution of the past to architectural production was being extensively meditated on by Franco Albini, Ignazio

Gardella, and the BBPR, among others. Typological and morphological studies were also being undertaken on different urban sites, the pioneer of which was the work of Saverio Muratori on Venice.

In Turkey as well, typological studies of traditional residential architecture had already begun under the supervision of Eldem and a few others at the Academy of Fine Arts in Istanbul. Those researches would have intermittent but considerable impact on Turkish architecture. Eldem, while displaying different architectural tendencies during his remarkably long career, nevertheless maintained a lifelong interest in traditional architecture. In the 1960s, he was, together with Turgut Cansever, among the notable Turkish architects who were thinking on history and locale in relation to architecture.

The SSK project, instead of concentrating in one singular block, diffused the program to smaller units that are articulated around courtyards, streets, and bypasses. Its models are the traditional Ottoman *külliye*—mostly religious complexes in which different functions are fulfilled by separate buildings organized around open spaces—and the traditional urban residential pattern of Istanbul displayed by the very district where it was placed.

With its wooden houses, small mosques, *medreses,* and tombs, in addition to the Byzantine church of Pantocrator and the Roman aqueduct, the traditional organic fabric of the Zeyrek area had already been dented by the opening of Atatürk Boulevard, which cut through the district and was quickly flanked by concrete high-rises. By constituting an environmentally sensitive model, one of the objectives of the SSK project was to resist land speculation, which was threatening the destruction of the area. Given the threat that such historic areas are under in developing countries, that consciousness raising about Zeyrek's value is a crucial contribution of the SSK.

Situated on a steep triangular lot between Atatürk Boulevard and the Zeyrek slope, the complex aimed to harmonize with its physical context and topography. On the north, it responded to the organic urban tissue of Zeyrek, which reproduced the fragmentary form and the modest scale of its wooden houses. The southeastern facade, with its tall, cascading masses, was in accord with the high-rises of Atatürk Boulevard. At the northeastern tip of the lot, where the unrealized coffee kiosk would have been built, the boulevard is connected to the cobblestone slope by a skillful arrangement of steps that lead to a small square at the adjacent higher level. This small plaza, which utilizes an existing fountain, marks the end of an "inner street" that traverses the whole complex.

The project consists of blocks of different sizes, heights, and functions that are arranged around the two-level "inner street" running parallel to the boulevard. Each of the modular units, connected at lower levels and separate at the top—from the southwestern office-and-store block to the central bank-and-restaurant and clinic blocks to the northeastern cafeteria-and-store unit—displays its architect's lifelong interest in the traditional "Turkish house."

Based on solid lower levels, as in traditional residential architecture, and gradually projecting toward the top, the blocks repeat the same facade elements: rows of vertical windows modulated by short concrete pilasters (a characteristic of Eldem's architecture) and below them tile in-fill panels emphatically distinguished from the reinforced-concrete skeleton of the building. As in his other projects, Eldem, here as well, succeeds in lending the lightweight, slender appearance of timber, which is part of the image of traditional architecture, to his reinforced-concrete building. Likewise, he reconciles the flat-roof requirement of the brief with his interest in traditional forms by creating a historical expression through the wrapping of the roofs with large eaves.

The end product is a geometrically disciplined modern interpretation of tradition. In Atilla Yücel's words, "[The SSK] stands in between the spatial morphology of a spontaneously grown historic Istanbul quarter and the rigid architectonic discipline of an August Perret classicism."

Social Security Complex, Istanbul, designed by Sedad Hakki Eldem (1970)

Photo by Mustafa Pehlivanoglu © Aga Khan Award for Architecture

The SSK stands out also within the oeuvre of its architect, who often reflects the results of his typological studies at the university in his architectural work. The "Turkish house" to which Eldem's architecture alludes is often seen as an idealized type based on the upper-class mansions of Istanbul and one that stands by itself, indifferent to its surroundings. At the SSK, as noted by Sibel Bozdogan, Eldem, for the first time, transcends the freestanding object and goes beyond building typology "into the realm of urban morphology."

Although the SSK had considerable influence on later Turkish architecture (as displayed by the Ziraat Bankasi in Bakirköy, among others), in time the context—the traditional urban tissue—with which the building tried to establish a dialogue disappeared, leaving the initial intentions of the architect irretrievably undercut. The original design was further weakened by the changes in the initial functions of the blocks and the conversion of the large part of the circulation spaces and stores into storages for a firm that rented the building.

BELGIN TURAN

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SOLAR ARCHITECTURE

The technique of passive solar design—the direct use of solar energy to provide heat and light in buildings—has a long history in building design. Its evolution during the 20th century began as a reaction to what Reyner Banham (1969) subsequently termed "a dark satanic century." Rapid urbanization during the 19th century brought with it polluted, unsanitary, and over-crowded conditions to the large industrial cities of Europe and North America. In England, as epidemics of disease threatened entire urban populations, liberal reformers reacted against a laissez-faire attitude to city development and instead promoted hygiene and sanitation as the founding principles of healthy urban planning.

By the beginning of the 20th century, the bactericidal properties of direct sunlight had been established, and countries such as England and Germany enacted laws ensuring sun rights for all citizens. In England, architects such as Raymond Unwin (1863–1940) began to systematically study solar geometry with the aim of maximizing solar access in and around buildings.

Throughout the 1920s and 1930s, the health benefits of sunlight remained a strong influence in European urban planning and building design. In Germany, large residential complexes, such as Siemenstadt (1929) in Berlin, master planned by Walter Gropius (1883–1969), utilized the *Zeilenbau* (row house) form. This functional and land-efficient arrangement, influenced by the spirit of the *Neue Sachlichkeit* (New Objectivity), consisted of high-density apartment blocks running north-south and set at precise distances to maximize the penetration of sunlight from the east and west. The addition of roof terraces or balconies provided further opportunities for occupants to soak up the sun.

During the 1930s, in response to the harsh economic conditions of the interwar period, the emphasis in passive solar design moved away from daylighting alone. Saving fuel, particularly that used for winter heating, became a design priority. By 1933, the Swiss solar community of Neubühl near Zurich consisted of rows of apartments oriented almost directly south with large areas of south-facing glazing to trap winter heat. However, as war loomed in Europe, the most significant developments in solar energy use for home heating occurred in America.

Chicago-based architect George Fred Keck (1895–1980) had recognized the potential of passive solar heating while working on the highly glazed “House of Tomorrow,” built for the 1933 Century of Progress Exposition in Chicago. In 1940, following several years of experimentation with different passive solar configurations, Keck designed a house for Howard Sloan, a Chicago real estate developer. The detached house, situated in Glenview, Illinois, established what was to become the archetypal form of the passive solar house. All the necessary elements of the house—its walls, floors, roofs, and windows—were arranged to maximize the benefits of solar energy in the form of heat and daylight. The rectangular plan of the house was elongated along its eastwest axis and arranged with the fully glazed living spaces facing directly south. Large monopitch roofs overhung the glazing to intercept high-angle summer sun to prevent the house from overheating in summer.

In America, Keck’s designs received wide publicity, and the 1940s saw a growing market for energy-efficient, solar homes. This period also saw significant research and development into passive solar design by a group of engineers at the Massachusetts Institute of Technology who constructed and monitored a series of both passive and active solar homes. Despite these developments, by the 1950s a plentiful supply of cheap fossil fuels diminished economic incentives for solar energy. In both domestic and commercial buildings, mechanical heating, cooling, and ventilation technologies had become widely established, further reducing demand for solar alternatives.

During the 1960s and early 1970s, passive solar design enjoyed a limited rebirth inspired by two fundamental concerns. First, many had begun to question the technological optimism of modernism and the International Style. Architects such as Ralph Erskine (1914–) began to draw on preindustrial and indigenous building techniques as the basis of a climate-specific architecture that was both regionally and culturally appropriate. Second, a more overtly political environmental movement grew critical of the social and environmental effects of industrial capitalism. By the early 1970s, a number of autonomous cooperative communities, such as Arcosanti (1970) in Arizona and The Centre for Alternative Technology (1973) in Wales, had been established. For those environmentalists such as Steve Baer, who chose to live this alternative lifestyle, the development of independent and renewable energy from sources such as the sun was essential. Baer’s own house (1972) in New Mexico consisted of an L-shaped organic cluster of 11 “Zomes” arranged to collect solar energy through large areas of south-facing glazing and then store it as heat within the thermal mass of water-filled drums. At night, large insulated shutters were pulled up over the glass to retain heat.

By the late 1970s, passive solar design was no longer the sole preserve of environmentalists. The oil crisis of 1973 had generated political concerns about the long-term availability of fossil fuels and had resulted in widespread academic research into the use of solar energy. A number of passive solar buildings were constructed on both sides of the Atlantic. During the 1980s, these concerns for energy efficiency were extended to global climate issues under the rubric of sustainability. In Europe, architects such as Renzo Piano and Norman Foster and Partners began to utilize passive solar features in the form of daylight and shading in order to naturally air-condition large-scale buildings. Among many, Norman Foster and Partners’ Commerzbank Headquarters (1997) in

Frankfurt, Germany, successfully utilizes principles of solar design and sustainable architecture.

GRAHAM FARMER

See *also* **Arcosanti, Arizona; Century of Progress Exposition, Chicago (1933); Energy Efficient Design; Environmental Issues; Erskine, Ralph (England); Foster, Norman (England); Gropius, Walter (Germany); Piano, Renzo (Italy); Sustainability and Sustainable Architecture**

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SOLERI, PAOLO 1919

Architect, Italy

Paolo Soleri was born in 1919 in Turin, Italy, where he studied at the Polytechnic, receiving a doctorate in architecture in 1946. From 1947 to 1948, he attended Taliesin West, Frank Lloyd Wright's famous architecture studio. After practicing in southern Italy and Turin in the early 1950s, he emigrated with his wife, Carolyn Woods, to the United States and settled in Arizona. Soleri devoted his life to the research of alternative urban development. His chief interest was in cities as a framework in which to combine human and natural resources and diversity of functions and events. This study moved him to explore a new concept, arcologies, environments that fused architecture and ecology.

His concern for the relationship between human-made objects and the earth is expressed in his early Dome house (1949) designed for Leonora Woods, his future mother-in-law. Located on a hillside at Cave Creek, Arizona, the house had retaining walls that were cast with red boulders and concrete, following Wright's technique. Soleri also explored thermal inertia resulting from a glazed dome above the living room and the excavated areas underground. The dome can be shaded or opened according to the seasons.

In 1951, Soleri moved with his wife to southern Italy and began his explorations in ceramics. His first major building, a workshop for Ceramica Artistica Solimene (1953) in Vietri-sulmare, faces the Mediterranean on the Amalfi coast. It was built on reinforced concrete covered outside with pottery. Here, Soleri anticipates later explorations using materials from the area and relating engineering, site, and handicraft.

After returning to the United States in 1955, Soleri began his project for Cosanti (from the Latin "before things") on a five-acre site in Scottsdale, Arizona. The complex grew according to the needs of the community and the experience gained in construction techniques. Soleri explored here the technique of wash-away silt casting, using it in construction of cast-concrete architectural buildings, wind-bells, sculptures, and models. Cosanti consists of several units related with the site in an organic language of architectural form. The first structure was the Earth House (1956), inmersed in the site after the land was excavated. The ceramic studio (1956) consisted of a structure of ribbed reinforced concrete. Other spaces are the Cosanti Gallery, with a vault formed in a mound; a series of working spaces with solar devices, the piscine and canopy; and the foundation offices (1971). As a comprehensive site, Cosanti provided an array of architectural prototypes. This was Soleri's first experience relating craft, work, ecology, and life in one complex.

Soleri's chief aim was to keep the integrity of both the natural and the urban. He needed a large-scale laboratory to research and develop his model for how to inhabit cities in the future. To demonstrate how to improve urban conditions and to minimize the impact of destructive forces of suburbia on the environment, Soleri started Arcosanti in 1971. Still in the process of construction, Arcosanti is located in Cordon Junction, 70 miles north of Phoenix in the mesa country. Soleri defines Arcosanti as an urban laboratory, an instrument for research meant to accommodate up to 7,000 people. Mostly pedestrian oriented, this prototype arcology project will eventually rise up to 25 stories, covering only 13 acres and leaving open 860 acres.

Arcosanti is composed of a series of public and semipublic areas, private zones, and utilities, most of which rely on passive energy. The East Crescend Complex is considered the essence of arcology, combining living and working spaces. These include the Colly Soleri Music Center (1989), a semipublic area dedicated to studios and diverse types of private housing. Arcosanti also has two greenhouses, gardens, a small vineyard, a field, and an orchard.

Over the last three decades, Arcosanti has been built by thousands of volunteers, all sharing part of Soleri's approach and visionary ideas about the environment. In this setting, workers share a communal way of life based on production of craft, agriculture, and a healthy use and inhabitation of the land. Soleri calls this approach the ethic of the urban and speaks of the culture of the automobile as the instrument of isolation and segmentation. In his view, our cities will require planners not only to change cities physically but also to change the habits and principles of human interaction. Presently, about 70 individuals live and work in Arcosanti. The community hosts a music festival, exhibits, lectures, and seminars. Arcosanti remains, essentially, a laboratory for multiuse architecture based on pedestrian circulation, energy efficiency, and careful solar orientation.

One of Soleri's recurrent themes has been the notion of bridge cities, which were published by the Museum of Modern Art in *The Architecture of Bridges* (1948). A large exhibition of his drawings of bridges and ideas about arcology held at the Corcoran Gallery of Washington in 1970 introduced the public to his notion of miniaturization, concentration, and ecological balance. Soleri has written several books and lectures all over the world.

Although Arcosanti concentrated most of Soleri's energies and efforts, he also designed the University of Arizona Cancer Center Chapel (1986) in Tucson. The interior of the chapel, stylized as a tree, has a multitude of metal wind-bells cascading from the ceiling. He also designed the De Concini residence (1982) in Phoenix and produced urban studies for the development of Scottsdale (1992).

Soleri's experiences in Cosanti and Arcosanti inspired him to develop a meaningful and alternative urban theory. His notion of "evolutionary coherence" in the city argues that urban megastructures share some characteristics with the complex systems of nature. Soleri is critical of the explosive growth of some metropolitan areas, such as Phoenix and Los Angeles. His planning thesis is based on concentration and miniaturization. Soleri has been defined as a visionary architect, urban planner, and process philosopher, and his work and books have advanced a new spirituality of technology, science, habitat, and humankind. His life has been devoted to experimentation in urban planning, architecture, and the applied arts. His idealism and research on the relationship between inhabitation, life, and work constitute his fundamental contribution.

JOSE BERNARDI

S*ee also* **Arconsanti, Arizona**

Biography

Born in Turin, Italy, 21 June 1919; emigrated to the United States 1955. Studied at Turin Polytechnic 1941–46; degree in architecture 1946; fellow, Frank Lloyd Wright Foundation, Taliesin West, Arizona and Taliesin East, Wisconsin 1947–48. In private practice, Turin and Southern Italy 1950–55; president, Cosanti Foundation, Scottsdale, Arizona from 1956; organized the Minds for History series of dialogues and lectures, Arcosanti, Arizona 1989. Distinguished visiting lecturer, Arizona State University College of Architecture, Tempe. Graham Foundation Fellowship 1962; Guggenheim grant 1964 and 1967.

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SOTA, ALEJANDRO DE LA 1913–96

Architect, Spain

Alejandro de la Sota is the maestro of many late 20th-century Spanish architects. On the one hand, he was an influential teacher at the school of architecture in Madrid from 1956 to 1972. On the other, he was a master builder whose projects set an example to be followed by his many disciples. It is unfortunate that his influence did not extend beyond the boundaries of Spain. He was recognized internationally only in the 1980s. Born in the Galician region in the northwestern part of Spain in 1913, he graduated from the school of architecture at the Polytechnic of Madrid in 1941. From 1942 to 1949, he worked for a central government housing and relocation agency, creating a series of rural housing developments for post-civil war Spain. Although the groupings relied on a rational plan and the repetition of forms, he adorned the houses with elements of vernacular architecture. With the exception of this first job, all his subsequent architecture was clearly modernist and characterized by its simplicity, rationalism, and abstract geometry. A follower of the Modern movement, de la Sota's building always seemed understated, although his genius was ever present. De la Sota, who suffered from Parkinson's disease in his final years, died in Madrid in 1996.

In the buildings, projects, and furniture designs of de la Sota, the primary idea is paramount. The final design is the result of a process that eliminates, little by little, extraneous and unrefined aspects. In the end, what is left is pure, concentrated, but also poetic. The generating idea of a project does not always come from the same source. In some cases, it may be the structure, the site, a technological aspect, or a programmatic intention. Functional and technical concerns become the architectural language. The tectonic quality of the building is always present, as de la Sota's works make constant references to the materials of which they are constructed. Each project seems to start fresh from the new situation at hand. Once de la Sota remarked that there is no reason to do the same thing over and over again. He expressed the idea that each project should present a new challenge and a new opportunity for exploration. De la Sota practiced architecture for about 50 years, maintaining an atelier type of approach. His body of work, both built and unbuilt projects, is part of the rich heritage of Spanish architecture of the end of the 20th century.

In 1955, a single-family house was built in Madrid on Doctor Arce Street. The site exerted its influence on the final form. The required setbacks from the property lines encouraged a compact structure on the widest part of the side. The house, on a busy street, looks inward. The windows to the street facade are few and small. The facade toward the garden is the exact opposite, with its large windows creating a transparency between interior and exterior. The entire house is made of brick with uneven surfaces that catch the changing natural light. The plan is simple; the staircase, with its gentle curve, seems to push out the exterior wall of the house, creating a bulge in the facade.

The Civil Government Offices in Tarragona (1957), really the central government building in the province during Franco's regime, shows clearly the architect's evolving vocabulary. The building, for representation, administration, and housing, is the union of three blocks, each used for one purpose: The entrance is pushed underneath the main podium, which itself comprises the main government floors. The top of the podium forms a terrace that dominates the square in front. It also creates a break between the building used for government functions and the official residences located in the cube above. A modular system of 18 by 18 feet is the underlying principle of the composition. The residential cube is exactly three modules by three modules. The clear use of geometry and the play between voids and solids call to mind Le Corbusier and Mies van der Rohe. Terragni's name also surfaces with a comparison made to the Casa del Fascio. The main building material is cut and polished local marble.

The Maravillas Gymnasium (1965) had to respond to a very difficult site with limited financial resources. The narrow, trapezoidal site, about 90 feet wide, has a steep slope of about 36 feet. The solution is one of fitting the building into the void and occupying the entire site. An ingenious structural solution using 60-foot trusses set at right angles to the street span the gymnasium. On the upper level, the 18-foot spaces between the trusses are used for classrooms. Below is the gymnasium, with the benches on one side and light from the windows above flowing into the other. The materials used are few and grant an idea of the thin skin enclosing the space, which becomes lighter and lighter as one goes up. At the lower level, the building faces a busy street and therefore has a rather closed facade at street level with brick. Higher up is glass, which seems to fold back and finally on top, surrounding the play space, is a wire fence.

The Post Office and Telecommunications Building (1984) in Leon, Spain, can be thought of as a functional building employing state-of-the-art technology. It is apparently a simple cube that allows work to be carried out efficiently while admitting that changes in use can occur over time. The structure is simple, and the interior is filled with light. The materials echo the intention of the building. It is clad in Robertson panels and uses glass, stainless steel, and straightforward fixtures.

The projects of de la Sota, from the early works, such as the TABSA Aeronautical Plant (1957) near Madrid, to his final ones, such the University Library (1993) in Santiago de Compostela, although always loyal to modernism, can also be seen as a quest for purity, order, and simplicity.

MARTHA THORNE

S*ee also* **Spain**

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SOUTHEAST ASIA

The architecture of Southeast Asia is characterized by pitched overhanging roofs and elevated floor archetypes. It has developed in political entities with varying cultures and histories. North and South Korea, Singapore, Thailand, and Indochina (Vietnam, Laos, and Cambodia) were all influenced by Confucian, Buddhist, and Taoist traditions, whereas the Philippines incorporated Christian and some Muslim forms, and Malaysia, Brunei, and Indonesia were influenced by Hindu and Islamic architecture.

Colonialism and Western interventions in the 20th century, especially the introduction of modernism, wrought dramatic changes on the built forms of all these countries. The peoples of the area have nevertheless retained traditional cultural styles, sometimes expressed in their architecture. At the beginning of the 21st century, almost as a reflection of the global profusion of information and images, architecture in Southeast Asia has a wide range of pluralistic architectural expressions.

Colonial Architecture

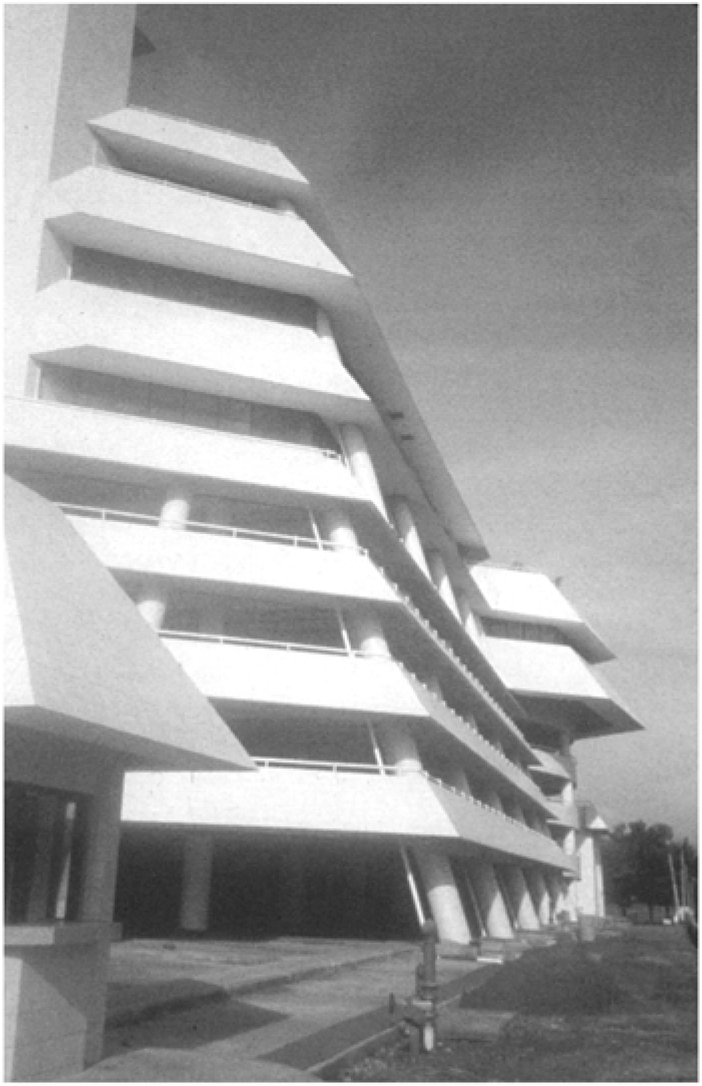
Southeast Asia's colonizers brought different approaches to architecture and urban planning. In Malaysia/Singapore the British presence led to the development of the Indo-Saracenic style that began with Indian architecture, exaggerating it with a baroque overlay. British-run architectural firms sprang up and helped establish this style, including the influential firms of Thompson, McPherson and McNair and Palmer and Turner, who practiced in several countries. Although alternative models were provided by the Malay *kampung,* or village settlement, and by Chinese courtyard houses and shophouses, the British influence prevailed. The 1933 British town plan for Kuala Lumpur established the concept of the "orderly city," reflecting "civilised life," for British colonies worldwide, and Singapore began to expand quickly on this model.

In 18th-century Indonesia, the houses retained their indigenous inward orientation, with courtyards and gardens, but under Dutch Colonial influence were reinterpreted in a mix of Amsterdam architectures. This changed when the Dutch architect Henri Maclaine Pont studied the palace architecture of Java in the 1920s and incorporated climatic and cultural lessons into his own designs, as did architects such as Thomas Karsten and Notodiningrat. Three outstanding examples are the campus of the Institut Technologi Bandung (1920) by Maclaine Pont, Bandung's Government Complex (1925) by J.Gerber, and Karsten's design for the Semarang People's Theatre (1920s).

In Thailand, the only country in the region that was never colonized, the 20th-century kings introduced European design, leading to hybrid styles of architecture. The grand Victorian Government House (*c.* 1905) in Bangkok was built according to drawings by Italian architect Annebale Rigotti in an Italianate classical style mixed with local Oriental features, which became the vogue. Another foreign-influenced work was the Khrom Phra Palace (*c.* 1926) by the French architect Charles Bequelin; later, in the 1960s, the influence of modernist architecture is apparent. However, the critic Udo Kultermann notes: "An important fact to remember is that in Thailand the majority of clients were Thai and the choice of architectural language was theirs," (1986, p. 58).

The French governance of Indochina from 1858 to 1954 included a *mission civilisatrice,* which in its urban design and social planning can still be felt. A great effort was directed at the end of the 19th century toward the master plans and architecture of Phnom Penh, Hanoi, and Haipong. The new settlements were built apart from the traditional city—for example, in Hanoi, the oldest area, the "36 streets quarter," was left largely intact, and the colonial development was put on the other side of the lake.

Early public buildings often imitated those in France: the Opera House (1900) in Hanoi by Eugene Teston was a copy of the Paris Opera, as Saigon's Hotel de Ville (1908) by Fernand Gardes was a copy of the Paris town hall. However, when Ernest Hébard was called to Indochina as the first director of urbanism



Dharmala Sakti Office (1986) in Jakarta, Indonesia, designed by Paul Rudolph

Photo courtesy Paul Rudloph © Aga Khan Award for Architecture in 1921, he studied the region's ancient past and, as Gwendolyn Wright noted, "freely mixed elements from different countries, in order to generate his ideal of an innovative, adaptive aesthetic" (1991, p. 64). This approach is well illustrated by his Ministry of Finance (1927) and the Louis Finot Museum (1931), both in Hanoi.

Spain heavily influenced the Philippines, a Spanish colony since 1521, in its ornate religious architecture. Under American governance after 1898, it was perhaps the first country in Southeast Asia to embrace the International Style and Western planning; its architecture remained imitative of the West. Daniel Burnham's Plan for Manila (1906) and William Parson's Manila Hotel (1912) are good examples. The Manila Post Office (1926) by Juan Arellano recalls Schinkel's Altes Museum in Berlin.

Between the World Wars the colonial powers began to sponsor Modern European architecture rather than the neoclassical indigenous amalgam. As a prelude to modernism, some of the finest Art Deco buildings can be found in Bandung, Indonesia. Examples are the Grand Hotel Preanger (1932) by C.P.Wolff Schoemaker and the "Denis" Gebouw (1935) by A.F.Aalbers. Kallang Airport Terminal (1937) in Singapore by the PWD and the Central Market (1936) in Kuala Lumpur by Y.T.Lee are also Art Deco. However, the aftermath of World War II brought with it the functionalism of the Modern movement and continuing Western cultural domination.

Independence, Nationalism, and Modernity

The nationalist movements brought the need to express freedom from a colonial, foreign-dominated past and, beyond that, even from local traditions. This rupture with the symbolic and visual past was achieved partially through new building types, such as airports, parliament complexes, and state mosques, expressing a national and collective identity. From the late 1950s the International Style and, to some extent, Soviet monumentalism gained adherents.

Local architects began to be influential in Malaysia and Singapore. An early modernist building of note is the Federal Hotel (1957, with a 1969 addition) by Goh Hock Guan. Perhaps the first truly local and most important firm, the Malaysian Architects Co-Partnership (1960–67), was founded by four Chinese British-trained architects who also studied in the United States—William Lim, Chen Voon Fee, Lim Chin See, and Lim Chong Keat. Their modernist works include the Singapore Conference Hall (1965) and the Seramban Mosque (1967). Lim Chong Keat went on to found Jurbina Bertiga (Team 3) and undertook major projects including the tallest structure in Penang, the Komitar Complex, built between 1976–87. Other important first-generation architects include Lai Lok Kun, Ruslan Khalid, and especially Hijjas Kasturi, whose Luth Building (1986) and Lot 10 (1994), a metal-clad shopping center, are good examples of contemporary mainstream architecture in Kuala Lumpur.

Malay architects began to look back to the Malay house with its pitched overhanging roofs for a contemporary Malaysian identity. The earliest examples of this can be found in the Language and Literacy Agency Building (1959) by Y.T. Lee and in the National Museum (1963) by the Singaporean firm Ho Kwong Yew and Sons. Around the same time, Baharuddin Abu Kassim and colleagues of the PWD were forging the expression of a national Islamic identity through architecture as in the National Mosque (1965), a modern building that used a folded concrete-plate parasol roof.

Chinese-Malay architects dominated Malaysian building until the 1970s when indigenous architects, aided by an affirmative action program, began to compete more successfully in the building boom. Newly established government entities such as the Urban Development Authority promoted public-private joint ventures. The 1980s begat a profusion of commercial blocks and mass-housing and tall office buildings, such as the 35-story Dayabumi Office (1984) in Kuala Lumpur, designed by the firms MAA and BEP.

A second generation of Malaysian architects includes Hajeedar, who designed the Subang View Hotel (1980), and Shahroun bin Dato Haroun of Dimensa, whose Condominiums (1987) are sited in Port Dickson. Ken Yeang of T.R. Hamzah and Yeang designed the Plaza Atrium (1983) in Kuala Lumpur and the 31-story MBF Tower (1993) in Penang. His own residence, Roof Roof House (1984), conceived as "an environmental filter," sparked a long-term concern with tropical architecture.

In Singapore after World War II, designers were both foreign and Chinese. Palmer and Turner's 1954 Bank of China Building and Ng Keng Siang's Asia Insurance Building (1954) are examples. After independence in 1965 modernist buildings predomi-nated, including the Jurong Town Hall (1974) by Raymond Woo of Team 3 International. RDC, founded in 1974, undertook the Science Center (1975), while the Alfred Wong Partnership designed the National Theatre (1963) and Scotts Shopping Complex (1984).

Foreign architects designed a majority of the landmark buildings. I.M.Pei did the Overseas Chinese Banking Corporation (with BEP Architects in 1976), and Moshe Safdie designed the Habitat Singapore (1984). Australians Geoffrey Malone and Philip Conn of IPC designed the high-tech Crystal Court (1985). Kenzo Tange's works for years dominated the city skyline, including Overseas Union Bank Plaza (1983–93) and TeleTech Park (1994).

Asia's famous shopping centers began in Singapore with the Golden Mile Shopping Centre (1972) and Peoples' Park (1973) by Tay Kheng Soon and William Lim of DP Architects. Lim later left DP Architects to form a smaller, more experimental practice and designed many fine projects such as Unit 8 condominiums (1984), Tampines Community Center (1989), and the Design School (1995) at the LaSalle-SIA College of the Arts. Akitek Tenggara, Tay Kheng Soon's firm, designed Chee Tong Temple (1987) and the dramatic steel-and-concrete Institute of Technical Education (1993) in Bisham. A new generation of architects including Manop Architects, Richard Ho, and Tangguanbee produces innovative work, including the latter's playful Institution Hill Apartments (1988).

Government architects also play a major role in Singapore building. The PWD did the Central Provident Fund (1977) and Changi International Airport (1981 and 1990). Lee Kwan Yew, the country's long-serving president, set up government agencies for physical planning of the Central Business District and the New Towns. The Housing and Development Board (HDB, founded 1960) designed and built the large housing estates where more than 80 per cent of Singaporeans live. Liu Thai Ker, CEO of HDB until the 1990s, was perhaps the most influential planner-architect shaping the physical fabric of the country. The largely successful projects have made Singapore the epitome of the modern Asian city.

However, the desire to be modern led to the razing of old buildings and whole areas, such as Chinatown. It was only in the mid-1980s that the government realized that areas with character and identity were being destroyed in favor of blandness.

Korea's upheavals in the 20th century led to the division of the country. While North Korea followed the Soviet Union's monumental style of architecture, South Korea's rapid reconstruction in the 1960s was greatly influenced by European and American internationalism and the use of concrete, giving rise to what was referred to locally as the "simple-structure style," replacing country's traditional low-rise timber buildings with tiled roofs.

Until the 1980s foreign architects, such as Skidmore, Owings and Merrill, with their Lucky-Goldstar twin towers (1986), designed the major buildings. Western influence can be seen in the works of two major Korean architects who worked for Le Corbusier in Paris before returning to Seoul. Kim Swoo Geun returned in 1952; he and his practice, the Space Group of Korea, designed the National Assembly (1960) and the Gumi Arts Complex (1990). The second, Kim Chung-up, designed over 200 buildings, later returning to tradition and local crafts as in his last work, the Olympic Gate (1988).

The second generation of Korean architects began to appear in the 1990s. Kim Won of Kwang-Jang Architects designed the Sisters Convent of Korean Martyrs (1993) in Seoul, a brick-faced complex of clear geometric forms. His Gallery Bing and Zo Kunyong's X-Plus Building (1992), both in Seoul, are good examples of ultramodernist work. The 1998 Olympic Games provided a great impetus for architects such as Ilkum and Woo and Williams, who designed a large housing scheme for the Olympic Village. Kyu Sung Woo also designed the elegant Wanki Museum (1993) in Seoul.

In the Philippines, among the post independence (1946) architects were Pablo Antonio with the Gonzaga Building (1957) and Angel Napkil, the Werkbund Exhibition-like National Press Club (1958). The government under Ferdinand Marcos produced ambitious large-scale modernist monumental buildings, many of the best examples of their 20th-century architecture. The leading and most prolific architect was Leandro V.Locsin, who interpreted his heritage through abstraction. Among his works are the Chapel of the Holy Sacrifice (1955) in Quezon City, the Hyatt Regency Hotel (1967), Manila, and the Berguet Center (1984) in Manaluyong. His most important design is the Cultural Center in Manila (1969–76), of which the Theatre of the Performing Arts (1969) is perhaps his best building. Other influential Filipino architects are Gabriel Formoso, Alfredo Luz and Jorge Ramos, and the Manosa Brothers, with their San Miguel Building (1984), Manila. Francisco "Bobby" Manosa's work combines traditional materials, craftsmanship and forms with contemporary needs, as in his Tahanang Pilipino (1984), popularly known as the Coconut Palace due to its use of materials.

Under Soekarno Indonesia's "New Order" nationalism was expressed after independence in 1945 by Modern architecture and Soviet monumentalism. Examples in Jakarta are the National Mosque (1962) by Siliban, the National Monument, a tall stele topped by a golden flame (1945–66), and Gadjah Mada Complex (1977) by Anthony Lumsden. Later, President Soeharto favored architecture of traditional values to establish a unifying identity for the diverse archipelago, and in 1975 Taman Mini Indonesia (Indonesia in Miniature Park) was created to display all the country's vernacular architectural styles.

Firms such as Atelier 6, founded in 1969, designed both modernist buildings such as

Lippi Headquarters (1982) in Jakarta and the vernacular-inspired Carita Beach Hotel (1993) in West Java. Additions to ITB (Bandung) in the early 1990s contained neovernacular buildings by Iwan Sudradjat. In 1986 a new University of Indonesia campus at Depok, near Jakarta, planned by The Lempaga Technologi-FTUI, was designed to reflect Javanese-Indonesian forms, with buildings such as the Rectorate Tower (1989) by Gunawan Tjahjono and the Mosque (1992) by Trianto Y.Hardjoko that clearly express this dictate.

Foreign architects continued to build in Thailand with John Carl Warnecke's 1956 U.S. Embassy, Robert-Mathew Johnson-Marshall's Asian Institute of Technology (1968), both in Bangkok, and Kisho Kurokawa's Japan Studies Institute (1985) in Rangsit. The most prominent Thai architect is the English-trained Sumet Jumsai, whose firm SJA+3D was established in 1969–applying technological innovations to local architecture. Buildings that exemplify his approach are at the Campus of Thammasat University (1986), Rangsit. They are all based on a square grid; most of them are raised above ground or water and are unified by prominent pitched roofs that lend traditional character. In a very different vein, he explores "high-tech aesthetic" in the Science Museum (1977) and a theory of "robot architecture" (reflecting interaction between humans and machines) in his controversial toy robot like Bank of Asia (1986) and the Nation Building (1991), all in Bangkok. The second important Thai architect is the American-trained Strabandhu Ongard. His later works, the Surijasat (1978) and Khun V.Ed (1983) houses and the Toshiba Headquarters (1986), present an amalgam of Thai and European architecture. Other prominent practitioners include CASA, Suriysat, Tiptus, and Plan Architects.

Elsewhere in the region, Brunei and Vietnam for example, contemporary architecture continues to be dominated by nonnative architects. In Bandar Seri Bagwan, the capital of Brunei, the symbolic Sultan Omar Ali Saifuddin Mosque (1958, architect unknown) expresses Islam, whereas the sultan's palace, Istana Nurul Iman (1984), by Locsin, is a monumental modernist complex. Kenzo Tange produced the new city center (1994) of Ho Chi Minh City and also the Master Plan for Brunei's capital in 1985. Vietnam now sees itself developing an architecture that is characterized by Chinese-influenced shophouses, French boulevards, Soviet housing, and Western-style commercial development. This sense of ecclecticism and overlay is common to much architecture in the region at the beginning of the 21st century.

Two topics provide a reading of the region's architecture today: one is the issue of identity as exemplified through hotel design, and the other is the form of the contemporary Asian city including the ubiquitous skyscraper.

Tourist hotels, which are economically vital for Southeast Asia, usually try to present the culture of the region. They take their clue from vernacular architecture, are built in beautiful settings, and include all comforts. They present an imagined authenticity, using replicated forms, and also stereotype the tourist's notions of the local culture. They are, however, an important modern building type that gives an image of regional homogeneity. Among the earliest is the Tandjung Sari (opened in 1962) in Sanur, Bali, conceived by its owner-operator, Wija Wawo Runtu; the Bali Hyatt (1973, renovated in 1994) also in Sanur, by Palmer and Turner out of Hong Kong; and the Tanjong Jara Beach Hotel (1973–80) on the east coast of Malaysia, by Wimberly, Whisenand, Allison, Tong and Goo of Hawaii. The entrepreneur Adrian Zecha, who with his architects established the “Bali style,” has developed some of the most remarkable ones, the Aman Resorts. The American Ed Tuttle designed the Amanpuri (1987) on Phuket Island, Thailand, and the Australian Peter Muller the Amandari (1989) in Ubud, Bali. More recently, alternatives to the Bali style are provided by the ecological emphasis at the Pearl Farms Beach Resort (1994) on Samal Island, Mindanao, Thailand, by Bobby Manosa, and by the search for historical references at the neo-Art Deco hotel Chedi (1993) in Bandung, by Kerry Hill.

High-rise buildings adapted to the region’s climate and local technology were developed in the 1980s, and Ken Yeang wrote about and built “bio climatic skyscrapers.” Perhaps this is most successfully explored in his award-winning high-tech, metallic office building with its vertically spiraling planting, the Menara Mesiniaga (1992) in Selangor, near Kuala Lumpur, and by Paul Rudolph in his Dharmala Sakti Office (1986) in Jakarta, a tall concrete building of stacked roofs on *pilotis* (stilts) that allow for natural ventilation throughout the building. The skyscraper continues to be the most prominent image of progress and modernity; note Kuala Lumpur’s twin Petronas Towers, designed by Cesar Pelli, which at 450 meters, were the tallest buildings in the world on completion in 1998.

Despite these glittering constructions, a majority of the urban population in Southeast Asia is poor and lives, sometimes as squatters, in sprawling settlements. Urban population distribution is distinguished by the presence of one major city—the primate city—of each country, characterized by rapid and uncontrolled growth, as in Jakarta, Bangkok, and Manila. A successful project that deals with the urban situation in Indonesia—the Kampung Improvement Program—was instituted by the government in the late 1970s. Since the 1990s private entrepreneurs have also developed new settlements, as in Lippo Karawaci, near Jakarta, a major urbanism that continues to expand.

The theory of buildings and human settlement in the tropics found its voice (among others in a multitude of disciplines) in architects Shlomo Angel, William Lim, Ken Yeang, and Tay Kheng Soon. Their concern with expressing an abstraction of a pan-Southeast Asian identity, instead basing it on regional or ethnic identity, has led to notions of a modern tropical city. It is likely that their ideas will find form in the 21st century. Tay’s Development Guide Plan for Kampung Bugis (1989) and Yeang’s JB2005 (1994) are excellent examples of this new thinking.

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S*ee also* **Petronas Towers, Kuala Lumpur; Tange, Kenzo (Japan)**

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SOUTO DE MOURA, EDUARDO 1952

Architect, Portugal

Among the vanguard of modern Portuguese architects, Eduardo Souto de Moura emerges from a recently revitalized architectural tradition that was singularly rich in the Renaissance and baroque periods. In the transition from the 15th to the 16th centuries, with astounding wealth accruing from a growing number of colonies, Portugal experienced a flourish of late Gothic building. This was the Manueline period, named for Manuel I (reigned 1495–1521) under whom colonies in southern Africa, the Indies, the Far East, and Brazil were discovered and settled. In the 18th century, with gold and diamonds flowing into the country from Brazil, the Portuguese baroque reached one of its most intense periods.

During most of the 20th century though, economically stagnant and politically authoritarian, the only "modern" construction of buildings in Portugal were scattered examples of a neoclassical block-like fascist structures. The impetus for modernist architecture in the Portuguese-speaking world came not from Portugal but from Brazil, primarily with the inauguration in 1960 of Brasilia. That futuristic capital's signature structures, the presidential residence, the cathedral, the Congress, and the Foreign Office reflected the influence of Le Corbusier as interpreted with lyrical, tropical exuberance by Lúcio Costa and Oscar Niemeyer. Aesthetically Portugal itself only became free to follow this style after the democratic revolution of 1974. Financially it only became capable of supporting a significant increase in building after admission into the European Union and the consequent growth of its economy.

Souto de Moura was born in the north of Portugal on 25 July 1952 in the country's second-largest city, Porto (also referred to as Oporto). It was there from the *Escola de Belas Artes* that in 1980 he received his degree in architecture. He forms the third generation in the Portuguese architectural "School of Oporto." This movement originated among young architects at the fine arts school in Porto during the decade of the 1960s, the waning years of the Salazar dictatorship and its debilitating colonial wars in Portuguese Africa. The Atlantic harbor of Porto, lying on the Douro River, is generally known to the outside world for the port wine named after it, which originates from the vineyards in the valley of the Douro. To those who live in Porto, however, the city is known for the industriousness of its small businessmen, merchants, and manufacturers. With the post-World War II growth of European and coastal Atlantic trade, its metropolitan area expanded to half a million people. This growth required much new construction together with significant remodeling of older buildings. Responding to these building and design needs were Portuguese architects trained in the School of Oporto.

The school began with the ideas of Fernando Távora (1923–), seeking in the late 1950s for a modernist building style that was socially responsible and allowed economy in the use of basic forms and materials. This led him to minimalism and Alvar Aalto's concepts regarding discrete yet organically integrated construction elements. The great disciple of

Távora was Alvaro Siza Vieira (1933–), whose purist poetic style won him the 1992 Pritzker architecture award. One of the leading students and longtime colleagues of Siza Vieira has been Souto de Moura.

Like his predecessors, much of Souto de Moura's work has been in Porto and cities in the north of Portugal, particularly Braga and Évora. Throughout most of his career he has designed houses, among his most famous works, and commercial spaces. He has also done extensive restoration of historic and domestic structures. He has taught in Zurich and Lausanne, and beginning in the late 1980s his work assumed a more international projection, especially in Italy.

In Porto he has built or restored numerous houses and apartments, medical buildings, a library, a museum, and a customs building. Possessing his own minimalist style, the effectiveness of his work is borne by a subtle juxtaposition of elementary building materials: stone, wood, glass, and metal. He incorporates these elements in structures whose dramatic weight is often conveyed in basic geometric shapes of rectangles, squares, cubes, cylinders, and circles.

Two important early works were the plan for the city market in Braga (1980–84) and the "Casa das Artes" cultural center in Porto (1981–91). The city of Braga has now outgrown the former, and he is redesigning the area as a complex of shops and cafes. The cultural center projected a striking model that concentrated the accumulated design tradition of international modernism.

Most significant, though, was a small weekend home built in the Algarve (1984–89), in the south of Portugal. Its all-white elements presented a subdued profile of long rectangular walls over which hovered the low silhouette of a dome and, varying with the angle of view, a triangle and cylinder. Occupying only one-fifth of the lot on which it lies, the structure establishes a balance of subdued tensions between itself and its setting.

Of further significance has been a series of residences he has built since the early 1980s in Nevogilde, a developing seaside neighborhood of Porto. On more restricted terrains, these houses also have demonstrated a style achieved through balancing subdued forces of contrast in structure and environment. However, they furthermore demonstrate his command of interiors, a spare equilibrium of the elements of space and light, and a progressive integration of a spectrum of structural elements, stone, wood, and glass, respecting principles of Mies van der Rohe. In Braga he built (1989–94) a two-story house that strikingly balances a stone environment on the lower floor with a glass one on the upper.

Among his more recent and significant challenges have been designing a civic center in Sicily, converting a monastery into a country inn, and redesigning the customs center of Porto. He has received numerous awards and honors in Portugal and abroad, including an Italian one for his use of stone. In 1998 he was the first architect to receive the coveted Portuguese cultural distinction, the Premio Pessoa. In the same year the Swiss-Italian city of Mendrisio mounted a retrospective exhibition of his work, emphasizing his skill for balancing structures in terms of their component parts and their placement within an environment.

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S*ee also* **Lisbon, Portugal; Malagueira Quarter, Evora, Portugal; Siza Vieira, Alvaro J.M. (Portugal); Tavora, Fernando (Portugal)**

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SPACE FRAME

A distinctly 20th-century structural form, the space frame is a three-dimensional system that transfers gravitational and lateral loads through a network of interconnected structural elements. In this efficient system, the load path is completely controlled, utilizing mainly straight elements that are securely joined together to safely transfer applied loads to other structural subsystems. The effectiveness of their structural form comes from three factors. First, unlike other structural forms where entire members are sized on the basis of maximum stresses that occur at singular points along their elements, the peak stresses in lattice space structures are distributed more evenly through the use of members transferring mainly tension and compression forces and, as such, requiring smaller cross-sectional profiles. Second, the fact that they are highly indeterminate structures causes stress redistribution in the event of one member or more failing during the life expectancy of such frames. This fact allows for the increase in allowable design code stresses and leads to smaller members. Third, coupled with their structural efficiency, their simplified and repetitive assembly techniques afford them the versatility to take on either flat or curved forms, making them systems of choice for designers and builders.

Space frames are seen as an evolutionary step in the eternal quest for building and spanning more with less natural resources and increased cost-effectiveness. Earlier efforts to construct lighter-weight structural forms included Schwedler's fully triangulated framed domes in 1863. Even the famed Dr. Alexander Graham Bell experimented with such spatial structural forms when, in 1907, he illustrated their effectiveness as structural systems by building a tetrahedron-based frame that could be used for the construction of kites, airplanes, and building structures. In 1942, architect Charles Atwood developed the Unistrut system, consisting of steel elements bolted into a flat gusset plate to form a space frame.

However, the major innovation in space frames came about when Dr. Max Mengeringhausen introduced his Mero system in 1943. His system gave birth to today's space frame technology. Consisting of up to 18 hollow steel tubes that can be screwed into a steel ball at the same time to form a single joint, the system simply and expeditiously builds a huge network of solidly connected members to form a long span structure.

Later, during World War II, the military realized the massproduction and prefabrication potential of such systems and utilized them in such structures as radar domes. In the 1950s, designers such as Konrad Wachsmann were developing space frame systems similar to the Mero. An example of Wachsmann's tetrahedral tubular space frame system is a U.S. Air Force hangar that measured 240 by 155 meters with a 50-meter cantilevered roof extending in both directions. Buckminster Fuller also invented geodesic domes known as "tensegrity" structures that became very popular optimal building forms in the 1960s and 1970s and led to the publication of the do-it-yourself books *Domebook One* and *Domebook Two*.

Expo '67 in Montreal featured space frame structures that opened the eyes of designers and builders alike to the potential of such building forms. The 1970s witnessed an eruption of space frames being used for airplane hangars, huge roofing systems, and efficient building frames. The British Airways 01 hangar at Heathrow Airport, designed by professor Z.S.Makowski, is a primary example of large roofing construction. The hangar spans 135 meters, accommodates two jumbo jets at the same time, utilizes tubular hollow sections, and can be mechanically jacked up in anticipation of future larger aircraft. The Interfirst Bank Building (1981) in Dallas, Texas, designed by Skidmore, Owings and Merrill, is an example of the versatility in the form design of space frame, which matched the half-pyramid shape of the building itself.

The advent of faster and more accessible computational power to structural engineers allowed for an explosion in the amount of shape complexity and design optimization of those structural forms. The Javits Convention Center (1987) in New York City, designed by I.M.Pei and Partners, is a primary example of how computer analyses allowed the creation of such complex building shapes.

The attractive properties of high strength-to-weight ratios and considerable torsional stiffness did not escape the everwatchful eyes of the aerospace industry, which started utilizing the technology in their air-space frames. At the same time, the car manufacturing industries began as early as the 1950s utilizing space frames in their high-performance car chassis. Today, Audi's A8 luxury car uses a very sophisticated form of aluminum space frame for its chassis. The frame was designed in concert with Alcoa and required 40 patents, ten years, and seven new aircraft aluminum alloys.

The National Aeronautics and Space Administration also invested for decades in space frame research. The result is its U.S. Laboratory module for the International Space Station currently under construction at the Marshall Space Flight Center station manufacturing facility in Huntsville, Alabama. However, perhaps the epitome of computer and space frame construction technologies coming together is the Fremont Street Experience Light and Sound Show in Las Vegas, Nevada. A 90-foot-high steel space frame, completed in September 1995, provides a high-tech display canopy over a 1,400-foot stretch of the Fremont Street and serves also as a spectacular foyer for existing casino and hotel resorts in the Las Vegas downtown district. The frame is arched, being 5 feet deep and 44 feet in curved radius. The inside of the canopy contains 2.1 million light bulbs acting like television pixels and fully controlled by 21 computers generating animated images perfectly syncopated to sound. The computer-generated light and sound show is produced using concert-quality sound emanating from a system of 208 speakers capable of generating 540,000 watts. Unofficially, this space frame is considered to be the world's largest graphics display system.

Today, there are tens of thousands of space frames all over the world. The future likely will witness an even greater reliance on space frame construction for the simple reason that computer, materials, manufacturing, and construction technologies are constantly evolving and successfully thriving to reduce cost with improved products. As such, in the very near future, architects, structural designers, and builders will have the option of designing and building space frames out of materials that are far superior in strength and much lower in weight than any of the currently conventional materials and methods. Primary examples of such construction materials are fiber-reinforced plastic composites. Their industry is extremely prolific, and they are light-weight, corrosion resistant, and ideal for tailoring their fiber orientations to optimally resist principal stresses induced under any loading conditions.

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SPAIN

Spanish architecture of the 20th century has exhibited a dynamic eclecticism that is rooted in the country's turbulent political history and in the persistent individualism of its historically autonomous provinces. The Castilian capital of Madrid and the Catalonian capital of Barcelona were the epicenters of the nation's architectural achievement throughout much of the century, each having gained international recognition for both their architecture schools and their architects of distinction.

By the early 20th century, Barcelona's dramatic population growth prompted city officials to address its urban expansion through an international competition that was ultimately won by the French Beaux-Arts architect Léon Jaussely (1875–1932), whose scheme was modified for implementation in 1917. At the same time, Antoni y Cornet Gaudí's (1852–1926) idiosyncratic use of Art Nouveau, Gothic, and Moorish influences, evident in such projects as the Sagrada Familia (Expiatory Church of the Holy Family, 1882–1926), dominated Catalan *modernisme,* a regional movement characterized by an interest in aesthetic and political separatism coupled with a respect for traditional craftsmanship and a personalized vocabulary of ornamentation. His structural experimentation and militant interest in creating a distinctively regional form of architecture had a profound impact on his contemporaries, Lluís Domènech i Montaner (1849–1923) and Josep Puig i Cadafalch (1869–1957), as well as subsequent generations of Barcelonese architects.

Antonio Palacios y Ramilo (1876–1945) was the primary architectural force in the Spanish capital of Madrid. His grandiose Palacio de Correos y Communicaciones (1918) went beyond the city's Beaux-Arts classicism and its neo-Plateresque references in its free use of space and light as well as in its indebtedness to the Wagnerschule of Vienna. Palacios' role as a professor at the Escuela de Arquitectura de Madrid (ETSAM) and as an academician of the Real Academia de Bellas Artes de San Fernando ensured his impact on early 20th-century Madrileño architecture; his brand of Beaux-Arts eclecticism came to populate the Gran Via, a major artery through the city's old slums that was created between 1910 and 1930.

Fernando Garcia Mercadal (1895–1984), a 1921 graduate of ETSAM, led the group of young architects known as the "Generation of 1925" to embrace contemporary architectural avant-gardism after spending four years traveling on a Pension de Roma (Rome Prize) study grant. His encounters with Peter Behrens (1920), Josef Hoffmann (1924), Le Corbusier (1925), and Adolf Loos (1927) led him to introduce certain rationalist tendencies in such projects as his small pavilion, the Rincón de Goya (1928, demolished in the Spanish civil war), in Zaragoza. In April of the same year, García Mercadal edited an issue of *La Gaceta Literaria* (The Literary Gazette) that was dedicated solely to the theme "New Art in the World: Architecture, 1928" and that featured an illustrated survey of the Dessau Bauhaus, quoted passages by Henry Van de Velde and Ludwig Mies van der Rohe, as well as essays written by some of García Mercadal's leading contemporaries. The group's crowning achievement, the Madrid university campus (1936), reconciled avant-garde eclecticism with the new rationalism but was largely destroyed during the Spanish civil war (1936–39).

Bauhaus utopianism directly impacted the Spanish architectural scene of the 1930s after Mies van der Rohe inaugurated his German Pavilion at the Barcelona International Exhibition of 1929. Standing for less than eight months, this linchpin of 20th-century avant-gardism provided a fluid architectural space of glass, water, marble, and travertine and came to epitomize the precepts of the International Style.

The creation in 1930 of the *Grupo de Arquitectos y Técnicos Españoles para la*

Arquitectura Contemporánea (GATEPAC) in Zaragoza was of significant importance to the promotion in Spain of utopian modernism by the *Congrès Internationaux d'Architecture Moderne* (CIAM) and the *Comité International pour la Realisation des Problèmes d'Architecture Contemporaine* (CIRPAC). GATEPAC's rationalist aims, articulated in the magazine *A.C.* (1931–27) and manifested in the early works of the Catalonian Josep Lluís Sert (1902–83), came to be associated with the International Style and especially the architecture of

Sagrada Familia, designed by Antoni Gaudí, Barcelona (1882–1926)

Le Corbusier. The Catalonian group of GATEPAC forged direct connections with the Swiss visionary: at the Fourth CIRPAC Congress, Le Corbusier assisted the group in designing a new urban study for the city of Barcelona (Macià plan, 1935).

The rise of modernist architecture was stemmed by the Spanish civil war and the establishment of the Franco regime (1939–75), which ultimately resulted in the dissolution of GATEPAC and the exodus of many of the nation's leading architects, including Sert, who became dean of Harvard University's Graduate School of Design. Architects remaining in Spain were disconnected from the world's architectural community: access to documentation and foreign-language publications was minimalized under Franco's censors, and much of the Madrid Architecture Library had been destroyed during the war years. Public building projects encouraged during the early years of the dictatorship were generally antimodernist, with autarchic tendencies gleaned from the classical architectural tradition in Spain, in which mimetic references to Rome's legacy on the Iberian peninsula and Philip II's El Escorial (1582, Juan Bautista Toledo and Juan de Herrera), the Renaissance palace and monastery outside Madrid, were highly desirable. The Catalan-born José Antonio Coderch y de Sentmenat (1913–84) was the most remarkable architect of the period. His ability to reconcile GATEPAC-era rationalism, the vernacular traditions of Mediterranean villa architecture, the Scandinavian organicism of Eric Gunnar Asplund and Alvar Aalto, and the austere outlines and creative spatial layouts of Bruno Zevi resulted in private seaside homes of great ingenuity. His use of local materials, in many instances brick and tile, along with a so-called deep plan, became characteristics of the later Barcelona School (e.g., Ugalde House, 1952, in Caldes d'Estrac; Apartment Building, 1954, in La Barceloneta).

During the early 1950s, Spain's autarchic isolationist philosophy dissipated; new interchanges were established with democratic nations, and Spain's economic system was bolstered by a new liberalism and a sizable monetary credit from the United States.

In Barcelona, "Group R" (1951–59) sought an imbrication of the regional Catalonian architectural tradition with the rationalist idiom of such exiled architects as Sert. Meeting formally for some eight years and organizing courses such as "Economics and Urban Development" and "Sociology and Urban Development," this group eventually transformed into the so-called Barcelona School. Studio Per, Josep Martorell Codina (1925–), Ricardo Bofill Levi (1939–), Oriol Bohigas Guardiola (1925–), and others were able to explore the Group R ideals of rationalism and "poetic realism" under the Franco regime primarily through commissions from the private sector (such as Editorial Gustavo Gili, 1961, Bassó and Gili; Argentona House, 1955, Martorell and Bohigas; and Meridiana Building, 1966, MBM). The Barcelona School came to reject the notion of a utopian industrialized society and sought to redefine local and traditional construction processes; as such, it was especially influenced by English New Brutalism and Italian neorealism.

Contemporary attempts to establish connections with international modernism remained isolated in Madrid and were dependent on the influx of translated versions of such authors as Zevi and Sigfried Giedion and the increasing ability for Spaniards to travel outside the Iberian peninsula. Historian Juan Daniel Fullaondo, inspired especially by the antirationalist leanings of Zevi, sought to create a new Madrid School around the peri-odical *Nueva Forma* (New Form), and the Galician architect Alejandro de la Sota

(1913–) adopted an essentialist language far removed from the Franco regime's ideological framework of isolation and tradition (for example Gobierno Civil, 1957, in Tarragona). Nonetheless, it was not until José Antonio Corrales (1921–) and Ramón Vázquez Molezún (1922–) unified a simple geometric form on an irregular multileveled site at the Exposition Universelle et Internationale in Brussels that a new era of freedom in Spanish architecture was launched (Spanish Pavilion, 1958, World Expo).

From the 1960s on, as the urban fabric of Spain's leading cities continued to stretch along with the nation's economic expansion, many of its architects became increasingly engaged in solving problems associated with postindustrial urbanization, such as public housing, integration between architecture and landscape, and the design of transportation infrastructures. The cities of Barcelona, Madrid, and Bilbao became epicenters of public architecture with a social conscience as their perimeters burgeoned with shantytowns of displaced workers from the country's impoverished regions. A prominent advocate of the primacy of the individual in an urban context, Coderch devoted the last decade of his life to reconciling the autonomous apartment unit with the unified apartment block. After nearly three decades of isolation from the world scene, Spanish architecture as a whole became more widely disseminated in publications and exhibitions and more prominently recognized as an increasing number of the nation's architects began to gain international attention and acclaim.

General Franco's death in November 1975 propelled Spanish culture into a period of significant changes; especially marked was the change from an authoritarian regime to a constitutional monarchy and a democratic state as well as the partial restoration of the nation's historically autonomous provinces, which resulted in a renewed fervor to mark the built environment with an emphatically regionalist aesthetic. Additionally, the country's architecture schools notably underwent significant modifications: increased staffing by professional architects, greater specialization and diversification, and an interest in redefining the architectural school as an intellectual forum. In the early 1970s, the contemporary design theories of Aldo Rossi's *L'architettura della città* (1966; *Architecture and the City)* and Robert Venturi's *Complexity and Contradiction in Architecture* (1966) became available in Castilian translations, and a number of new Spanish architectural publications emerged, most notably the Italian-influenced *2C Construcción de la Ciudad* (1972–85; Construction of the City) and the more pragmatic Catalonian *Arquitectura Bis* (1974 and later).

Oriol Bohigas, who in 1981 became the director of urbanism for the City of Barcelona, promoted a regionalist urbanization program for the Catalonian capital. In the process, much of the city was redesigned, and its distinctive neighborhoods, or barrios, were revitalized with new plazas and parks. Helio Piñón (1942–) and Alberto Viaplana's (1933–) minimalist Plaça dels Països Catalans (1983, also called the Plaza de la Estación de Sants, designed along with Enric Miralles) was the first of a series of urban spaces called *plazas duras* ("hard" squares) created under Bohigas' administration that helped establish Barcelona as a leading center of modern urban renewal and the host for the 1992 summer Olympic Games.

In 1986, the Andalusian capital of Seville was officially proclaimed the site of the 1992 Universal Exposition commemorating the fifth centenary of the discovery of America. This selection, as in the case of Barcelona, prompted a large-scale urban-renewal program that included the redesign of the city's transportation and communication infrastructures and the renovation of the so-called La Cartuja district, a man-made "island" along the Guadalquivir River. Neorationalist adherent Rafael Moneo (1937–) sensitively designed the new airport to reflect its Sevillian roots, with austere Moorish-inspired arches and a series of blue domes illuminated by a central oculus. Moneo's former students Antonio Cruz Villalón and Antonio Ortiz García created the Santa Justa Railway Station, a project that aligned the new transportation hub with a distinctively Spanish Postmodernism.

The Franco regime's continued promotion of mimetic architectural historicism deterred many young Spanish architects of the 1980s from utilizing a postmodernist idiom; however, Bofill and Oscar Tusquets (1941–) adopted postmodern tendencies that are evident in the former's INEF Building (1991) and the latter's Más Abello Housing Complex (1990), both in Barcelona. A more expressive architectural language, the inheritor of the legacy of Antoni Gaudí, was adopted by the Valencia-born Santiago Calatrava (1951–), whose bridge and recent museum designs are neosurrealist versions of avian osteomorphic forms.

In the latter decades of the century, both public and private sectors have contributed significantly to the advance of innovative architecture by employing progressive young architects. Regions such as the Basque provinces, Andalusia, and Valencia—bolstered by the economic expansion correlated to the nation's acceptance into the European community in 1986—have promoted highly individualized and internationally recognized building projects, including Frank Gehry's titanium-sheathed Guggenheim Museum (1997) in Bilbao and Giorgio Grassi's University Library (1999) on the Nou-Campus in Valencia.

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S*ee also* **Barcelona, Spain; Bofill, Ricardo (Spain); Calatrava, Santiago (Spain); Coderch y de Sentmenat, José Antonio (Spain); Gaudí, Antoni (Spain); Moneo, Rafael (Spain); Sert, Josep Lluís (United States)**

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ST. PETERSBURG (LENINGRAD), RUSSIA

At the beginning of the 20th century, St. Petersburg was in the midst of a transformation of commercial and living space that had begun in the 1860s and would continue until World War I. Although the great imperial monuments remained standing, practically everything around them was rebuilt during this period in an eclectic array of architectural styles, including the style moderne. The densely constructed St. Petersburg environment consisted of buildings within a city plan that followed the straightedge wherever its deltaic terrain permitted. The city's height restrictions, which limited most construction at five or six stories, also encouraged perspectival uniformity.

In this setting, the plasticity of structure and material that characterized the style moderne in Moscow frequently assumed a two-dimensional form that depended on the texture and shaping of the facade of contiguous apartment buildings. Of the several hundred building projects undertaken in the city between 1898 and 1915, only a small fraction applied the new style in anything other than a fragmentary, decorative manner. There were, nonetheless, architects whose work defined a distinctive variant of the new style known as the "Northern moderne." Fedor Lidval (1870–1945) was the most productive among them, and his career ranged from the early moderne to the more austere neoclassical revival. Lidval's buildings—primarily large apartment houses and banks—also illustrate the developing links between large construction projects and private capital resources in St. Petersburg.

Among other architects active in the apartment construction boom, the work of Aleksei Bubyr is notable for its original approach to structure as a sculpted, textured block. A 1902 graduate of the Institute of Civil Engineering, Bubyr often collaborated with the architect Nikolai Vasilev, who also designed a number of large housing projects in St. Petersburg. Yet Bubyr himself developed a distinctive interpretation of the rationalist side of the style moderne, with equal attention to aesthetics and engineering. In the latter area, he was a pioneer in the use of reinforced concrete for the walls as well as the floor construction of apartment buildings, and this familiarity with new construction methods is reflected in the free style of even his largest structures.

The apartment house that Bubyr built in 1910–12 on the Fontanka Quay (no. 159) is striking not only for its lack of ornamentation but also for its massive outline, looming above the largest of St. Petersburg's canals. In constructing the facade, Bubyr resorted to the familiar device of unfinished granite on the lower surface, but only to the level of the first-floor window ledge. For the most part, the walls are covered with gray roughcast, yet the facade is framed by a top floor and corner bays of smooth, light stucco that produce a clarity of line and a bright exterior. Bubyr emphasized the tectonic character of the building with multistoried window bays that define the vertical lines of the facade and at the same time provide more light for the main rooms of each apartment. The upper stories culminate in a complex line, beginning as a mansard roof with low, narrow dormers (in effect, a seventh story) and rising at the corners to high gables and a series of pyramidal forms covered by ceramic roofing tiles.

The style moderne also appeared in the design of public buildings for banking and commerce. The most notable landmark of early 20th-century commercial architecture is the headquarters of the Singer Sewing Machine Company (1902–04), at the corner of Nevskii Prospekt and the Catherine Canal. Its architect, Pavel Siuzor (1844–*c.*1919), had established a career remarkable not only for prodigious output (some 100 original projects and reconstructions, of which more than 60 are extant) but also for its success in adapting to stylistic and technical innovations. Among the technical advances in the Singer Building is the use of something approaching a skeletal structural system, although not the steel frame of the type widely used in the United States. The exterior facades are supported with a ferroconcrete and brick frame, and the interior floors (also reinforced concrete) rest on iron columns. By surfacing the arcade of the first two floors with rusticated blocks of polished red granite and using a lighter, gray granite for the upper stories, Siuzor created a visual base for the structure, which rises in granite-surfaced piers and glass window shafts that extend from the third to the sixth floor in a secondary arcade pattern. The culminating element of the building is the elongated metal-ribbed and glass cupola, which could be illuminated to advertise the Singer logo.

By 1910 the style moderne had yielded to various modernized forms inspired by classical and Renaissance motifs, such as the Azov-Don Bank (1908–09) and the Hotel Astoria (1911–12), both by Fedor Lidval; the Mertens Building (1922–12) by Marian Lialevich (1876–1944); the Guards' Economic Society department store (1908–09) by Ernest Virrikh (1860–after 1921), Stepan Krichinskii (1874–1923), and Nikolai Vasilev; the Vavelberg banking building (1910–12) by Marian Peretiatkovich (1872–1916); and various apartment buildings by Vladimir Shchuko (1878–1938) and Andrei Belogrud (1875–1933). Perhaps the most accomplished architect of the neoclassical revival was Ivan Fomin (1872–1936), who specialized in the design of private houses but also conceived of an enormous apartment development known as New Petersburg (1911–12), only a few buildings of which were completed before World War I.

After the outbreak of World War I, the overheated Russian economy led to a collapse of the construction industry. The monumental buildings that had been erected by the hundreds in the preceding decades could no longer be maintained. In addition, the terror of the 1918–21 civil war led to the almost total collapse of services and infrastructure in Petrograd, as the city was called after 1914. After the death of Lenin, the name was changed again, to Leningrad, in 1924.

Under the direction of Sergei Kirov, the city began to recover from its precipitous economic and political decline after the revolution. Although the historic central districts of the city remained largely intact by virtue of a comprehensive preservation policy and the limited resources of an abandoned capital, Constructivist architecture began to appear in the late 1920s in the design of administrative and cultural centers for the city's largest outer districts, where workers' housing was under construction. One of the earliest examples was Moscow-Narva District House

Singer Sewing Machine Company building, designed by Pavel Siuzor (1904)

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of Culture (1925–27; later renamed the Gorkii Palace of Culture) by Alexander Gegello and David Krichevskii. Essentially a symmetrical structure designed around a wedge-shaped amphitheater of 1,900 seats, the compact building demonstrated the beginnings of a functional monumentality dictated by actual circumstances—circumstances that had been ignored in the earlier Workers' Palace and Palace of Labor competitions.

The construction of a number of model projects occurred in the same district, including workers' housing (1925–27), by Gegello and others, on Tractor Street; a department store and "factory-kitchen" (1929–30; to eliminate the need for cooking at home), built in a streamlined early Bauhaus style by Armen Barutchev and others; and the Tenth Anniversary of October School (1925–27), designed by Aleksandr Nikolskii, on Strike Prospekt. The centerpiece of the district (subsequently renamed Kirov) was the House of Soviets (1930–34), designed by Noi Trotskii. Its long four-story office block, defined by horizontal window strips, ends on one side in a perpendicular wing with a rounded facade and on the other in a severely angular ten-story tower with corner balconies.

A similarly austere, unadorned style emphasizing the basic geometry of forms was adopted by Igor Ivanovich Fomin and A. Daugul for the Moscow District House of Soviets (1931–35) on Moscow Prospekt. Yet the facade, composed of segmented windows of identical size, signifies the repetition of an incipient bureaucratic style rather than the streamlined dynamic of earlier Constructivist work. During the same period (1931–35), Igor Fomin and Evgenii Levinson designed an apartment complex for use by the Leningrad Soviet in the fashionable prerevolutionary Petrograd district, on the bank of the Karpovka River near Kamennoostrovskii Prospekt (subsequently renamed after Kirov). With an open passageway supported by granite columns in the center of the curved facade, the design echoes the work of Moisei Ginzburg and, especially, of Le Corbusier. A stylobate of gray granite provides a base for the rest of the structure, whose facade is coated in artistic concrete with a scored surface. The careful attention to such details of architectural and decorative design is unusual for this period and indicates the privileged status of the city bureaucrats for whom the structure was built.

The 1935 Leningrad city plan, devised by Lev Ilin and modified in the late 1930s by Nikolai Baranov, involved a shift from the historical central districts to a new grand avenue—Moscow Prospekt—leading to the south and to a proposed administrative complex centered on the House of Soviets. This building, and the plaza surrounding it, formed the most grandiose project of the 1930s (if one considers the Moscow Palace of Soviets to have been, in effect, utopian). Ultimately, the project was reduced in scale, and the outbreak of war curtailed construction still further,

New Petersburg Apartment Building, by Ivan Fomin and E.Levenson (1912)

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but the House of Soviets (1936–41), designed by an architectural collective headed by Noi Trotskii, was completed in the purest form of totalitarian monumentality: 220 meters long and 150 meters deep. The central facade is marked by 20 attached columns, above which is a massive frieze depicting scenes from the construction and defense of the socialist homeland. The design attempted to draw on the legacy of classical architecture and city planning in St. Petersburg with its open squares and monumental facades and at the same time to supersede that legacy by sheer exaggeration of scale.

The outbreak of World War II found Leningrad catastrophically unprepared. Surrounded by German and Finnish forces during the 900-day siege, the city was subjected to almost constant artillery bombardment. With the breaking of the siege in early 1944, architects and construction teams immediately began the process of restoring not only the great monuments but also the city's apartment buildings.

In the post-Stalinist period, most of the city's growth occurred in large housing projects of standardized design on the outskirts of the historic center, which itself remained relatively well preserved. Following the collapse of the Soviet Union in 1991, the decline in funding for city services led to a crisis in maintaining the many prerevolutionary apartment buildings that provide the city with its urban texture. In addition, economic stagnation and lack of investment have hampered the development of innovative architectural concepts. Under these circumstances, the primary goal is to preserve and renovate the architectural legacy of a time when St. Petersburg was one of Europe's great capitals.

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S*ee also* **Ginzburg, Moisei (Russia); Russia and the USSR**

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STADIUM

Today, major cities heatedly debate the need for new structures for their most prominent inhabitants: their athletic teams. As sports have become primary generators of revenue for cities, the cutting-edge stadium has become an earmark of a city on the move. Hellmuth, Obata, and Kassabaum, Inc., Sports Facilities Group (HOK) has been the trendsetter in contemporary stadium design since 1983. With 1400 architects, the company now is building consistently enough to create divisions based around different sports, including hockey, basketball, baseball, football, and soccer. HOK, based in

Kansas City, Missouri, is responsible for Oriole Park at Camden Yards, which defined a return in baseball to traditional ballparks. Perfectly suited to alternative agenda in the postmodern era, contemporary designers must walk careful lines between tradition and cutting-edge enhancements to the sports spectacle.

Olympic Games Tent (1972) in Munich, designed by Gunter Behnisch

The first modern stadium appeared in Victoria, Britain, in the late 1890s. However, there was obviously a precedent even before this: The ancestral prototypes for modern facilities are the stadiums and hippodromes of ancient Greece. Here, Olympic and other sporting contests were staged, starting in the eighth century B.c. Greek stadiums, which could be found in many larger cities, were laid out in a U shape, with the straight end forming the starting line for races. Some also followed the model of theaters and were built into hillsides. Other forms during this early history included Roman amphitheaters and circuses.

In the late 1800s, designers began experimenting with more modern facilities, although they often relied on classical models. Ballparks for the nation's most popular sport, baseball, took shape in many cities. In the early 1900s, the ballparks in many cities were used separately by major-league players and Negroleague players. From the era of the smaller ballpark, the next epoch emerged in the form of great stadiums, such as New York's Yankee Stadium (1923), Philadelphia's Shibe Park (1909), Chicago's Wrigley Field (1926) and Comiskey Park (1910), and Boston's Fenway Park (1912), to name just a few. The forms that today are called stadiums, ballparks, or sports facilities would not appear until the 1940s. After World War II, a new wave of stadium building shifted to multipurpose facilities with partial

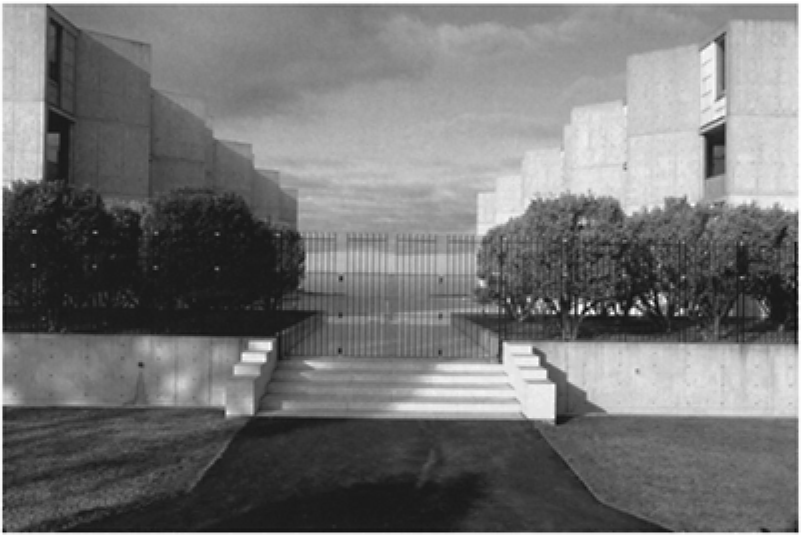
Detail of Munich Olympic Games tent (1972)

roofs. The Oakland Coliseum, Shea Stadium, and others were often located in suburban areas and surrounded by acres of car parking. In addition to baseball, such stadiums could be used for football and public gatherings, such as concerts.

The multipurpose form of stadium had its origins in the enclosed dome. The originator of this form was the Houston Astrodome, which opened in 1964. Judge Roy Hofheinz, with the quirky idea of combining attending a sports event with going to a cocktail party, designed the dome around the idea of sky-boxes. These private boxes allowed high-paying clients to attend games without interacting with other fans. A young pitcher for the Houston Astros bounded into the stadium in April 1965, taking in the miracles of the dome: air conditioning, grass growing indoors (artificial turf would be laid in 1966), the translucent roof (greenhouse by day, a planetarium by night), and seating for 66,000.

Many traditionalists viewed attending baseball in airconditioned splendor as a travesty. The players, however, were most critical of the roof, the panels of which created a glare that made it impossible to see the ball. The league tried changing the color of the ball, but to no avail. The team painted over the roof panels, banishing the sun and killing the grass—Tifway 419 Bermuda, which had been specially developed by scientists in Georgia. For the rest of the season, the Astros simply painted over the dead grass. Following the season, Monsanto's new artificial turf, renamed AstroTurf, was installed. By 1973, five more stadiums would have synthetic surfaces, and many others would follow.

Other domes would follow, including the Louisiana Superdome, the largest dome when it was built in 1975, with a seating capacity of 76,800. Although traditionalists would wage war against domes and artificial turf, there was practical value to the controlled environment. Particularly when professional sports became more concerned with moneymaking, these technologies reduced the games' dependence on weather and made these events more appealing for family and business groups. The effort to reconcile these needs led to some significant innovations, including the retractable domed roof, which was first installed in the Toronto Skydome, designed by Canadian architects Rod Robbie and Michael Allen in 1989. As a site for concerts and other sports events, including Canadian Football League games, in addition to baseball, this stadium featured movable lower stands and a retractable AstroTurf surface that permits a baseball-to-football conversion in 12 hours' time. Large, domed sports stadiums continue to be built around the world, including Milwaukee's Miller Park (2001, HKS, Inc., Dallas; NBBJ of Los Angeles; and others) and the Osaka Dome (1997, Nikken Sekkei). From 1965, when the Houston Astrodome was opened,



Salk Institute (1966), La Jolla, California

Designed by Louis I.Kahn (United States)

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Wynn Commons (2000), University of Pennsylvania, Philadelphia

Designed by Denise Scott Brown of Venturi, Scott Brown and Associates (United States)

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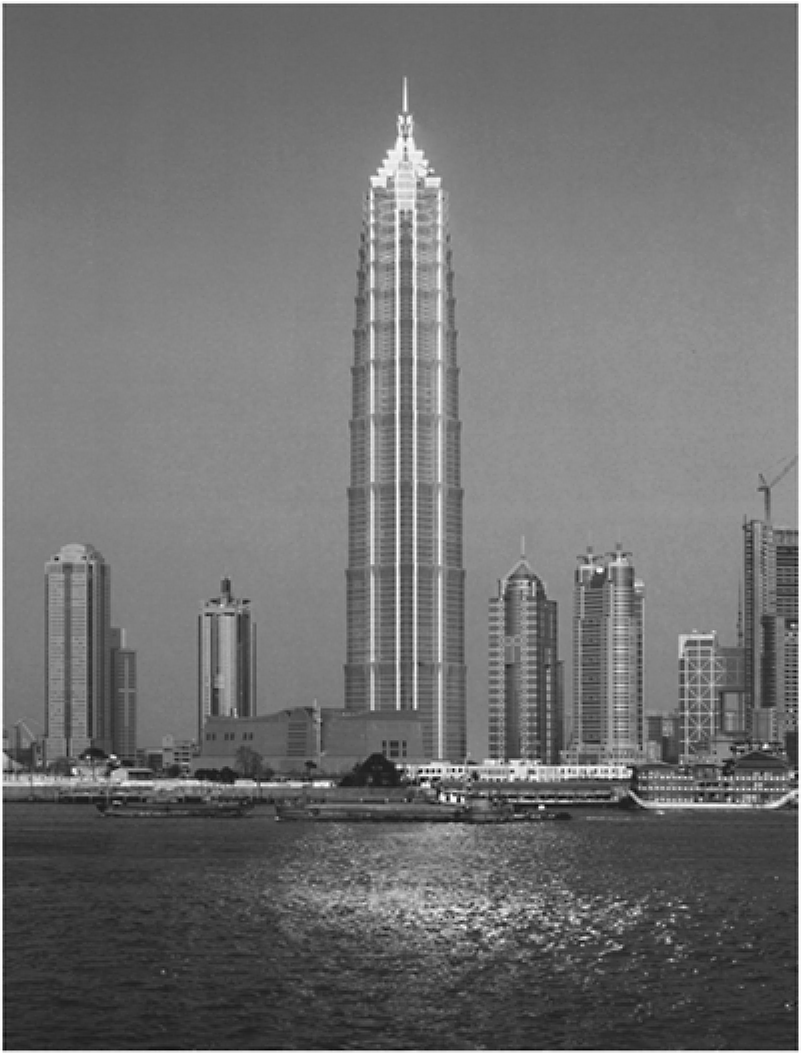

Jin Mao Tower (1998), Shanghai, China

Designed by Skidmore, Owings and Merrill (United States)

© China Jin Mao Group. Photo courtesy S.O.M., LLP, Chicago, Illinois

Tribune Tower (1925), Chicago, Illinois

Designed by Raymond M.Hood and John Mead Howells (United States)

Berlin Olympic Velodrome (1999), Berlin, Germany

Designed by Dominique Perrault (France)

Hong Kong Club (1984), Hong Kong, China Designed by Harry Seidler (Australia)

St. Mary's Cathedral (1963), Tokyo, Japan

Designed by Kenzo Tange (Japan)

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Tugendhat House Interior (1930), Brno, Czech Republic

Designed by Ludwig Mies van der Rohe (Germany)

Trans World Airline (TWA) Airport Terminal (1956–62), Idlewild, New York

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Vienna Secession House (1897–98), detail of door, Vienna, Austria

Designed by J.M.Olbrich (Austria)

Vidhan Bhavan (State Assembly) (1996), Bhopal, India

Designed by Charles Mark Correa (India)

Stockholm Municipal Library (1928), Stockholm, Sweden

Designed by Eric Gunnar Asplund (Sweden)

Theme Building at Los Angeles International Airport (1961–65), Los Angeles, California Designed by Paul Revere Williams, in collaboration with Pereira & Luckman and Welton Becket Associates (United States)

National Congress Complex (1958–60), Brasilia, Brazil

Designed by Oscar Niemeyer (Brazil)

to 2000, nearly 30 significant domed sports stadiums were built, mostly in cities in the United States, Canada, and Japan. Importantly, several domed stadiums were built as part of a host city's preparations for the Olympic Games; these include the Amsterdam Arena (1996) and Paris architect Roger Tallibert's Le Stade Olympique (1976). The domes have fueled a return to the more traditional model of stadiums designed in the early 1900s. Clearly, many communities now idealize the ballparks that predated Yankee Stadium. The contemporary version of this early baseball park, however, is quite different in scale and amenities.

Many late 20th-century stadium projects have followed the 1992 model of Oriole Park at Camden Yards (HOK Sport, Kansas City, Mo.) in Baltimore and the new Comiskey Park, designed by Osborn Engineering Company in Chicago, as well as stadiums in Denver and Cleveland. Returning to the one-dimensional parks and often to natural bluegrass surfaces, these forms combine modern convenience with nostalgic detail. The postmodern fusion has been a universal success, functioning to attract entire families to baseball games and revitalizing aging urban centers. Many stadiums have included amusement and shopping facilities within the park for those less enamored with sports.

Twentieth-century stadiums often accommodate more than one sport and, thus, prolong their function and profitability beyond a single sport season that lasts a few months. During the last two decades of the 20th century, many major North American cities built sports stadiums for their home teams in hockey, basketball, and football. Among more recent American sports arenas, the Pepsi Center in Denver was designed in 1999 by HOK for the city's professional hockey and basketball teams and features luxury suites and a

300-seat restaurant overlooking the sports field.

The 20th-century stadium as a prominent and innovative building type has served more than just professional sports. As gathering places for national political events or other large-scale public or state-sponsored occasions, North Korea's May Day Stadium (capacity 150,000), Iran's National Stadium (capacity 128,000), and Pirouzi (capacity 128,000) represent the world's largest domed structures. Others include City Stadium Jornalista Mário Filho in Brazil (capacity 120,000) and East Bengal in India (capacity 120,000).

BRIAN BLACK

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STEEL

Steel is a material present in the structure of virtually all works of 20th-century architecture: in the connectors, plates, nails, bolts, and screws of timber floors and frames; in the deformed bars hidden within the cement and stone matrix of reinforced concrete; and in the hot-rolled wide-flange columns and beams characteristic of steel skeletal frameworks. Although its history as a building material can be traced back at least to the fifth century B.C., and although its potential to revolutionize the whole process and form of building was in many ways already evident in the 19th century, it is in the 20th century that the architectural expression of steel was most thoroughly explored.

Steel refers to any metal consisting primarily of iron, although the term is now commonly used in a more restrictive sense, reserved for the mild carbon steels that first appeared in the mid-19th century and the high-strength, corrosion-resistant ("weathering"), and stainless steels developed more recently. Cast- and wrought-iron products had been used extensively in building, especially in the 19th century, but were largely superseded by the beginning of the 20th century by hot-rolled steel members. The ultimate victory of steel over earlier forms of iron was the result of steel's superior structural properties along with an increasingly efficient manufacturing process—based on the innovations of Bessemer, Siemens, Thomas, and others—that dramatically reduced its cost while increasing its output. Stimulated first by the needs of the railway industry in the mid-19th century and later by a dramatic increase in large-scale building projects, construction in steel became inextricably linked with the accelerated pace of commercial and industrial development in the 20th century.

The economic and social changes accompanying this development met with mixed reactions. Chicago architect Louis Sullivan found a kind of spiritual poetry in the steel frame's aspiration for verticality; Italian futurist Sant'Elia proclaimed in 1914 that the steel bridges, railway stations, cars, and planes of the modern epoch already signaled a radical discontinuity with the traditional forms of the past; and Russian Constructivist Vladimir Tatlin's proposal for a spiraling steel monument to the Third International in 1920 provided a dynamic and optimistic visual image for the new technology. Yet other artists and critics saw only the negative social consequences of the 20th century's new steel-framed architecture: dark, canyonlike streets; anonymous, repetitive facades; and degrading or dangerous working conditions. Steel was not simply the material par excellence of the industrial revolution; at the dawn of the 20th century, it was also a potent symbol of economic power and monopolistic arrogance, personified in the legendary figures of Andrew Carnegie, J.P. Morgan, and Elbert H.Gary.

With the development of steel architecture, other formal and technical issues have emerged: reconciling requirements for fireproofing and corrosion protection with the desire for direct expression; exploiting the potential of standardization, prefabrication, and mass production; expressing the ideal of lightness and elegance or the tectonics of load and resistance; and incorpo-rating the image of the machine (whether derived from industry, transport, or war) or the influence of other aesthetic tendencies (from Constructivism to deconstruction). These issues are subsumed within the following discussion, which is based on three critical 20th-century building types: the office building, the long-span "shed," and the house.

Chicago School architects pioneered the steel-framed office building in the late 19th century, and similarly important skyscrapers were designed in New York City and most major American urban centers. In New York, the 30-story Park Row Building (1898) was soon surpassed in height by a series of early-20th-century stone-clad, steel-framed towers, braced internally with diagonal trusswork or made rigid with riveted steel portal frames. The most influential of these buildings was the Woolworth Tower (1913). Designed by Cass Gilbert, it was the tallest building in the world at the time, having overtaken the 50-story Metropolitan Life Insurance Building (1909), designed by Nicholas Le Brun and Sons, which had just surpassed the 47-story Singer Building (1907), designed by Ernest Flagg. At the beginning of the Great Depression, two steel-framed structures in New York City took skyscraper design to new heights, both literally and metaphorically: the Chrysler Building (1929) by William Van Allen and the Empire State Building (1931) by Shreve, Lamb, and Harmon. The Chrysler Building is notable in this context for its crown of stainless-steel cladding, one of the first extensive building applications for the newly invented steel alloy.

Critics have argued about the architectural significance of these New York skyscrapers and whether their exuberant facades of stone and brick—reminiscent in many cases of medieval towers and Renaissance campanile—adequately express the nature of modern steel construction. Although their effect as cultural icons is unquestioned, in general it is the earlier-19th-century Chicago School buildings of Sullivan, Root, Burnham, and Jenney that are cited as exemplars of steel-framed building and precursors of modern design. After World War II, architects generally eliminated cornices and other traditional decorative elements derived from historic architectural styles in favor of the unornamented, rectilinear geometry associated with 20th-century modernism. Even so, the expression of steel framing remained problematic. For example, in Mies van der Rohe and Philip Johnson's Seagram Building (1958) in New York City, the actual steel structure is first encased in concrete fireproofing and then hidden behind a metal and glass curtain wall. Even with bronze I-beams applied on the facade to stiffen the vertical mullions, expression of the actual steel framework is, at best, indirect.

A more direct expression of steel structure is achieved by exposing the characteristic flanged shapes of actual painted or corrosion-resistant steel beams and columns or by celebrating the geometry of structural forms characteristic of steel—usually trussed or rigid frameworks evocative of steel industrial or civil engineering works. In the first case, Kevin Roche and John Dinkeloo's use of exposed and unpainted corrosion-resistant steel girders for the Knights of Columbus Headquarters (1969) in New Haven, Connecticut, and Skidmore, Owings, and Merrill's use of partially exposed painted steel girders (the flanges being covered for fire protection) in the U.S. Steel Building (1972) in New York City may serve as examples.

In the second case, the geometric form of truss or frame (rather than the shape of the individual elements) evokes steel structure. Three buildings by Skidmore, Owings, and Merrill illustrate this approach. The Inland Steel Building (1957) in Chicago expresses its welded-steel framework by locating the vertical elements of the framework outside the glass plane of the curtain wall, the Alcoa Building (1964) in San Francisco positions its triangulated steel bracing structure 18 inches in front of its glass curtain wall, and the Hancock Building (1970) in Chicago sets its steel trusswork into the plane of the facade. Two buildings in Hong Kong provide additional examples based on the same principle. The Bank of China (1990) by I.M. Pei selectively expresses the complex triangular geometry of its steel frame, suppressing the articulation of horizontal truss elements and thereby changing the apparent pattern of the framework on the facades from a series of Xs—which would have negative cultural connotations—to a series of diamonds. Norman Foster's Hongkong and Shanghai Bank (1986) employs a more explicitly machine-derived aesthetic, using tension elements to literally hang sections of the building—eight floors at a time—from steel trusses that in turn are cantilevered from mammoth steel columns. In these examples, the actual articulated steel structure is clad in sheet metal or, in the case of Pei's triangulated framework, stone veneer. Steel "exoskeletons" may also be unclad, as at the Foundation Cartier (1994) in Paris by Jean Nouvel, where abstract planar surfaces of parallel curtain wall screens are contrasted with exposed angular steel frames designed to provide structural stability.

The Shed

The use of steel for long-span roof structures has its roots in 19th-century bridges, train sheds, market halls, and exhibition spaces. Structures such as the Crystal Palace (1851) in London and the Galerie des Machines (1889) in Paris already showed the potential of iron (or steel, in the case of the Galerie). New functions requiring long-span roofs evolved in the 20th century, including hangars for airships and aircraft as well as single-level factories oriented toward the new flexible assembly-line production techniques pioneered in the automobile industry.

Long-span steel trusses, originating with 19th-century bridges (Benjamin Baker's steel-truss Forth Bridge in Scotland was the world's longest spanning structure at the time of its completion in 1890) were used in numerous factories and other building types to create large, column-free interior spaces. Albert Kahn's Glenn Martin Aircraft Plant (1937) in Middle River, Maryland, is of interest not only because its 300-foot (91-meter) trusses created the largest flat-roof span attempted up to that time but also because Mies van der Rohe used a photograph of its interior to construct his famous collaged image for a Concert Hall project, published in 1943. Additional representative examples in which steel parallel-chord, horizontal trusses are featured as important architectural elements include the New Haven Veterans Memorial Coliseum (1972) by Kevin Roche and John Dinkeloo, where exposed corrosion-resistant steel trusses carry a multilevel parking structure over the stadium below, and the McCormick Place Convention Center (1970) in Chicago by C.F.Murphy Associates, in which two perpendicular sets of parallel trusses are used. An unusual multistory application of long-span steel trusses can be seen at the Georges Pompidou Center (1977) by Renzo Piano and Richard Rogers, where the truss span—and therefore the required depth of the structure—is reduced through the use of sophisticated cast-steel "gerberettes" cantilevered inward from water-filled tubular steel columns to support the trusses, the columns being expressed on the building's exterior along with tensioned steel rods and diagonal cross bracing.

Variations on steel-trussed arches and frames, providing lightweight and structurally efficient spans, can be seen in early20th-century hangars for airships (zeppelins) and factory buildings, especially in Germany. An early example, influenced by the three-hinged steel arch forms of 19th-century bridge and exhibition structures, is Peter Behrens's AEG Turbine Factory (1909) in Berlin, in which hinges and vertical elements making up the repetitive steel arches are expressed on the exterior of the side facade. Norman Foster's Sainsbury Centre (1977) in Norwich, England, uses tubular steel-trussed rigid portal frames that contain the mechanical services for the building while providing a clear span for the display and academic functions within. A more complex three-hinged trussed arch appears in Nicholas Grimshaw's Waterloo International Rail Terminal (1994) in London. There, the required asymmetry results in steel tension elements of the truss—expressed as thin rods—being located first above and then below the roof structure, creating a form at once rational and counterintuitive. A final example is the International Exhibition Center (1996) in Leipzig by Ian Ritchie, in which arched trusses with cast-steel support arms form an exoskeleton supporting the vaulted Main Hall.

Polyhedral-based structures—three-dimensional versions of simple planar trusses—

were pioneered by Alexander Graham Bell in 1907 and developed into more sophisticated space frames by Max Mengeringhausen in Germany in the 1940s and Konrad Wachsmann in the United States in the 1950s. Buckminster Fuller invented the geodesic dome, based on the triangulation of a spherical surface, in the late 1940s. Steel-lamella roofs, consisting of intersecting, offset systems of parallel ribs, have been used in hangars, stadiums, and other long-span applications. Later—20th-century versions of these forms include the Javits Convention Center (1986) in New York City by I.M.Pei, consisting of a steel space frame used for both walls and roofs; Fuller's geodesic dome for the U.S. Pavilion (1967) at the Montreal Expo; and the steel-lamella Louisiana Superdome (1975) by Sverdrup and Parcel Associates.

Long-span masted tension structures, inspired by 19th-century suspension bridge and 20th-century cable-stayed designs, use steel rods in tension to support horizontal roof surfaces. The Burgo Paper Mill (1962) in Mantua, Italy, by Pier Luigi Nervi quite literally mirrors the form of conventional suspension bridges to create clear-span spaces below its suspended roof. More recent masted steel structures exploit the same principles, although their forms have become less derivative of bridge design and more articulate in expressing the exposed-steel connections between tension rod, horizontal beam, and vertical mast. Notable examples by Richard Rogers include the Fleetguard Distribution Center (1979) in Quimper, France; the Inmos Microprocessor Factory (1982) in South Wales; and the PA Technology Laboratories (1985) in Princeton, New Jersey. Norman Foster's Renault Distribution Center (1980) at Swindon, England, has a more complex geometry defined by perforated, tapered beams; masts; and tension rods. The Darling Harbour Exhibition Center (1988) in Sydney, Australia, by Philip Cox, Richardson, and Taylor makes reference, in its masted supports and steel outriggers, to the adjacent maritime harbor and its associated nautical motifs. The suppression of tension elements and the elaboration of the mast into compressive "treelike" structural forms—first systematically studied by Frei Otto—can be seen in several steel-framed projects by Santiago Calatrava, including the BCE Place Gallery (1992) in Toronto and the Oriente Station (1998) in Lisbon.

In tensioned-membrane structures, steel cables are combined with fabric membranes to create extremely lightweight, long-span structures. Frei Otto's tent structures for the German Pavilion (1967) at the Montreal Expo and for the Munich Olympics (1972) are landmarks in the development of these forms. Two late-20th-century long-span examples are the Georgia Dome (1992) in Atlanta, engineered by Weidlinger Associates and based on a patented "tensegrity" geometry defined by triangulated steel tension cables and floating steel compression struts, and the Millennium Dome (1999) by Richard Rogers in which the dome—historically a compressive structure—is transformed into a tensioned membrane by hanging the steel cable net defining its domical surface from an array of twelve inclined steel masts that penetrate the membrane. Lightweight domical surfaces can also be formed with membranes by mechanically increasing the interior air pressure, as in a balloon: An early example of such a pneumatic structure, contained by a net of steel cables, is the American Pavilion at the Osaka Expo (1970) by Davis Brody Associates.

With the development of welded connections—first invented in the late 19th century but not used in buildings until the 1920s—steel beams and frames could more readily be designed within the modernist syntax of interpenetrating line and surface, uninterrupted by gusset plates, bolts, or rivets. The buildings of Mies van der Rohe at the Illinois Institute of Technology in Chicago illustrate this type of abstract welded-steel expression, most dramatically in the exposed parallel portal frames of Crown Hall (1956). Later projects from the 1960s and 1970s, influenced by Mies's work, include Roche and Dinkeloo's Cummins Engine Company plant (1966) at Darlington, England; the Reliance Controls plant (1966) at Swindon, England, by Team 4 (including Norman Foster and Richard Rogers); and Skidmore, Owings, and Merrill's Republic Newspaper Plant (1971) at Columbus, Indiana. Functional requirements—for example, the need for daylighting in the immense new factory buildings of the steel, automotive, and aircraft industries—could also be addressed using welded-steel frames, angled or stepped to accommodate monitor skylights. Such bent frames can be found in Albert Kahn's Chrysler Half-Ton Truck Plant (1937) in Detroit and, more recently, in Helmut Jahn's Terminal One Complex for United Airlines (1987) in Chicago, the latter project using clusters of tubular steel columns supporting perforated steel beams that define skylit, linear public circulation spaces within the terminal. Curved, welded ribbed frames are used at an even more monumental scale in Rafael Viñoly's Tokyo International Forum (1996), defining an immense elliptical tied-arch roof supported by two centrifugally spun steel pipe columns 400 feet (124 meters) apart.

The House

The use of steel in the construction of factories, train sheds, market halls, and office buildings parallels the development of 19th- and 20th-century industry and commerce. The use of steel in 20th-century residential design has less of an objective basis, despite Le Corbusier's famous aphorism defining the modern house as a "machine for living in." Although steel-based technology was critical to the production of cars, trains, airships, and airplanes, attempts to design mass-produced, prefabricated, standardized, and flexible kits of steel parts applicable to the production of houses were generally less successful. In fact, although at least one fireproof steel residence—the Reid House (1894) in Chicago by Beers, Clay, and Dutton—was constructed before the 20th century, ambivalence about the appropriateness of exposed steel within the domestic sphere, as well as its relatively high cost compared with traditional residential construction systems, delayed the first applications of steel framing to residential construction. An experimental steel-framed house was produced for the German Bauhaus Exhibition of 1923 by painter Georg Muche and Adolf Meyer, but this house, along with a subsequent design completed in 1927, had little lasting influence.

The first truly influential steel-framed houses, built on both sides of the Atlantic Ocean at the end of the 1920s, rely for their expressive power on the juxtaposition of steel framing with large surfaces of glass. Among the most important are Richard Neutra's Lovell Health House (1929) in Los Angeles; Pierre Chareau's Maison de Verre (1932) in Paris; Mies van der Rohe's Tugendhat House (1930) in Brno, Czechoslovakia; and Leendert Cornelis van der Vlugt's van der Leeuw House (1929) in Rotterdam. Whereas Chareau has made the specific character of rolled steel—the flanged column shapes and the bolted and riveted connections—an integral part of his architectural expression, Neutra's steel frame is integrated into a more abstract gridded composition of glass and cement, visible only on the exterior of the house, where the closely spaced vertical members of the steel framework are selectively exposed as window mullions or supports for projecting rooms and balconies. In Mies' Tugendhat House, similar in its detailing and expression to the better known German Pavilion (1929) designed for the World Exhibition at Barcelona the previous year, the actual bolted-steel framework is never truly revealed. Instead, only the grid of columns, clad in chromium-plated sheet steel and set didactically between abstract planes of floor and roof, can be seen. The van der Leeuw House is perhaps the most literally "machinelike" of all, boasting a whole array of electronic gadgetry and controls within a structure based on four parallel steel frames that penetrated the house from front to back.

A different tendency can be seen in the polygonal Dymaxion House (1927), designed by Buckminster Fuller, in which a rigorous analysis of functionality and structural efficiency is combined with an interest in mass production at low cost, unfettered by the aesthetic preoccupations of the European modernists. Fuller refined the design during the 1930s and 1940s and found manufacturers to build prototypes but was unable to implement the idea commercially on a large scale.

During the period immediately after World War II, especially in the United States, steel was vigorously promoted as a material suitable for residential construction. John Entenza's *Art & Architecture* magazine published a series of so-called Case Study houses, the most influential of which was designed by Charles and Ray Eames for themselves in Pacific Palisades, California. The Eames House (1949) pioneered an aesthetic derived from the assembly of off-the-shelf, mass-produced, standard steel elements: open-web steel joists, corrugated-steel decking, and rolled-steel-column sections.

Two non-Californian steel-framed houses designed in the late 1940s were also extremely influential. Mies van der Rohe's Farnsworth House (1951) in Plano, Illinois, and Philip Johnson's Glass House (1949) in New Canaan, Connecticut, evince less concern with issues of economy, standardization, and mass production and more interest in exploring the formal qualities of the rectangular glass box within a welded-steel frame. The Farnsworth House was designed with its horizontal steel-framed floor and roof planes cantilevered outward from within two rows of external steel columns, raising the house off the ground. Johnson, however, by placing his Glass House directly on the ground with no cantilevered elements and by positioning his black-painted steel columns inside the glass plane, has shifted the emphasis from the steel frame to the glass enclosure.

Many postwar steel houses combine in various degrees formal qualities associated with the work of Eames and Mies. Influential Californian Case Study houses, such as Raphael Soriano's Olds House (1950) in Pacific Palisades, Craig Ellwood's Bailey House (1958) in Los Angeles, and Pierre Koenig's Stahl House (1960) in Los Angeles, all are based on rectilinear grids of steel columns, with steel beams and corrugated-steel roof decks completing the framing schemes and largely defining the formal vocabulary. Beginning in the mid-1950s, modern steel houses began to be built in England as well, including Michael Manser's Capel Manor House (Kent, 1970), the Richard Horden house (Dorset, 1975), the John Winter house (1969) in London, and Ian Ritchie's Eagle Rock House (1982) in East Sussex. Soriano, in particular, has been an influential figure for both British and American architects building in steel. Having experimented with lightweight steel trusses, beams, and columns since the late 1930s, he lent a certain credibility to the well-publicized but still largely unrealized ideal of industrialized building based on modularity, standardization, and prefabrication.

Interest in industrialized building—for housing, schools, and other building types—has been a continuous current in architectural thought for most of the 20th century. Early research into the mass production of lightweight steel structures, on the model of automobile production, can be seen in the work of Jean Prouvé and Buckminster Fuller from the 1920s and 1930s. Several industrialized steel systems for schools were implemented in the period after World War II, most notably the Hertfordshire County Council and CLASP systems in Britain in the 1940s and 1950s and the School Construction System Development Program in California led by Ezra Ehrenkrantz during the 1960s. By the end of the century, industrialized products were routinely used in a variety of applications, ranging from metal building systems—consisting of heavy steel frames with corrugated-steel cladding—to complete "volumetric" steel-framed housing units, the latter accounting for a small but growing proportion of total new home construction in Japan.

Steel-based industrialized housing systems were developed in Britain, the United States, and France in the aftermath of World War II, including several designed by Prouvé in the 1940s based on his earlier use of bent steel sheet in his Pavillion Démontable (1939). Jerry Wells and Fred Koetter continued research into the potential of light-gauge, cold-formed sheet steel for modular housing (1971), as did Cedric Price in the same year. Other experimental steel-based building systems designed in the 1970s and 1980s include Helmut Schulitz's "Team for Experimental Systems and Building Techniques" (TEST) at the University of California, Michael Hopkins's Patera System in Britain, Gunter Hübner and Frank Huster's prototype housing system in Germany, Renzo Piano's experimental houses in Italy, and Michiel Cohen and Jan Pesman's Heiwo system in the Netherlands. However, these industrialized building attempts were only partially successful, with houses produced often only as prototypes, occasionally in limited numbers, and sometimes not at all.

Notwithstanding the limited application of steel-framed industrialized building systems to housing, the use of prefabricated, industrial steel elements has had a notable effect on later-20th-century residential architecture. In particular, an ad hoc and idiosyncratic use of corrugated-steel panels for roofing and siding can be seen in the provocative residential work of Frank Gehry, beginning with his Davis Studio/Residence (1968–72) in Malibu, California, and including the first addition to his own house (1978) in Santa Monica, California. The Australian architect Glenn Murcutt has also used corrugated steel and steel framing as crucial elements in many of his residential designs, including the Marie Short House (1975) in New South Wales and the Ball-Eastaway House and Studio (1983) in Glenorie, Sidney. Where the raw, industrial quality of steel cladding in Gehry's work reinforces a sense of displacement already evident in the deliberately fragmented or truncated forms of his structures, Murcutt's use of the same material achieves an opposite effect, imparting what has been described as a sense of dignity to the corrugated surfaces.

Steel as Skin

Steel appears in architecture primarily as structure, but it is also used as nonstructural cladding, or "skin." Gehry's corrugatedsteel panels and the Chrysler Building's stainless-steel crown have already been noted. Other representative examples include Jean Prouvé's innovative sheet-steel curtain wall for the Maison du Peuple (1939) at Clichy, France; Skidmore, Owings, and Merrill's stainless-steel mullions at Lever House (1953) in New York City; Harrison and Abramovitz's textured panels of stainless steel for the Socony Mobil Building (1955) in New York City; Richard Meier's gridded porcelain enamel steel panels at the Athenium (1979) in New Harmony, Indiana; and Frank Gehry's overlapping galvanized-steel sheet cladding at the California Aerospace Museum (1984) in Los Angeles.

The uniqueness of steel sheet and plate also manifests itself in a group of idiosyncratic structures not easily categorized by function or formal type but having in common a kind of sculptural presence in which distinctions between structure and skin become less clear. Eero Saarinen's 630-foot (190-meter)-high Gateway Arch (1965) in St. Louis uses a double layer of steel, with quarter-inch (six-millimeter) stainless-steel plate forming the outside layer, as both cladding and structure. Le Corbusier's pavilion for Heidi Weber (1967) in Zurich, based on his earlier steel project for the "Saison de l'eau" at the Exposition de Liegè (1939), contains an angular sheet-steel roof cantilevered from a series of steel piers and detached from but covering a rectilinear steel structure below. Bernard Tschumi's abstract, orthogonal sculptural "follies" and expressionistic "gallery" structures within the Parc de la Villette (1982) in Paris provide a final example based on the use of both painted and porcelain-coated sheet steel.

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S*ee also* **Bank of China Tower, Hong Kong; Chicago School; Chrysler Building, New York City; Empire State Building, New York City; Farnsworth House, Plano, Illinois; Fuller, Richard Buckminster (United States); Gateway Arch, St. Louis, Missouri; German Pavilion, Barcelona (1929); Illinois Institute of Technology, Chicago; Mies van der Rohe, Ludwig (Germany); Monument to the Third International (1920); Skyscraper; Pei, I.M. (United States); Sullivan, Louis (United States); Tschumi, Bernard (France)**

Further Reading

An excellent history of steel houses in the 20th century is provided by Jackson; for an overview of long-span structures ("sheds"), see Wilkinson; for a history that includes the development of early-20th-century American skyscrapers, see Condit. The importance of engineers is discussed in Billington, Rice, and Thornton. A comprehensive overview of steel in relation to architecture can be found in Blanc.

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STEEL-FRAME CONSTRUCTION

This method of construction provides support by means of a closely knit structure of steel. Primary and secondary members compose the skeleton of the structure, to which a covering can be applied. With a steel frame, it is possible to enclose space with suspension structures. Steel framing is the counterpart to vaulting, in which the materials are in compression, and to pneu-

Reliance Building (detail, upper stories) Chicago, designed by Daniel Burnham (1895)

matic structures, in which the skins are held in place by air pressure.

The basic elements of the steel skeleton frame are vertical columns, horizontal girders that span the longer distance between columns, and beams that span shorter distances. The frame is reinforced to prevent distortion and possible collapse caused by uneven or vibratory loads. Lateral stability is provided by connecting the beams, columns, and girders and by diagonal bracing or rigid connections among columns, girders, and beams.

A frame composed of three end-connected members, more commonly known as a truss, cannot change its shape, even if its joints could act as hinges. Moreover, the principle of triangulation—attaching a horizontal tie beam to the bottom ends of two peaked rafters—can be extended indefinitely. Thus, spanning systems of almost any shape can be subdivided into triangles, the sides of which can be made of any appropriate material (most commonly steel or wood), and assembled using suitable end connections. Each separate part is then subject only to either compressive or tensile stress. The exterior skin, or curtain wall, that is placed over the steel frame can be made of metal (stainless steel, aluminum, or bronze), masonry (concrete, brick, or tile), or glass.

In the second half of the 19th century, builders in New York City and Chicago experimented with high-rise buildings. A valuable learning experience came with the construction of the Statue of Liberty (1886). Erected between 1883 and 1886, the statue is a copper-sheathed enclosure standing 151 feet, making it comparable in size, if not in weight, to the skyscraper of its day.

The sculptor of the Statue of Liberty, Frederic Auguste Bartholdi, posed a problem for his engineer Gustave Eiffel that was less one of supporting vertical loads and more one of resisting the force of wind on the extensive surface area surrounding the hollow interior. Eiffel's solution to the wind load problem involved several valuable innovations for American building. Most important, the diagonally braced frame inside the figure represented the most extensive system of wind bracing employed for any American structure to that time other than a bridge.

The braced and riveted steel skeleton was used in New York with the construction of Bruce Price's American Surety Building (1895) at Broadway and Pine Street. With a height of 20 stories, rising 303 feet above grade, a masonry wall was simply out of the question. For this height, a wall without supplementary columns inserted in the masonry would need to be at least seven and a half feet thick at the base. At this time, the Chicago architect Louis Sullivan, in his Wainwright Building (1890–91) in St. Louis, Missouri; his Guaranty Building (1895) in Buffalo, New York; and his Carson Pirie Scott Department Store (1899–1904) in Chicago gave new expressive form to urban commercial buildings, known as the Chicago School. These buildings made a successful transition from the masonry-bearing wall to the steel frame, which assumed all the load-bearing functions.

By 1895, engineers and architects in Chicago had contributed several innovations to skyscraper construction. The engineer Corydon T.Purdy, in collaboration with William

Holabird and Martin Roche, seems to have been the first to use portal arches as wind bracing when he designed the steel frame of the Old Colony Building (1893–94) in Chicago. In this system of bracing, deepening the ends of the girder into quarter-circular fillets gives the underside of the girder an arched profile.

The culmination of the Chicago School's contributions to steel-frame construction came with the Reliance Building (1894–95) after the plans of D.H.Burnham & Company and the engineer Edward C.Shankland. The steel frame of this slender tower is carefully braced in two ways: clinch-deep spandrel girders provide the usual portal bracing, and two-story columns erected with staggered joints increase the rigidity of the vertical members.

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STEINER HOUSE, VIENNA

Designed by Adolf Loos; completed 1910 Vienna, Austria

The Steiner House is among the best known of Adolf Loos's early residential works. Loos designed the house in early 1910, at the same time he was working on the even more controversial Michaelerplatz Building, and the two projects bear a certain kinship despite their programmatic differences. Both works followed immediately in the wake of Loos's famed address, "Ornament und Verbrechen" (Ornament and Crime), first delivered in January of the same year, and as a result, they may be understood as exemplars of the antiornamental ideas he laid out in the talk. The Steiner House, however, which was completed by the end of 1910, more than a half year before the much-discussed Michaelerplatz Building, initially drew little public notice, no doubt in large measure because it was a private domicile in an inconspicuous residential neighborhood.

The clients, wealthy textile manufacturer Hugo Steiner and his wife, Lily, a graphic artist and painter, subsequently commissioned Loos to design the interiors of their elegant Knize tailor shops in Vienna, Paris, and Berlin. The house itself, by contrast, is rather modest in terms of both its scale and its detailing. The freestanding structure is roughly square in plan (13.5 by 14.5 meters). Seen from the front, it appears to consist of a single story with a high attic. In fact, the house has three stories, which are clearly visible from the rear garden. The most distinctive feature of the building, the curving sheet-metal roof, was Loos' reply to the local building codes, which required that the streetfronts of houses in the area be no more than one story, with a second-story mansard. Loos maximized the space by concealing not one but two stories in the attic and connecting the half-barrel vault in the front to a flat concrete roof covering the rear two-thirds of the structure. The resulting configuration, despite its somewhat peculiar profile, allowed Loos to make use of nearly the entire interior volume.

The front and rear facades of the house are symmetrically arranged, although the windows and doors have varying formats and dimensions. By contrast, the fenestration pattern on the two sides is irregular, and on the southeastern side is a projecting bay topped by a small balcony accessible from the second story. Unlike Loos' later residential works, with their complex interlocking volumes, the regular horizontal layering of the floors is maintained, but the rooms on the three levels are of different heights: the ceilings on the ground floor are 2.85 meters, those on the second floor 3 meters, and those on the uppermost floor 2.10 meters. The ground floor contains a large vestibule, a kitchen, and an adjoining living and dining room, which extend the length of the house's rear. On the second story were originally two bedrooms, a servant's room, a small children's room, and a studio for Lily Steiner (facing out to the street), and the third floor was taken up with a laundry room and other service spaces. In addition, the house also has a basement, which at the time of its completion housed a garage, another servant's room, a furnace room, and a coal storage space. As in all of Loos' residences, there is a clear distinction between the public and private domains and between the served and serving spaces. The principal living areas and the bedroom above are linked with a stair, but there is a second spiral staircase to allow the servants access to all four floors.

The original interior detailing was remarkably simple, combining white walls, dark-stained oak wainscoting, and beamed ceilings on the ground floor and painted white wainscoting and floral wallpaper in the upstairs bedrooms. A number of the rooms were also originally furnished with both built-in and free-standing furniture of Loos' own design, including chairs, benches, stools, and a buffet. In contrast to the exterior, with its associations to the Mediterranean vernacular, the interior evoked an air of contemporary Anglo-Saxon domesticity, a feel-ing that was further enhanced by the flowing quality of the principal ground-floor spaces—living room, dining area, and music room—that Loos would further develop in his subsequent houses. Movement to and from these spaces, however, was limited to a conventional enclosed hallway, a strategy that Loos would later largely abandon.

In the early histories of modernism, much was made of the Steiner House's simple, planar walls and lack of traditional detailing, which seemed to directly presage the rise of the new purist architecture of the post-World War I period—an idea further advanced through views of the house's rear garden facade, which were juxtaposed with later works by Le Corbusier and others. Vincent Scully, writing in 1961, similarly noted the connection between "the obsessive puritanism" of Loos' prewar works and His polemical statements concerning the elimination of ornament. More recently, however, it has become clear that many of the features of the Steiner House, like Loos' other buildings of the time, derived as much from his attempt to find an appropriate modern language as from his belief in continuing the Viennese tradition. Indeed, both the house's sheet-metal roof and its smooth stucco finish draw directly on traditional local building practices, and the design must be seen not only in light of the turn-of-the-century Viennese interest in abstraction but also in that of the contemporary Biedermeier Revival. Loos' apparent rejection of ornament in this view is less an expression of a new functionalism than a reaffirmation of older ideas of bourgeois modesty and propriety, values that very much suited the house's first owners. The apparent contrast between the exterior and interior, which has also been repeatedly observed, may also be understood not as an inherent contradiction but as a reflection of Loos' notion of the difference between the public sphere, where propriety is paramount, and the private world, where a more relaxed attitude may prevail. Such an interpretation suggests not only the complexity of Loos' views but also the transitional nature of the house's design.

CHRISTOPHER LONG

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STERN, ROBERT ARTHUR MORGAN 1939

Architect, United States

A brilliant polymath in command of a daunting array of talents, Robert Stern is perhaps the true successor to Philip Johnson, one of his mentors, as one of the prime figures in the American architectural world. In 1998, Stern was appointed dean of the school of architecture at Yale University, where he had earned a Master of Architecture degree (1965). He was coeditor of *Perspecta 9–10,* the first double issue of that distinguished periodical created by graduate architectural students at Yale. In 1970, he began teaching in the Graduate School of Architecture, Planning, and Preservation at his undergraduate alma mater, Columbia University (BA., 1960), and in 1984 undertook a four-year term as first director of its Temple Hoyne Buell Center for the Study of American Architecture.

Stern's eclecticism and reliance on quotation in his architectural practice has been criticized, but as in the 19th century, exemplars are chosen according to their appropriateness to program or context. Furthermore, the often dazzling spatial strategies, as well as the techniques of collage and juxtaposition, are thoroughly of the 20th century. Initially a disciple of Robert Venturi, whom Stern launched (when in 1966 he curated "40 under 40," an important exhibition that brought a new generation of architects to public attention) on the national stage while still a student at Yale, gradually Stern moved in a more overtly historicizing direction. Nevertheless, the quality of wit and irony so important to postmodernists such as Venturi and Charles Moore also pervades Stern's work; their affinity for Pop art is mirrored in his amusing allusions that at times approach parody.

Stern's Postmodernism, a movement that he did much to foster, has many different sources, although he is particularly fond of the classical tradition (as explained in his book *Modern Classicism*), especially as represented in late 18th-century France (Poolhouse, Llewellyn Park, 1981, and Point West Place Offices, Framingham 1985 are both based on Claude-Nicolas Ledoux), Colonial (Residence in at Apaquogue, East Hampton, 1993), and Federal America (Observatory Hill Dining Commons, 1984, and Darden School of Business, 1996 both at the University of Virginia and therefore, predictably, transcriptions of Thomas Jefferson's work); his "Late Entry to the Chicago Tribune" (1980) marries Adolf Loos with Mies van der Rohe (each a classicist in his own way). However, Stern also is one of the most skillful manipulators of the late 19th-century Shingle style (houses on Martha's Vineyard, 1983), which he learned about firsthand from his Yale professor and later colleague Vincent Scully and from the frequent commissions in his early career that comprised extensions to authentic Shingle-style houses. When the building type demands it, he may turn to the Richardsonian Romanesque; thus, the Ohrstrom Library, 1991, at St. Paul's School is, in plan and elevation, an interpretation of Richardson's small-town libraries, complete with the eyebrow dormer windows, and Stern himself identifies Charles Rennie Mackintosh as a guide. Craftsman features, including touches

Darden Graduate School of Business Administration, University of Virginia (1996)

Photo © Mary Ann Sullivan

of Frank Lloyd Wright and Julia Morgan, inform the Roger Tory Peterson Institute, 1993, and the Columbus Regional Hospital, 1995, and Spanish Colonial contextualizes the Police Building, 1990, in Pasadena. Significantly, the five-story office building for Bancho House, 1989, does not look to Japanese architecture but to the classicizing style of the nearby British Embassy and other Westernized buildings in Tokyo. Further, as heroic modernism itself has passed into history, Stern is happy to emulate its most positive aspects; as his remodeled loft duplex (1999) in New Haven attests, he is especially fond of furniture produced under its banner, from Le Corbusier and Charlotte Perriand to Eames and Saarinen.

Stern's first executed work was the Wiseman House in Montauk (1967), an obvious bow to the Vanna Venturi residence, though altered to suit a family with children and incorporating elements from Le Corbusier. Houses of the next decade (including those done with John Hagmann, a Yale classmate who was a partner from 1969 to 1977), such as the Lang House in Washington, Connecticut, 1974, and the Beebe houses in Montauk, 1972, continued Venturi's lessons but revealed a penchant for interestingly varied sections and sensitive treatment of natural light and of views toward the land- and seascape. Stern has said that private houses are his obsession, and he has continued to design them, although subsequently, more public building types have eclipsed the domestic side of his practice.

However, the dense urban matrix composed of commercial structures informs his work. His first job (1967–70) was with the New York Housing and Development

Administration, and he has published an invaluable series of exhaustively researched books on New York City architecture. His firm has been responsible for many renovations and additions in New York City and has erected tall buildings in Boston as well as Manhattan. Yet small towns delight him, too: he has supported New Urbanists such as Andreas Duany and Elizabeth Plater-Zyberk and mirrored their insights in his planning, with Jacquelyn Robertson of Celebration, Florida, and other Disney sites. He also acknowledges studying his summer hometown of East Hampton in this connection. Stern even has affection for the much-maligned suburb, writing cogently on its virtues and making several ideal schemes that exploit its possibilities.

HELEN SEARING

S*ee also* **Celebration, Florida; Duany and Plater-Zyberk (United States); Johnson, Philip (United States); Moore, Charles (United States); Postmodernism; Venturi, Robert (United States)**

Biography

Born New York City, 23 May 1939. Bachelor of Arts Columbia University 1960. Master of Architecture, Yale University 1965. Married Lynn Solinger 1966 (divorced 1977): 1 child, Nicholas. Stern & Hagman Architects 1969–77; Principal, Robert A.M. Stern Architects from 1977. Worked in the office of Richard Meier 1966; from 1967–70, special assistant for Design, Housing and Development Administration of the City of New York. Teaching positions at Columbia University from 1969; Bishop Visiting Professor, Yale University 1979; Appointed Dean of the School of Architecture, Yale University 1998. Visiting critic at the Universities of Houston, Pennsylvania, North Carolina, Rice, at Mississippi State University, Rhode Island School of Design, North Carolina State University, Institute for Architecture and Urban Studies. First director, Temple Hoyne Buell Center for the Study of American Architecture, Columbia University 1984–88. President, Architectural League of New York 1973–77. Trustee, American Federation of the Arts 1967–79; Cunningham Dance Foundation 1969–73. FAIA. AIA National Honor Award 1980, 1985, 1990; New York Chapter of the AIA, Distinguished Architecture Award 1982, 1985, 1987, Medal of Honor 1984; John Jay Award, Columbia College 1991; Academy of Arts Lifetime Achievement Award, Guild Hall, East Hampton, NY 1999.

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STICKLEY, GUSTAV 1858–1942

Architect and designer, United States

Gustav Stickley remains one of the most well known figures of early 20th-century American architectural history, not because he was an architect creating revolutionary spaces or employing new materials or innovative structural systems but because he was perhaps the most influential designer of his generation. Stickley furniture and the Craftsman bungalow style established an appealing image that came to embody the honest and simple life of an unsophisticated, independent, democratic American. It is ironic that such an architectural influence would spring from a man who was not a trained architect but whose career as a furniture designer prompted a widespread change in domestic taste and residential design. Stickley's model houses influenced builders and home owners throughout the country to create whole neighborhoods of Craftsman bungalows as well as an interior aesthetic that personified home for an entire generation.

Elements inspired by English domestic architecture and an Arts and Crafts attitude toward craftsmanship especially informed the Stickley aesthetic. Inspired by the communal character of medieval great halls, Craftsman living rooms displaced formal parlors and opened to large dining rooms, creating gathering places for family and friends: the fireplace hearth and ample-dining room table encouraged conversation, intimacy, and conviviality, making the bungalow a place for social interaction as well as private comfort. Built-in bookcases, stenciled walls, and objets d'art brought a cultural enrichment and art into the lives of the inhabitant on a daily basis. Evidences of artisan craftsmanship abounded as sconces and chandeliers were handcrafted, linens and textiles ornamented tabletops and chests, and tilework enriched fireplace surrounds. The Craftsman interior was an artistic home in which art and life were synthesized, but not by means of sophisticated, dust-collecting bric-a-brac and the excessive ornamentation that had characterized Eastlake and Queen Anne interiors of the late Victorian Aesthetic movement, to which Stickley's simplified forms and restraint may be seen to be in reaction.

Gustav Stickley was the eldest son of a large family and one of the oldest of an emerging generation of American Arts and Crafts figures: born in Wisconsin in 1858, Stickley was two years younger than his archrival, Elbert Hubbard (b. 1856), founder of the Roycrofters, but four years older than Bernard Maybeck (b. 1862) and a decade older than Frank Lloyd Wright (b. 1867) and the Greene brothers (Charles Sumner Greene, b. 1868; Henry Mather Greene, b. 1870). Toward the end of the 1890s and following a series of enterprises in various furniture-making companies over about 15 years, Stickley traveled to England and the Continent, where he was exposed to Arts and Crafts ideals and the message of artisan handwork. William Morris (1834–96) had recently died, and John Ruskin (1819–1900) was too ill to receive visitors, but Stickley's affinity to their ideals and philosophy was indicated by his devoting the first issue of *The Craftsman* magazine (1901–16) to Morris and the second issue to Ruskin. Between Stickley's England visit and the establishment of *The Craftsman* in 1901, Stickley produced his first pieces of Craftsman furniture, rejecting the stylish and ecclectic furniture of his earlier business associations. As he began to make simpler Craftsman pieces, Stickley also experimented with proportions, refined forms, and developed a finish that would maintain the natural qualities of wood while protecting its surfaces and color.

Some 40 years earlier, when Philip Webb (1831–1915) completed Red House (1859) for William Morris, the client realized proper furniture and interior fittings were unavailable for his simple and "styleless" house, and so Morris looked to his artist and artisan friends to design pieces to ornament the house, establishing William Morris and Company to produce such furnishings for a wider audience and clientele. Stickley was faced with the reverse situation. He had developed a simplified, styleless furniture aesthetic and realized that late Victorian houses, particularly the popular Queen Anne domestic forms, were unsuitable for his simple, honest, and unadorned furniture, and thus the Craftsman bungalow was born.

The earliest designs for Craftsman houses were amateurish, and Stickley's first architects less competent, but following a brief association (1903–04) with Harvey Ellis, both the refinement of furniture and the quality of architecture improved. By the middle of the first decade of the 20th century, Stickley's Craftsman aesthetic had reached a maturity that stimulated a national craze. Both Craftsman furniture and Craftsman houses were marked by a frank structural expression that was strong and conspicuous in the elimination of carving, inlay, moldings, and ornament. Built-in furniture (bookcases and china cabinets) became part architecture, part furniture, and even freestanding furniture, such as settles, thronelike armchairs, and large refectory-inspired dining room tables or writing tables and appeared architectonic in their four-square, virtually "trabeated" construction and form.

As Stickley first turned from the ecclectic historicism and revivalism of earlier aesthetics, the United States was experiencing a surge of Arts and Crafts interest. Elbert Hubbard had established his Roycrofter community in East Aurora, New York, in 1895 and was soon publishing *The Philistine* magazine and his *Little Journeys to the Homes of the Great* book series. Arts and Crafts societies were founded in Boston and Chicago in 1897, in Minneapolis in 1899, and in Grand Rapids, Michigan, in 1902. Frank Lloyd Wright was buying and making artisan fittings and furnishings, including Stickley furniture, for his home in Oak Park (built 1889 on), and he produced his own artisan prairie houses during the first decade of the 20th century. Charles Keeler (1871–1937) founded the Ruskin Club (1896) in Berkeley, California, and Bernard Maybeck was building "simple homes" in the San Francisco Bay Area "tradition" already at the turn of the century. Greene and Greene were building bungalows in southern California when Stickley visited there in 1904, and the Greene brothers soon took the Arts and Crafts aesthetic to an extraordinary level of refinement and richness in such "ultimate bungalows" as the Blacker House (1907) and the Gamble House (1908).

Throughout the period, Stickley's Craftsman empire was widening. In November 1903, *The Craftsman* magazine announced the Home Builder's Club, through which any subscriber could order free home plans for houses costing $2,000 to $5,000. By 1916, when the magazine folded, some 200 plans had been published, appearing monthly since 1904. By 1914 Stickley's Craftsman furniture was being sold by some 50 dealers.

In 1905 Stickley was headquartered in New York City, although he maintained his furniture factory earlier established at Eastwood (Syracuse), New York. In 1911 Stickley built the Craftsman Farms in Morris Plains, New Jersey, and two years later he took the dramatic step of leasing a small skyscraper in New York in which to consolidate his enterprises. The 12-story, 200-foot-deep Craftsman Building on 39th Street in New York City contained four lower floors of showrooms for furniture, draperies, and rugs; four middle floors housing the Craftsman Permanent Homebuilders Exposition, in which manufacturers rented space to display house and garden products and model rooms; and four top floors for various Stickley enterprises supporting the Craftsman movement: Craftsman workshops demonstrating crafts, Craftsman architects available to discuss house plans, and the editorial offices of *The Craftsman* as well as club rooms, lecture rooms, a library, and a restaurant, the latter serving meats, vegetables, and fruits homegrown on the Craftsman Farms in an ambiance in which restaurant patrons sat at Craftsman dinner place settings amidst Craftsman chairs, Grueby tiled fireplaces, and Craftsman fittings.

The whole was too much. Stickley had overextended, and by March 1915, The Craftsman Inc. was bankrupt. *The Craftsman* magazine published its last issue in December 1916 and merged with *Art World* in January 1917. Stickley left New York and soon returned to Syracuse for a brief but unsuccessful effort to work with his brothers in the furniture business (Stickley Associated Cabinetmakers, 1917–18). By 1918, Stickley was 60, the country was at war, and his wife had died. Stickley moved back to his old Syracuse home, now owned by his daughter and her husband, and for 24 years lived in a third-floor suite with a small kitchen where he continued experimenting with wood finishes, still working with his hands in admiration of the natural properties of wood.

From the end of the 19th century until World War I, Stickley created a national empire of furniture and furnishings that inspired a national movement in architecture. When Midwest regional artist Grant Wood painted the tapered piers of a bungalow porch and called his picture "Main Street Mansion," he made an icon of Stickley's Craftsman bungalow for Everyman: a simple American house characterized by a direct structural expression of carpentry and joinery and an honest display of materials. The Craftsman house was the product of entrepreneurial enterprise, Arts and Crafts ideals, and Stickley's reverence for simplicity. Within the short period of a single generation and in the tradition of an Emersonian, self-reliant individualism, a furniture maker had become one of the most influential designers in the history of American domestic architecture: In the opening years of the 20th century, Stickley produced the quintessential house style for democratic America.

ROBERT M.CRAIG

See also **Arts and Crafts Movement; Bungalow; Greene, Henry M. and Charles S. (United States); House; Maybeck, Bernard (United States); Regionalism; Wright, Frank Lloyd (United States)**

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STIRLING, JAMES 1926–92

Architect, Scotland and England

James Frazer Stirling was born in Glasgow in 1926 but was rather proud of having been conceived on board a ship docked in Manhattan. His father was a marine engineer, and this might account for Stirling's love of tight, shipshape modern design. He studied architecture at Liverpool University, where the presence of Colin Rowe as a fellow student may help explain the classical and humanist tendencies seen in his later work.

In 1953 Stirling worked for Lyons Israel and Ellis in London, where he met James Gowan. They commenced practice together in 1956 and soon became known for a series of buildings that, although uncompromisingly modern, owed little to the thendominant International Style. The principal works of the partnership were houses at Ham Common (1955–58); a competition project for Churchill College, Cambridge (1958); a project for Selwyn College, Cambridge (1959); and the Leicester University Engineering Building (1959–63), which achieved worldwide fame both for its dramatic contrast of red bricks and greenhouse glazing and for the audacity of its formal precision.

From 1964 to 1971, Stirling practiced alone. To this period belong many original designs, including the Cambridge University History Faculty Building (1964–67); residential units for students (1964–68) at St. Andrew's University; the projects for Dorman Long Headquarters (1965) in Middlesborough; the Florey Building (1966–71) for Queen's College, Oxford; housing for Runcorn New Town (1967–76); the Olivetti Training Centre (1969–72) at Haslemere; and projects for Siemens AG (1969) in Munich and for Derby Civic Centre (1970). In the two last projects, Leon Krier was assistant, and his hand may be detected in drawings made between 1968 and 1970. It seems that Stirling's work did not conform sufficiently to the current ethos, and almost ten years were to pass before he again received an important British commission—for the extension of the Tate Gallery in London (1986).

From 1971 to 1992, Stirling was in partnership with his associate Michael Wilford. Their more important work includes projects for the Olivetti Headquarters (1971) at Milton Keynes

The Clore Gallery for the Turner Collection, Tate Gallery, London (1986)

Photo © Mary Ann Sullivan

and for an Arts Centre (1971) at St. Andrew's University, competition designs for the Kunstsammlung Nordrheim-Westfalen in Düsseldorf and the Wallraf-Richartz Museum in Cologne (both 1975), extensions to the Staatsgalerie Stuttgart (1977, opened 1984), and a new building for the Württenbergisches Staatstheater in Stuttgart.

After taking part in a competition for lower Manhattan in 1968 and serving as a visiting critic and professor at the Yale University School of Architecture from 1960, Stirling became well known in the United States. As a result, he received a number of commissions, including an extension to the Rice University School of Architecture (1979–81) in Houston; the Sackler wing of the Fogg Art Museum (1984), Harvard University, Cambridge, Massachusetts; and the Chemistry Department (1981), Columbia University, New York. The latter project was abandoned, but the Performing Arts Center for Cornell University in Ithaca, New York, was completed in 1988 and the Science Library for the University of California, Irvine, in 1996.

Some critics have seen Stirling's work after 1970 as taking on an increasingly formalist tendency. Works such as the Staatsgalerie Stuttgart and the Tate Gallery extensions have been referred to as Postmodern. Close examination, however, will show the underlying unity of all his work, although there is certainly an important shift (somewhat analogous to the shift in Le Corbusier's late work with the Chapel of Notre Dame du Haut in Ronchamp) in that, compared with his earlier buildings, a freer rein is given to expressive gestures. Stirling is always consciously experimental in his use equally of eclectic reference and formal structures. In freely admitting the premeditated nature of all artistic creation, he has liberated himself from the false determinism that plagued so much architectural production after 1945. The element of historicity in his work is no less self-conscious and willful than was the element of modernity in his early work. It is this candor and lack of preconception that perhaps makes his work so vital.

Some of Stirling's most interesting work remains in the form of projects, such as the superb design for a Public Library (1983) at Latina in Italy; the competition entries for the National Gallery Extension (1985) in London; the Thyssen Art Gallery (1986) in Lugano; a design for residential development (1988) at Canary Wharf, London; the Philharmonic Hall (1988) for Los Angeles; the Bibliothèque de France (1989); and the Tokyo International Forum (1989).

However, other larger commissions have matured, giving us the Research and Production Headquarters for Braun Pharmaceuticals (completed 1992) at Melsungen, near Frankfurt, with the collaboration of Walter Nägeli. Since Stirling's death in 1992, we have the Music Academy (completed 1995) at Stutt-gart; the Science Library (completed 1996) for the University of California, Irvine; the Temesek Polytechnic University (1998) in Singapore; a mixed development at No. 1 Poultry (completed 1998) in the city of London; the mixed residential and offices building (completed 1999) in Carlton Gardens; and the Performing Arts Centre (under construction) at Salford, Lancashire.

Of these, the Braun Headquarters is especially remarkable for the expressiveness of its forms. The single line of conical capitals carrying the administration building is rendered immaterial in certain lights by the choice of materials, so that the building seems to float rather than bear down. It is as though the language of modern architecture had been taken into meditation and revised in the light of an inner vision.

All these works show a remarkable consistency in their conception and design, which is probably explained by the talent and the loyalty of the architects that Stirling and Wilford have employed. Since Stirling's unnecessary death in 1992, the control of the office has passed to his partner, Michael Wilford, who has affirmed his commitment to the sort of architecture that Stirling practiced: experimental, making use of technology but not allowing technology to impose its values alone, aiming always to extend and improve the city fabric, and communicating enjoyment to ordinary people. The working team remains largely intact, and the work continues in large measure to be imprinted with his genius. In 1992, just before going into the hospital for a routine operation, Stirling accepted a knighthood.

ROBERT MAXWELL

S*ee also* **Chapel of Notre-Dame-du-Haut, Ronchamp, France; Neue Staatsgalerie, Stuttgart**

Biography

Born in Glasgow, Scotland, 22 April 1926. Studied at the Liverpool School of Art 1942; attended the University of Liverpool School of Architecture 1945–50; exchange student in New York 1949; degree in architecture 1950; studied at the School of Town Planning and Regional Research, London 1950–52. Served in the British Army 1942–45. Worked as senior assistant for Lyons, Israel, Ellis and Gray, London 1953–56; partnership with James Gowan, London 1956–63. Private practice, London from 1964; partner, with Michael Wilford, James Stirling and Partner, later James Stirling, Michael Wilford and

Associates, London 1971–92. Visiting lecturer, Architectural Association, London 1955; visiting lecturer, Regent Street Polytechnic, London 1956–57; visiting lecturer, Cambridge University School of Architecture 1958; Royal Institute of British Architects Lecturer 1965; Davenport Professor, Yale University, New Haven, Connecticut from 1967; visiting professor, Akademie der Künste, Düsseldorf from 1977; Banister Fletcher Professor, London University 1977; Architect-in-Residence, American Academy, Rome 1982. Associate, Royal Institute of British Architects 1950; honorary member, Akademie der Künste, Berlin 1969; honorary fellow, American Institute of Architects 1976; honorary member, Accademia delle Arti, Florence 1979; honorary member, Accademia Nazionale de San Luca, Rome 1979; fellow, Royal Society of Arts, London 1979; honorary member, Bund Deutscher Architekten, West Germany 1983. Gold Medal, Royal Institute of British Architects 1980; Pritzker Prize 1981; knighted 1992. Died in London, 25 June 1992.

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Churchill College (competition project), Cambridge, 1958

Selwyn College (project), Cambridge, 1959

Engineering Building, Leicester University, 1963

Dorman Long Headquarters (project), Middlesborough, Yorkshire, 1965

History Faculty Building, Cambridge University, 1967

Student Housing, St. Andrew's University, Scotland, 1968

Siemens AG (project), Munich, 1969

Derby Civic Centre (competition project), 1970

Florey Building, Queen's College, Oxford, 1971

Olivetti Headquarters, Milton Keynes, Buckinghamshire, 1971

Arts Centre, St. Andrew's University, 1971

Olivetti Training Centre, Haslemere, Surrey, 1972

Kunstsammlung Nordrheim-Westfalen (competition project), Düsseldorf, 1975

Wallraf-Richartz Museum (competition project), Cologne, 1975

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Staatsgalerie (extension), Stuttgart, 1977

Building for the Württenbergisches Staatstheater, Stuttgart, 1977 School of Architecture (extension), Rice University, Houston, 1981

Chemistry Department (unbuilt), Columbia University, New York, 1981

Public Library (project), Latina, Italy, 1983

Sackler Wing, Fogg Art Museum, Harvard University, Cambridge, Massachusetts, 1984

National Gallery Extension (competition project), London, 1985

Clore Gallery, Turner Collection, Tate Gallery, London, 1986

Thyssen Art Gallery (competition project), Lugano, 1986 Residential Development (competition project), Canary Wharf, London, 1988

Performing Arts Center, Cornell University, Ithaca, New York, 1988

Philharmonic Hall (competition project) Los Angeles, 1988
Bibliothèque de France (project), Paris, 1989
Tokyo International Forum (project), 1989
Research and Production Headquarters, Braun Pharmaceuticals, Melsungen, Germany (with Walter Nägeli), 1992
Music Academy, Stuttgart, 1995
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Mixed Development, No.1 Poultry, London, 1998
Mixed Development, Carlton Gardens, London, 1999

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STOCKHOLM PUBLIC LIBRARY

Designed by Erik Gunnar Asplund; 1918–28; additions 1928–31
Stockholm, Sweden

The City Library (Stadsbiblioteket) in Stockholm, designed by Erik Gunnar Asplund, is one of those unusual 20th-century buildings that has had two lives. Design work began in 1918, and the Library opened to widespread acclaim ten years later. Its second life came in the late 1970s and the 1980s, when architects and critics were looking afresh at early 20th-century architects such as Asplund, whose work represented a form of modernity that did not involve the adoption of modernist functionalism.

The commission of the City Library was prompted by a gift from the Knut and Alice Wallenberg Foundation. Their donation of one million kronor (Swedish crowns) stipulated that matching funds as well as land and all design costs be provided by the Stockholm City Council. Carl Westman (1866–1936), who had just completed the

Rådhuset (1908–15), the municipal courthouse in Stockholm, was invited to serve as architectural consultant, but he declined, and an offer was made to Asplund, then only 32 years old, who was appointed on 2 December 1918. It was an important commission, not only for the prominence of building and site but also for its uniqueness: It was the first public library building in Sweden from which patrons themselves could remove books from the shelves.

The site chosen was the corner of Sveavägen and Odengatan, slightly outside the center of the city, on a lot that included the termination of the Brunkebergsåsen ridge, on which Carl Hårleman had built an observatory (1746–53). The first plan (published 1921) was to develop the entire lot, including a school of economics and law faculty for the University of Stockholm as well as the Library and a market hall along Odengatan. Work began initially on the Library program, and in May 1920 Asplund and the city librarian Fredrijk Hjelmqvist were sent to the United States to study American libraries. Their journey took them to the major cities on the East Coast and the Midwest, and the visitors were particularly impressed by Cass Gilbert's Main Library (1913–21) in Detroit, Michigan, which provided a model for the centralized plan, second-story book room, and upper-level down lighting later employed in Stockholm. Asplund was also impressed by the functionalist process by which Americans studied libraries. "In America," he wrote in his travel journal, "one gets an overwhelming impression of the extraordinary, almost scientific care with which the libraries are designed. It is a continuously evolving development towards better result. Experiences of earlier libraries are studied and utilized in every new one."

Asplund was predisposed to a classically inspired solution for the Library. His earliest sketches, possibly from 1919, employ circular spaces that suggest that the original inspiration might have been Palladio's Villa Rotunda in Vicenza. This kind of source might have been expected for someone educated at the Klara School (1910–11), where stripped-down classicism was used to evoke modernity. Revisions (1921) to the original proposals, after the American trip, show a gridded facade with paired columns and a truncated entablature that recalls, albeit much simplified, Ivar Tengbom's contemporary Konserthuset (1920–26). As part of this early scheme, a dome rises prominently from the center of the block.

Changes were made by the time of construction. The building was raised to a broad plinth above street level to accommodate the irregular terrain, and the university buildings and market hall were suppressed. Along Sveavägen, shops were added, and entry to the Library was placed on axis with the main door along a ramplike flight of stairs through the (later) shopping block. The Library itself is a square with a projecting cylinder rather than a raised dome, as originally proposed, to mark the circular reading room rotunda. Around the outside of the Library is a low-relief Etruscan-Egyptian frieze, and the marble door is Egyptian in style, with canted sides. From the marble entrance lobby, a flight of narrow stairs between dark marble walls leads directly to the reading room, a fact that is also revealed from street level.

The central reading room is the heart of the plan. Three levels of open-shelved books surround the central space. This was Asplund's clear design preference, and he argued to the program committee that in addition to its formal value, the circular plan was more functional, allowing more space along the walls for bookshelves and on the floor for desks, chairs, and the librarians' station. The reading areas were furnished with lights, tables, and chairs designed by Asplund. All other rooms (for reading, study, and periodicals) are subservient to the central space, located either in the surrounding square or, as light wells, in the spandrels between the square and the rotunda. One of the most noted rooms is a special section for children that was decorated with a semicircular fresco by Nils Dardel depicting the dream figure of John Blund and his umbrella. (Blund is a kind of sandman who brings sleep and happy dreams to Scandinavian children.)

There has been much discussion of the nature of Asplund's sources. Roman sources from the Pantheon to the Castel Sant'Angelo (Rasmussen, 1940) and to the Tomb of Hadrian, as illustrated by Fischer von Erlach (Donnelly, 1992), have been the most commonly cited for the square plus cylinder. Caldenby (1985) and others have suggested that the Library might depend on Claude-Nicolas Ledoux's Rotonde de la Villette (1785–89), one of his tollbooths for Paris. It has also been suggested that Asplund knew Étienne Boullée's Cenotaph for Isaac Newton (Wrede, 1980), an unlikely possibility, as Boullée's image was generally available only later. A more conventional source, one that is typologically appropriate, would have been Sidney Smirke's rotunda (1854–57) for the British Museum in London. Perhaps the initial idea for a dome came from Hårlemann's observatory on the hill above. Finally, it cannot be forgotten that the City Library stands at the north end Sveavägen, a street that originates at Tessin's Royal Palace on Gamla Stan and that provides justification for the monumental character of the building. Indeed, a specific recollection might be found in the ramplike entry, which recalls the approach to the Royal Palace up Slottsbacken in addition to stairway sequences that had inspired him during his Italian journey (1913–14), as has been observed by Winter. Finally, the classicizing order of the building includes decorative motifs: Egyptian, Etruscan, and Greek Revival, most notably from Michael Gottlieb Bindesbøll at the Thorvaldsen Museum in Copenhagen (1839–48), whose Egyptian-style portal seems to have been a specific inspiration.

The precise symbolic program of the Library remains elusive. Of course, the circle within the square and the dome recollect a heavenly universality. An early drawing (1921) shows a medallic portrait of a bald-headed man with a short beard in profile over the door, possibly a representation of an ancient philosopher. On the floor of the entry mosaic is the inscription (in Greek) "Know Thyself." In the entrance hall, the walls are reliefs by Ivar Johnson with scenes from Homer's *Iliad.* Somewhat at odds with this evocation of ancient myth and philosophy are the original door handles of the Library, now preserved on the second floor. They represent Adam eating the apple (inside handle) and Eve with the apple (outside handle), and both needed to be gripped and held, if briefly, by patrons entering and exiting the Library. Do they suggest the potential dangers of knowledge or a recognition that it is in human nature to eat from the tree of knowledge? Or are they prelapsarian guardians of a paradisaic place of knowledge?

The Library remains largely unaltered from its original construction. In 1974, a double flight of stairs was built to handle traffic to the upper gallery, elevators were installed, and building restoration was undertaken (1979–81) with the opening of a further light well. The original entrance doors were replaced, the furnishings were renovated, and the lighting was improved at that time. In 1994, the entire Library and terrace building was replastered and painted.

Following the completion of the Library, Asplund plunged into work on the Stockholm Exhibition of 1930 and began his brief functionalist period. Already, the reflecting pool (completed 1931) along Sveavägen evokes modernist architectural concerns as do the retail shops at street level and the small rear facade addition (1928–31). Indeed, the building was completed at a critical point in Swedish architectural history. Writing in the magazine *Byggmästaren* (1928), the architect Uno Åhrén declared, "New classicism is dead." The Library, he wrote, "stands at the border, not between two minor stylistic tendencies of Swedish architecture, as some suggest, but between two phases of fundamental difference in mentality." Åhrén was right to the extent that the succeeding years did not favor the classicizing references that Asplund deployed in the Library. Nonetheless, writers on Asplund, such as the Englishman Eric de Mare (1955), continued to praise the prefunctionalist phase of Asplund's career despite—or perhaps because of—its traditional nature.

In the 1970s, when Asplund became a focus of attention for a generation of Postmodernist architects "stalking," in the words of Treib (in Engfors, 1986), "the considered balance between modernity and tradition," the Library became a pilgrimage site. Architects such as Leon Krier looked to the Library as a model of geometric typology. In the United States and Italy, Romaldo Giurgola and Aldo Rossi helped revive interest in Asplund; Kenneth Frampton and Stuart Wrede (1980) were also influential in the United States, along with Michael Graves and Thomas Beeby, who were probably introduced to Asplund by the architectural critic Colin Rowe (see the essay by Parsons in Engfors, 1986).

NICHOLAS ADAMS

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STOCKHOLM, SWEDEN

The center of Swedish activity in architecture during the 20th century was Stockholm, its capital city. Not only was Stockholm the locus of political, financial, and cultural power, but it was also the site of the major architecture school in Sweden, the Kunigligan Teknikiska Högskolan.

The two most significant buildings in Stockholm at the beginning of the 20th century, the Nordiska Museum and the Town Hall, represent different aspects of national consciousness in architecture. With its prominent position on the island of Djürgården, Isak Gustaf Clason's (1856–1930) Nordiska Museum (1889–1907) was intended to be a temple for Swedish culture. Its towers recall the great castles of the Vasa period (Gripsholm, Vadstena, and Kalmar), and its gables recall the Trefaldighetskyrkan (1658) in Kristianstad. The entrance portal is in the form of a secular Gothic-style cathedral with Mother Svea and Odin. The use of stone from around Sweden and the naturalistic carving by local stonemasons recall principles enunciated by the English critic John Ruskin. At the center of the building is a great room, evoking both castle hall and ecclesiastical nave, and a monumental statue of Gustav Vasa by Carl Milles (1875–1955). In short, the building celebrates national culture through its great moments of history, both real and mythic, and representative examples of its geology.

By contrast, the Town Hall (1904–23), designed by Ragnar Östberg (1866–1945), is much less explicit in its sources; historic architecture is evoked through the lens of the native traditions of arts and crafts. Although made of brick, traditionally common in southern Sweden, its profile recalls an Italian communal palace rather than any Swedish building. Östberg has confected his historical references: part Romanesque, part Gothic, and part Byzantine. The great top-lit hall at the center of the building, the so-called Blue Hall, is slightly out of square, deliberately recalling the craft traditions of the Middle Ages.

New influences arrived from the United States and from Germany in the 1910s and 1920s. Sweden was especially receptive to North American architecture as a result of emigration. Many architects and artists traveled to America, some to stay, some to profit on their return. Ferdinand Boberg, for example, took advantage of his visit to Chicago for the World's Columbian Exposition of 1893 to study American building practices, and Gustaf Wickman (1858–1916) and Carl Westman (1866–1936) visited the United States and were inspired by H.H.Richardson. With the construction of a pair of concrete skeleton-frame skyscrapers, North American influence became technological and urbanistic. Over 60 meters tall, the skyscrapers were part of the 1919 master plan. The new street, Kungsgatan, broke through the old ridgeline, leaving the old street as a flying bridge. The northern skyscraper, inspired by Louis Sullivan, was designed by Sven

Wallander (1890–1968) and employed a tripartite division and vertical pilaster strips "to describe," as Wallander said, "the forces at work within." The southern tower, similar in form, was built by Ivar Callmander (1880–1951) in 1925. The urbanistic effect recalls the multilevel visions of New York in Moses King's *Views of New York* or even the most up-to-date American architecture at Grand Central Terminal in New York City, where the Park Avenue flyover had just been connected.

In this period, connections with Germany and Austria are decisive for the architecture of Stockholm, as can be seen in works such as the Liljevachs Konsthall (1913–16), built by Carl Bergsten (1879–1935) for the sawmill magnate C.F.Lilejevalch. It was built on a grid plan with concrete piers and brick screen in-fill. In its rationalism, it recalls the work of Peter Behrens and Heinrich Tessenow and thus marks a significant passage from Östberg's Town Hall. Like Östberg's Blue Hall in the Town Hall, the main gallery is lit by a clerestory window that encircles the room at the upper level, but the gray-concrete trim and columns alternate with the white of the walls to recall Behrens' favored Italianate sources, as the coffered ceiling and decorative details further reveal. Bergsten also built the church at Hjorthagen (1904–06), which recalls Wiener Werkstätte designs. Architects such as Ivar Tengbom (1878–1968) also employed a simplified Italianate classicism.

The figure that most effectively represents the advanced trends of architecture in this period in Stockholm is Gunnar Asplund (1885–1940). In the early phase of his career, he combined apparent opposites: the traditions of Östberg's folk architecture with the reductionist geometry of the Germanic countries. His Woodland Chapel (1920), for example, employed traditional materials (wrought iron, stone, and wood) but in rigid geometric order. In his designs with Sigurd Lewerentz (1885–1975), with whom he shared design responsibilities for the Woodland Cemetery (1915–40), these are integrated into the traditions of Swedish landscape made mythic with biblical references. Lewerentz's Chapel of the Resurrection (1925) is strongly classical in inspiration, and in the Skandia Cinema (1922–23) and City Library (1920–28), Asplund's classicizing tendencies emerge clearly.

Asplund soon moved in a new direction. In 1928, he was appointed chief designer for the Stockholm Exhibition organized by Slöjdföreningen (the Society for Arts and Crafts), which opened on 16 May 1930 on Djurgården. Asplund took on the task of shaping Swedish notions of European modernism. With his associates, notably Sven Markelius (1889–1972), Uno Åhrén (1897–1977), and Wolter B. Gahn (1890–1985), he provided a series of exhibition buildings decorated with flags, constructivist neon signs, nighttime floodlighting, and playful graphics to display new techniques of construction and new design approaches in housing, office design, and urbanism. With this group, which included Gregor Paulsson (1889–1977) and Eskil Sundahl (1890–1974), Asplund authored a manifesto of modern functionalism (1931) with the declarative title *acceptera:* "Accept the reality before you only through it do we have any prospect of mastering it, of coping with it so as to alter, and to create culture that is a handy tool for one's life." Swedish architects were receptive to the ideas of functionalism. With many architectural problems in need of solutions, notably in the field of housing, functionalism seemed to offer a logical path toward their resolution. The strip window, for example, which might need to be rationalized elsewhere, made perfect sense at 60 degrees north, where the sun barely moved beyond the horizontal much of the year. At another level, however, the success of functionalism reflected a broader cultural effort: 20th-century Swedes who wanted a modern Sweden based on values other than those of the state, the church, or bourgeois capitalism. The first public building in the functionalist style was Markelius and Åhrén's Kårhus (student center, 1928–30) at the Kunigligan Teknikiska Högskolan. Lewerentz's unadorned gridded facades for the Riksförsäkrings-verket (1930–32), or national insurance board, is a significant early example of government-commissioned functionalism.

It was not until after World War II that significant architectural inroads were made into the old fabric of the city, although not always with happy results. The Hötorscity office and commercial complex, for example, was started in 1945 and recalls Gordon Bunshaft's Lever House in New York City. By David Hellden (1905–90), Anders Tengbom (1911–), Sven Markelius, Lars Erik Lallerstedt (1864–1955), and Backström (1903–92) and Reinius (1907–95), of the firm Backström and Reinius, Hötorscity consists of five multistoried slab blocks (with a significant pedestrian component). Construction was not completed until the mid-1950s. The development gave Stockholm an American-style architectural skyline. In 1971–73, Kulturhuset, a megastructure at Sergels Torg by the architect Peter Celsing (1920–74), inspired in part by Le Corbusier, provided a city-sponsored communal center with theaters, restaurants, meeting space, and exhibition space nearby. One of the most significant buildings of this period was Celsing's gridded facade to the Riksbanken (1976), behind Kulturhuset, which suggested greater acceptance of historical forms. In effect, Lewerentz's Riksförsäk-ringsverket grid of the 1930s was transformed into rusticated stone. Important church buildings by Celsing (Olaus Petrikyrkan, 1957–59) and Lewerentz (Markuskyrakan in Björkhagen, 1956–60) demonstrated a new attention to traditional materials.

By the 1970s, the era of large-scale city demolition was over. Protests in 1971 over the felling of a stand of elms in Kungsträd-gården to make way for a subway station marked the change in public sentiment, although the last of the great reconstructions was still ongoing at the end of the century. Cityterminalen (1986–89) by Arken Arkitektur with Ahlqvist and Culjat, Ralph Erskine (1914–), and Tengboms Arkitektkontor is a mixed public-private venture adjacent to the Normmalm shopping district designed to create a new business-conference center at Stockholm's transportation node (bus, subway, and train). Slowed by the downturn in the economy at the beginning of the 1990s, when completed the project will form a new, efficient business center near the heart of the old city.

Any survey of Stockholm in the 20th century must touch on housing. At the beginning of the century, more than 50 percent of living quarters consisted of one room plus a kitchen or less. There were various experiments: garden city-style suburban developments at Gamla Enskede (1907) designed by Per Olof Hallman (1869–1941) and Herman Ygberg (1844–1917), functionalist-style worker housing at Svarneholmen (1928–1930) designed by Olof Thunström (1896–1962) of the firm KFAI, and the founding in 1936 by the City of Stockholm of the Familjebostäder and Stockholmshem housing companies, both of which were responsible for the erection of large-family housing in areas such as Abrahamsberg, Åkeshov, Riksby, and Åkeslund. The first examples of collective housing were designed by Markelius at John Ericssonsgatan

(1934–35).

The nature of housing construction changed after World War II. In 1941, the Stockholm City Council decided to build a new subway system, and construction began between Slussen and Hökarängen (1950) and Hötorget and Vällingby (1952). The two lines were linked at the main train station, T-Centralen, in 1957, and housing was developed along these lines. The plan was to build developments of between 10,000 and 15,000 inhabitants centered on a subway station with small commercial and service centers, a school, and playing fields within walking distance. Among the newly incorporated suburbs, Vällingby is among the best known and became an international model for new town construction. Planning began as early as 1940, and ground was broken in 1951. With its commercial center designed partially by Backström and Reinius, its adjacent subway station by Magnus Ahlgren (1918–), churches by Celsing and Carl Nyrén (1917–), and segregated pedestrian/cycle paths, it was model of efficiency. Around the center were large slab blocks of multistory apartments, and farther out were row houses. Farsta (1953–61) was a similar counterpart south of central Stockholm.

In 1965, the Swedish government sought to put an end to the housing shortage and developed the Miljonprogrammet (Million Dwelling Program), which also had an effect on Stockholm. In Rinkeby and Tensta, for example, huge anonymous apartment buildings were built, and although later examples improved this type at Norra Järva, Akalla, Husby, and Kista, they were not popular. Additionally, terrace housing on an American pattern—that is, without proximate public services and thus requiring the use of an automobile for all activities—was built in areas such as Kälvesta and Hässelby.

At the end of the 20th century, it is difficult to isolate projects that will have lasting architectural influence on the city. From a visual point of view, the Globen sports complex by Berg Arkitektkontor AB (1986–88) is the most important but is not universally welcome. The giant sphere looms over Södermalm like an escapee from a Walt Disney amusement park. More significant, Ralph Erskine's Aula Magna (1988–90) at Frescati represents the continuing engagement of Stockholm's urban architecture with its natural environment, and the Moderna Museet and Arkitekturmuseet (1990–98) by Rafael Moneo (1937–) on Skeppsholmen and Ricardo Bofill's (1939–) Bågen Residence (1989–1991), a vast, crescent-shaped housing development at Södra station, are examples of the renewed influence of foreign architects, something not felt strongly in Stockholm.

NICHOLAS ADAMS

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STONE

Stone has two distinct architectural faces: in monumental architecture, it stands for wealth, power, and permanence; on the other hand, especially when used at a domestic scale and based on local craft traditions, it appears as modest, forthright, and natural. These two aspects of stone correspond to the varying levels of effort and skill marshaled in its fabrication, transportation, and erection. Finely worked, accurately cut blocks, sometimes of exotic origin or polished to a jewel-like finish, characterize monumental architecture, while fieldstone, rubble, or roughly worked stone set in thick mortar beds is more often associated with modest works. Stone's symbolic content is not determined by these two traditions alone but also reflects the revolutionary changes brought about by industrialization and by the attitudes—ranging from ambivalence to outright hostility—with which those changes are greeted. Increasingly anachronistic from a purely functional standpoint, stone survives in 20th-century architecture largely as a medium through which these attitudes can be symbolically expressed.

At the beginning of the 20th century, monumental stone architecture is associated primarily with neoclassical and Gothic Revival styles. McKim, Mead and White's Pennsylvania Station (1910) and James J.Farley Post Office (1912), both in New York City, employ classical stone facades—Doric and Corinthian, respectively—coexisting with an infrastructure of glass and steel necessary to accommodate and express the realities of modern urban life. Ralph Adams Cram, America's leading Gothic Revivalist, also incorporates modern construction technologies—including various hidden reinforced-concrete decks, lintels, and bond beams—together with traditional limestone detailing in projects such as his Princeton University Chapel (1922) in Princeton, New Jersey.

At the same time, neoclassical monumentality was attacked from several points of view at the beginning of the 20th century. The Arts and Crafts movement, reacting to the social and physi-cal fallout associated with industrialization, proposed a return to "honest" craft values. These values are expressed in the rough stone walls of W.R.Lethaby's All Saints' Church (1902) in Herefordshire, England, and the rounded rubble stone foundations of the John Bakewell Phillips House (1906) designed by the Greene Brothers in Pasadena, California. Edwin Lutyens' use of rubble stone in early 20th-century residential projects such as Grey Walls (1900) in Gullane, Scotland, is similarly rooted in an Arts and Crafts sensibility, although his monumental Viceroy's House (1931) in New Delhi, clad with finely worked red-and-buff-colored Dholpur sandstone, reaffirms the neoclassical tradition, albeit combined with vernacular elements.

The most radical of the reactions against traditional architectural styles was

International Style modernism. Modernists invoked the idea of "truth to materials" to provide intellectual cover for the unsettling changes in the built environment associated with the industrial revolution—specifically, the rationalization of the building process to increase productivity and reduce costs. Eliminating gratuitous decoration (such as the ornamented stone facades of traditional monumental architecture) became a fundamental tenet of modernism. However, the use of stone as honest bearing wall or smooth-surfaced veneer was generally accepted.

Le Corbusier's Villa de Mme de Mandrot (1931) in Le Pradet, France, illustrates the use of undecorated stone walls within a modernist syntax, as does his earlier exploration of parallel masonry bearing walls in the Maisions Citrohan projects of the early 1920s. While such structural stone walls remained fairly common in domestic-scaled buildings—Frank Lloyd Wright's dramatic use of stone piers supporting horizontal cantilevers of reinforced concrete at Fallingwater (1938) in Bear Run, Pennsylvania, is a notable example—the development of steel and concrete frameworks rendered stone load-bearing walls virtually obsolete for larger institutional or commercial buildings. An exception is Kevin Roche's Creative Arts Center at Wesleyan University (1973) in Middletown, Connecticut, consisting of 14-inch-thick limestone bearing walls laid without mortar and capped by a reinforced-concrete roof structure. Roche uses a similar stone system in his additions to the Metropolitan Museum of Art (1974–80) in New York City.

Attitudes toward nonstructural cladding, articulated by 19th-century theorists such as John Ruskin, Carl Bötticher, and Gottfried Semper and adapted in the 20th century by European architect-theorists such as Otto Wagner and Adolf Loos, provided a theoretical basis for the "honest" expression of thin stone veneer. Wagner's Post Office Savings Bank (1906) in Vienna, although constructed with conventional brick bearing walls, is clad with thin marble panels visibly attached to the brick walls with aluminum-capped iron bolts. Adolf Loos used stone and other cladding materials to develop richly surfaced interior spaces that correspond not to the structure of his houses but to the logic of their social functioning. Loos' Müller House (1930) in Prague includes thin green-veined Cipollino marble panels on key interior surfaces, emblematic of wealth and refined taste but at the same time marked by a certain modern dissonance. Stone cladding was often used to impart a kind of traditional legitimacy to otherwise modern buildings. Examples include Mies van der Rohe's Barcelona Pavilion (1929), Giuseppe Terragni's Casa del Fascio (1936; now Casa del Populo) in Como, Italy, Edward Durrell Stone and Philip Goodwin's Museum of Modern Art (New York City, 1939), and the United Nations Secretariat Building (New York City, 1953) by Wallace K.Harrison and others.

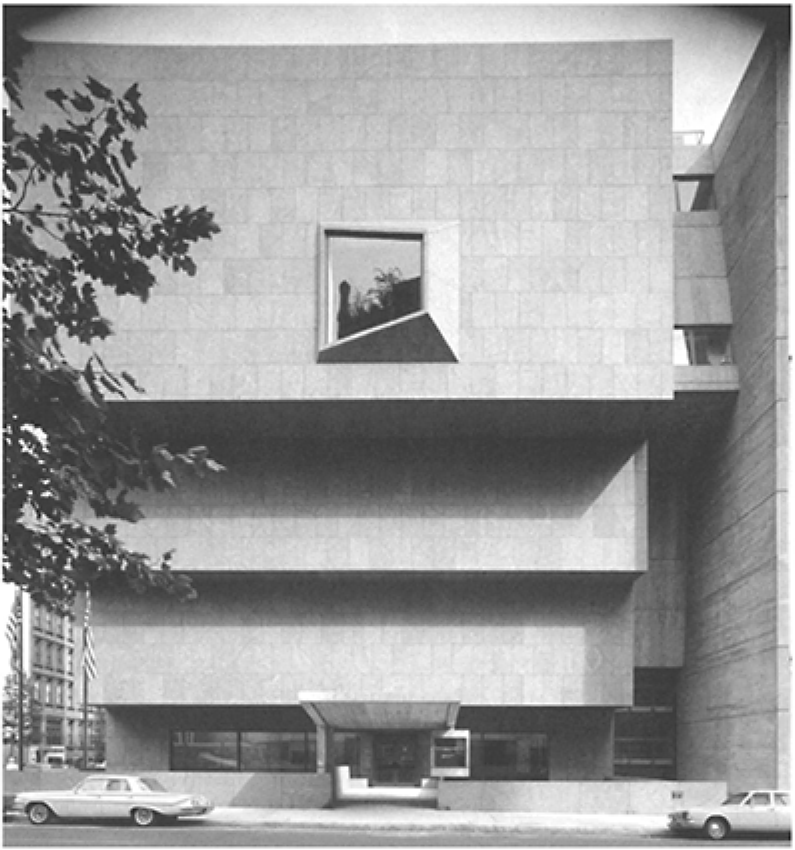
On the other hand, rough stone was used to impart a more domestic or natural feeling to modern buildings. Marcel Breuer and Walter Gropius' Hagerty House (1938) in Cohasset, Massachusetts, utilizes stone and stucco surfaces to create a picturesque though still modern formal composition. Eero Saarinen's IBM Facility (1956) in Yorktown, New York, contrasts roughly worked stone walls reassembled from existing pasture barriers on the site with modern glass curtain walls.

Still, stone use declined in the three decades following World War II in favor of more technologically advanced materials and curtain-wall systems. Within the modernist genre, stone was relegated to thin veneer without decorative embellishment, understated in its color and texture. Saarinen's CBS Building (1965) and Breuer's Whitney Museum of American Art (1966), both in New York City, are faced in a muted, thermal-finished granite cladding consistent with the minimalist aesthetic of the time. Other examples include Kevin Roche's Ford Foundation Building (1968) in New York City, with granite cladding defining the boundaries of its abstract cubic form, and I.M. Pei's East Wing of the National Gallery (1978) in Washington, D.C., similarly using stone veneer—in this case Tennessee marble matching the original stone used in the museum's West Wing—to define its abstract angular geometry.

The 1980s saw an explosion in the use of stone cladding, typical of postmodern exuberance, while advances in stone fabrication technology significantly reduced costs. The postmodern synthesis—combining the symbolic values of traditional architecture with the rational infrastructure of modernism—gained both notoriety and legitimacy with the construction of Philip Johnson's pink granite AT&T Building (1983) in New York City. Other notable examples within this genre include Michael Graves' Humana Headquarters Building (1985) in Louisville, Kentucky, covered with several varieties of exterior granites and interior marbles; Kohn Pedersen Fox's Procter and Gamble World Headquarters (1985) in Cincinnati, Ohio, clad in six-inch-thick buff-colored Indiana limestone panels spanning from floor to floor; and Cesar Pelli's World Financial Center (1985–88) in New York City, consisting of two million square feet of stone, primarily polished and thermal-finished granite.

Earlier attempts at such a synthesis can be seen in the abstracted monumental classicism promoted by Mussolini during the 1930s and 1940s. Guerrini, Lapadula and Romano's Palace of Italian Civilization (1942) in *Esposizione Universale di Roma* (EUR), just outside of Rome, is an example; its monumental cubic form, defined by rows of deep-set travertine arcades, mimics the stone arches and axiality of classical and baroque Rome while maintaining plain and unornamented surfaces. In the United States, a variant form of abstracted neoclassicism can be seen in the arched travertine facade of Wallace K.Harrison's Metropolitan Opera House (New York City, 1966).

Especially outside the United States, Postmodernism draws on the platonic geometries associated with such 18th-century visionary designers as Claude-Nicolas Ledoux and Etienne-Louis Boullée. The stone block or panel becomes important in this context not just for its symbolic resonance but also as the basic elemental unit to which the overall geometric form of the building is inextricably tied. Charles Correa's Jawahar Kala Kendra



Whitney Museum of American Art (1966), New York City, designed by Marcel Breuer Ezra Stoller © Esto

Museum (1990) in Jaipur, India, is based on a nine-square plan, with each square block symmetrically stepping down at the corners, consistent with the module of its red sandstone cladding; Aldo Rossi's Monument to Sandro Pertini (1990) in Milan, Italy, is a symmetrical cubic block clad in gray and pink marble into which a monumental stair is cut. Here, stone provides a historic link both to Milan's Duomo (whose stone was cut from the same quarry) and to the traditional rose granite street pavement removed for subway construction and reused by Rossi on the site.

A self-consciously critical, if not overtly ironic, attitude toward the use of stone can also be discovered in Postmodern architecture. Vittorio Mazzucconi's 22 Avenue Matignon (1976) in Paris juxtaposes fragments from an old stone facade within a new glass curtain wall. Francesco Venezia's Museum (1989) in Gibellina, Sicily, sets part of an earthquake-damaged stone building into a new stone structure in which the old and new are integrated yet clearly distinguished. Hans Hollein's Jewelry Shop (1974) in Vienna creates a deliberately "cracked" stone facade that challenges not only the modernist notion of honest expression but also the canonic meaning of stone as a signifier of wealth and permanence. Venturi, Scott Brown and Associates' Sainsbury Wing of the National Gallery (1987) in London takes a Corinthian pilaster motif from the existing museum's 19th-century neoclassical facade, carefully reproduces it in a new stone facade, and then incrementally transforms it into an increasingly abstract (modern) figure. Rem Koolhaas' Nexus World Kashii (1991) in Fukuoka, Japan, features a curving wall whose concrete surface texture expertly simulates—and caricatures—the traditional stonework of Japanese castles. Examples of the deliberate and didactic juxtaposition of stone with more modern construction technologies include Álvaro Siza's Galician Center for Contemporary Art (1994) in Santiago de Compostela, where granite cladding rests on exposed steel channels and posts, and Jacques Herzog and Pierre de Meuron's Stone House (1982) in Tavole, Italy, in which a slatelike rubble in-fill wall is contrasted with a rigorously orthogonal exposed reinforced-concrete frame.

Stone has also been "reinvented" by several 20th-century architects who have developed wall systems combining aspects of stone masonry and concrete technology. Frank Lloyd Wright's "desert rubble masonry"—first used at Taliesin West (1937) in Scottsdale, Arizona—sets unworked stones tight against concrete formwork so that they become visible on the wall's surface. Similarly, Eero Saarinen's Norwegian-based system, adapted for his Stiles and Morse Colleges (1962) at Yale University, injects pressurized concrete into forms filled with rough stones. Peter Zumthor, for his Thermal Bath (1997) in Vals, Switzerland, created a composite concrete-masonry system in which locally quarried gneiss blocks defining the continuous cavelike internal spaces and external massing of the building are made integral with reinforced-concrete cores.

Finally, stone buildings have continued to be built in traditional ways throughout the 20th century. Quinlan Terry's Mait-land Robinson Library (1993) in Cambridge, England, with its pedimented stone facade, may serve as an example of the continuing interest in literal, neoclassical form. The use of stone based on local, vernacular traditions can be seen in numerous 20th-century projects: examples include Ricardo Bofill's Sanctuary of Meritxell (1978) in Andorra, faced with thick stone excavated from the site by Galician masons; Jan Olav Jensen and Per Christian Brynildsen's Hospital (1985) in Maharastra, India, featuring stone load-bearing walls built with local materials by local masons; and Raffaele Cavadini's Municipal Buildings (1995) in Iragna, Switzerland, faced with dry split stones detailed according to local tradition.

JONATHAN OCHSHORN

S*ee also* **AT&T Building, New York; Cram, Ralph Adams (United States); Herzog, Jacques, and Pierre de Meuron (Switzerland); McKim, Mead and White (United States); Postmodernism; Rossi, Aldo (Italy); Saarinen, Eero (Finland); Sainsbury Wing, National Gallery, London; Taliesin West**

Further Reading

The history of stone in 20th-century architecture can be pieced together from readings in general architectural histories and in the accounts of individual architects, but sections or chapters dealing specifically with stone are unusual. Exceptions include Sailer (1991), Goff (1997), and Patterson (1994). Detailed drawings illustrating stone construction in the works of architects such as Ralph Adams Cram, Adolf Loos, Edwin Lutyens, McKim, Mead and White, Mies van der Rohe, and Otto Wagner can be found in Ford (1990). Innovative late-20-century stone projects from around the world are featured in the periodical *A+U* (1998).

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STONE, EDWARD DURELL 1902–78

Architect, United States

Edward Durell Stone was one of a handful of architects who introduced historicism and ornament into the modernist architecture of the 1950s and 1960s. In an era dominated by the modernist glass boxes of Mies van der Rohe and others, with abstract spaces united behind increasingly anonymous facades, Stone sought an ornamental and exotic version of modernism. Where some architects in this era explored a more expressive modernism, as did Eero Saarinen, Paul Rudolph, and Gordon Bunshaft, Stone, Minoru Yamasaki, and Philip Johnson independently explored the combination of modernist forms and materials with classical motifs and elements. Although Stone began his career as an International Style modernist, the ornamental detailing of his U.S. Embassy building (1954) in New Delhi, India, exemplifies the stylistic characteristics of his mature style. From the mid-1950s on, Stone explored a fusion of classical and arabesque detailing with fundamentally modernist forms and materials, resulting in an architecture of elegance and luxury. This decorative modernism proved extremely popular with both the American public and his patrons, landing him a number of prominent commissions, including the American Pavilion (1958) at the World’s Fair in Brussels and the John F. Kennedy Center for the Performing Arts (1971) in Washington, D.C. Regardless of his personal and professional success, architects, critics, and historians derided his work as formalist and derivative. However, Stone exerted a powerful influence on the everyday commercial and residential architecture of the 1950s, 1960s, and 1970s in America.

Born in Fayetteville, Arkansas, Stone briefly studied art at the University of Arkansas before moving to Boston (where his brother Hicks was an architect) in the early 1920s. Finding work as an office boy, Stone attended classes and lectures at the Boston

Architectural Club. While continuing his studies in classical architecture, Stone joined the firm of Henry R. Shepley (a Boston Beaux-Arts architect) as a draftsman. In 1926, he won a scholarship to Harvard but, dissatisfied with its traditional curriculum, quickly transferred to the Massachusetts Institute of Technology (MIT) to study with Jacques Carlu (an early exponent of modernism). While at MIT, Stone won the Rotch Scholarship, then spent two years in Europe studying the monuments of antiquity and the works of the European modernists. Stone returned to New York in the inauspicious year of 1929 and eventually found work on Rockefeller Center's Radio City Music Hall (1932) under Wallace K. Harrison.

Following his work on Rockefeller Center, Stone came into his own as an architect with the design of the modernist Mandel House (1933) in Mount Kisco, New York. The house clearly evoked the major elements of European modernism as defined by the International Style Exhibition (which had opened the previous year in New York), including asymmetrical massing, smooth planar geometries, ribbon windows, and an open plan. In addition to a number of other modernist houses, Stone was responsible (along with Philip Goodwin) for the design of the Museum of Modern Art (1939) in New York. In the 1940s and 1950s, Stone continued to explore other modernist idioms, from the concrete grid of his El Panama Hotel (1946) in Panama City (reminiscent of the work of Le Corbusier) to a series of houses that explored organic materials and siting.

Regardless of the style or materials of Stone's architecture, his work was increasingly infused by a classical sense of massing and order. Although present in a number of his designs, Stone's predilection for classical symmetry and detailing reached its most elegant and compelling expression in his 1954 design for the U.S. Embassy in New Delhi. The building consists of a rectangular *cella* surrounded by a series of attenuated columns. Behind the colonnade is the building's most interesting feature: the screen wall that shelters the offices and the interior court from the searing heat.

Stone's design was part of a large-scale embassy-building program initiated by the U.S. government in 1954 that called for

State University of New York, Albany (1962) view of the entrance

Photo © Mary Ann Sullivan

embassy designs that harmonized with the climate and historical context of the host country. The U.S. Embassy's screen wall (composed of patterned concrete terrazzo blocks) served both of these functions by filtering the heat and sun while evoking the patterned walls of mosques and mausoleums. Indeed, with its rigid classical symmetry, airy interior court, and arabesque screen walls, the embassy was praised as the new American Taj Mahal. Intended as an act of architectural diplomacy, Stone's willingness to appropriate Indian imagery into his modern design has been criticized by recent historians as an example of American cultural hegemony during the Cold War. Critics initially praised the design for its success in reintroducing monumentality into modern architecture while relieving the monotony of glass-and-steel modernism. Stone had borrowed much from the work of Mies van der Rohe and other modernists (e.g., cruciform columns, projecting horizontal slab roof, and recessed walls treated as abstract geometry), but his lavish use of materials and the richly patterned screen wall set him apart from his contemporaries.

Stone revisited the basic aspects of the U.S. Embassy with minor variations several times in the following decades, using the same concrete-block pattern at the Stuart Pharmaceutical Company (1956) Headquarters in Pasadena, California; a round version of the embassy for the United States Pavilion (1958) in Brussels; and a rectilinear box with screen walls and attenuated columns at the campus of the State University of New York at Albany (1962) and the John F.Kennedy Center for the Performing Arts. Stone did depart from these screen walls on several occasions, notably in his design of skyscrapers, such as the General Motors Building (1968) in New York City.

Although Stone had served as a university professor (teaching at New York University between 1935 and 1940, as an associate professor at Yale University from 1946 to 1952, and as a visiting critic and professor at Princeton University, the University of Arkansas, and Cornell University), his most lasting contribution to American architecture was his decorative modernism. Although not popular with critics, Stone's influence can be felt throughout the popular vernacular both commercial and residential structures. By using the concrete-block motif seen on the U.S. Embassy, countless Americans were able to introduce modernism and exoticism into everyday architecture.

MATTHEW S.ROBINSON

Biography

Born in Fayetteville, Arkansas, 9 March 1902. Attended the University of Arkansas, Fayetteville 1920–23; apprenticed to Henry R.Shepley, Boston 1923–25; studied at Harvard University, Cambridge, Massachusetts 1925–26; attended the Massachusetts Institute of Technology School of Architecture, Cambridge 1925–26; Rotch Traveling Scholar in Europe 1927–29. Served in the United States Air Force 1942–45. Worked with a consortium of architects designing Rockefeller Center, New York 1929–35. In private practice, New York from 1935; president, Edward Durell Stone and Associates, New York, with offices in Palo Alto, California, Los Angeles, and Chicago. Instructor in advanced design, New York University 1935–40; associate professor of architecture, Yale University, New Haven, Connecticut 1946–52; visiting critic, Princeton University, New Jersey 1953; visiting critic, University of Arkansas, Fayetteville 1955 and 1957–59. Trustee, American Federation of the Arts; director, American National Theater and Academy; director, Whitney Museum, New York; fellow, American Institute of Architects; member, National Academy of Design; member, National Institute of Arts and Letters. Fellow, American Academy of Arts and Sciences 1960; fellow, Royal Society of Arts, London 1960. Gold Medal, American Institute of Architects 1955. Died in New York, 6 August 1978.

Selected Works

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El Panama Hotel, Panama City, 1946

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The Evolution of an Architect, 1962
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Further Reading

The only monographs on Stone's work are autobiographical. To date there is not significant critical assessment of Stone's life or career in print; he has been largely ignored by critics and historians. Two recent studies of embassy buildings by Ron Robin and Jane Loeffler address the significance of the U.S. Embassy in New Delhi, as well as the larger cultural ramifications of its design. A significant part of Stone's importance lies in his popular appeal, and the cover story in *Time* magazine of 1958 is a typical example of his treatment in the popular media.

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STRUCTURAL SYSTEMS

Structural systems are considered any collection of construction materials arranged in specific configurations for producing the most efficient medium that safely transfers applied gravity and lateral loads in any given structure. More specifically, structural systems can be categorized into four main groups: solid, framed, surface, and tensile. Typically, combinations of those groups, particularly the first three, which encompass a huge and highly competitive variety of systems available for the designer to choose from, are selected for the construction of any specific building project. In general, the bases of such selection are economy, special structural requirements, problems of design and construction, and materials and scale limitations. Realistically, however, in the majority of built projects the overriding criterion for selecting systems is that of economy.

Solid and monolithic elements of foundations include footings (strip and isolated), slab-on-grade, large piers, and abutments. They represent the last components of the load path in a structure. Their main purpose is to safely transfer all applied loads to the supporting soil.

Structural walls function either as supports for horizontal spanning systems (as bearing walls) or as stabilizing elements for the lateral bracing of structures (as shear walls). Depending on the way they are constructed, walls can be classified as either solid or framed elements. Examples of such systems can be found in any building project, such as supports for floor and roof structural subsystems. Examples of structural walls acting as lateral bracing elements also abound, but particularly notable are shear walls in skyscrapers. In 1976, architects Johnson and Burgee designed the 36-story Pennzoil Plaza in Houston, Texas, with a concrete core for wind load resistance.

The oldest and most basic manner in which a frame is constructed is based on the post-and-beam system. It is composed of two essential elements: the posts (typically vertical compression members) and the beams (typically horizontal elements transferring applied loads through shearing forces and bending moments). The degree of rigidity of the connections between those elements determines the amount of moment being transferred from the beams to the posts. The beams can be continuous over several posts (columns), creating a multibay arrangement. Similarly, columns can be vertically continuous, creating a multistory configuration. As such, this system can be expanded to form the three-dimensional skeletal frame of a building structure. Examples of such systems include the Empire State Building (New York City, designed by Shreve, Lamb and Harmon, 1931).

Other frame-based arrangements include such innovative systems as geodesic domes. Made famous by R. Buckminster Fuller in the 1960s, they utilize multiple stable triangularly shaped units that, when framed side-by-side, form a shell-like structure. Architects Murphy and Mackey in St. Louis, Missouri, implemented this framing concept in their design of the Climatron, a geodesic dome used in the Missouri Botanical Gardens.

Trusses

Perhaps the most efficient framing elements are trusses used for horizontal spanning in roofs and floors as well as for bridges. Trusses rely exclusively on straight members framed together through bolted, welded, or a combination type of joints. By lining up the axes of the joined members and directing applied loads to the joints only, a truss will transmit tension and compression forces mainly through its members. The advantage of trusses lies in the openness of their structure, allowing required electrical cables/conduits and mechanical pipes/ducts to go through them without requiring additional dedicated space. Because of their relatively lightweight and rigid triangularly based framework, trusses are capable of spanning very large distances. There are many examples of truss structural systems, but perhaps the most visible are the ones used in bridge construction. The San Francisco-Oakland Bay Bridge, opened in 1936, is one such example, with a truss system connecting San Francisco to Treasure Island.

Arches and Vaults

The main objective of the arch is to span horizontally, utilizing a structural system that develops internal compression forces only. A temporary structure is erected in order to hold the arch solid elements *(voussoirs)* while being placed starting at the ends of the arch. Once both sides of the arch are completed, the last voussoir (keystone) is inserted in place and the temporary shoring removed. If expanded in one direction, arches form tunnel vaults. If crossed at 90 degrees, two vaults will produce a groin vault. Modern arches and vaults are being achieved using structural systems such as framed truss members forming the arch without resorting to solid elements. In 1998, Tate and Snyder architects employed steel trusses, formed into arches, to support the curved roofing system in the main lobby of Terminal D of McCarran International airport in Las Vegas, Nevada.

Plates and Shells

Classified as surface structures because of their very high surface-area-to-thickness ratio, plates and shells encompass slabs, panels, folded plates, and shells with various simple, as well as complex, geometric surface configurations (e.g., conical, spherical, and hyperboloidal). Architectural history in filled with cases of those forms. Notably, however, because of the vast repertoire of construction materials available to the designer in the 20th century, today's architects have found these forms very tempting. As such, there are many cases where plates and shells have been successfully incorporated into the architectural design. In 1997, the American architect Frank Gehry made use of the shell system concept to encapsulate his entire Guggenheim Museum in Bilbao, Spain, with curved titanium surfaces.

Tent and Cable-Suspended Systems

These systems act in an opposite way to the concept of arches and vaults, the difference being that the internal forces induced in cable-suspended or tent systems are tensile in nature. Engineers and builders have been successful in utilizing such systems whenever a large span is desired. Completed in 1999 and spanning 1,198 feet (365 meters), the Millennium Dome in Greenwich, London, is a contemporary example of the cable-suspended tent system.

Because of their elegant design and structural efficiency, cable-suspended constructions have also been mandatory when it comes to large-span bridges, for example in the Golden Gate Bridge (with a span of 1280 meters) in San Francisco (1937). Another type of tent construction, air-inflated structures, has domelike roof structures and has become the preferred method of covering giant open-air public spaces. In 1988, architect Nikken Sekkei and the Takenaka Corporation used an air-inflated membrane to cover the 660-foot (201 -meter) span of the Tokyo Dome in Bunkyo Ward, Tokyo.

ZOUHEIR A.HASHEM

S*ee also* **Empire State Building, New York; Fuller, Richard Buckminster (United States); Guggenheim Museum, Bilbao**

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STRUCTURALISM

The term *structuralism* is generally applied to the work of a diverse group of French intellectuals working in the 1950s and 60s. Drawing on modern philosophy and the human sciences that arose in the 19th and early 20th centuries—linguistics and anthropology—and to a lesser extent on the hard sciences and mathematics, structuralism's influence continued long after its formal existence as a coherent movement. In the most general sense, structuralism was the search for the most elementary and universal patterns underlying cultural reality—patterns and structures that form the basis of social life in its most fundamental expressions: language, economy, science, and so forth. Less doctrine than method, the basic tenets of structuralism were adapted to virtually every discipline in the academy. Simply stated, these tenets were, first, individual phenomena (utterances, rituals, the formation of social institutions) only have significance when considered as part of a larger system; second, the huge variety of isolated phenomena that are discernible within the world or a given system are specific permutations of a very few general principles; and third, the structure or conceptual model constructed to chart these general principles (and the meaning of their individual manifestations) is just that—a conceptual model or structure that by definition cannot be empirically verified.

Even though generalizations like these can be identified, structuralism's significance lay in what it rejected as much as in what it adopted as its own method. By asserting the necessity of distinguishing between specific phenomena and their underlying principles, and placing the emphasis on the latter, structuralism leveled the cultural field to a certain extent, doing away with a Eurocentric model that would maintain a qualitative difference between, for instance, the social activities of modern and "primitive" societies. The fundamental rejection of the dichotomy modern/primitive, especially evident in the work of the anthropologist Claude Lévi-Strauss, was also a rejection of a century-and-a-half of Hegelian determinism, or the myth of cultural progress. In addition, by insisting on the syntactical consideration of phenomena—the relationships between them, as opposed to their individual significance—structuralism rejected metaphysical hermeneutics as well as phenomenology. This philosophical conflict was played out most dramatically in the debates between Lévi-Strauss and the existentialist/Marxist philosopher Jean-Paul Sartre in the pages of the journals *Les Temps Moderne, L'Homme,* and *L'Express*. Whereas Sartre maintained the existence of conscious, human agency, Lévi-Strauss insisted on the importance of the underlying elements that gave meaning to human action. The climate in postwar France was much more conducive to Lévi-Strauss's approach, which seemed more objective than Sartre's—an important attribute during a time in which many academic disciplines sought grounding in the hard sciences and mathematics.

Lévi-Strauss's "structural anthropology" was not developed *ex nihilo;* it drew on the achievements of past ethnographers and, perhaps more important, on developments in the field of linguistics. Whereas some earlier ethnographers had recognized the importance of a comparative method, according to Lévi-Strauss they remained mired in empiricism, which prevented them from ascending beyond the level of the specific. Lévi-Strauss sought to do away with the endless observation and cataloguing of human behavior characteristic of ethnography and to implement a more conceptual comparative model that would establish underlying structural principles. For Lévi-Strauss, this gap was bridged definitively when he was exposed to the work of the Swiss linguist Ferdinand de Saussure.

Lecturing earlier in the century, Saussure had students whose notes were published as the *Course in General Linguistics*. The essential lessons of "the course" established Saussure as the founder of structuralism. By far the most significant idea in Saussure's teachings is the fundamental distinction he makes between the signifier and the signified. For Saussure, there is no determined or natural relationship between a word and what it represents—be it thing or idea. Rather, words are small units in a larger linguistic system—phonemes whose meaning arises solely from their syntax, or relation to one another. From this assertion, Saussure derived yet another important dichotomy—that between *langue* and *parole,* or the greater, underlying system of language and the individual instances of its utterance or speech. Thus, Saussure broke language off from the empirical world and established a method for studying it as an autonomous system. Moreover, this system was to be studied synchronically as opposed to diachronically or historically. The relational nature of the signifier meant that for any given word or phrase, the relation to the rest of the system had to be considered simultaneously. Thus, the entire structure is being studied at the same moment as an individual utterance. In the field of linguistics, this constituted a break with etymological studies of language, but for French structuralism, the emphasis on synchrony formed the basis for the later rejection of classical history.

Saussure became one part of a triad of great thinkers to whom the new generation of French intellectuals turned, the other two being Freud and Marx. Significantly, each of these figures asserted systems that made a fundamental distinction between specific, verifiable reality, and an underlying system: Saussure's *langue/parole* distinction, the Freudian unconscious/conscious construction, and the fundamental tenet of Marxism, the base/ superstructure dichotomy.

Saussure's structuralist linguistic model allowed Lévi-Strauss to assert that like the system of language *(langue),* human cultural activity should also be analyzed relative to its underlying, relational structure. Lévi-Strauss's student thesis, *The Elementary Structures of Kinship,* published in 1948, had a wide influence, far beyond the disciplinary confines of anthropology. For supporters of Lévi-Strauss and structuralism, who were growing in number, *The Elementary Structures* suggested a methodological revolution that could bring all of the human sciences to the level of rigor and legitimacy of the natural sciences. Thus, the promise of structuralism was initially that of objectivity but was transformed as it disseminated throughout the academy.

The radical and highly influential psychoanalyst Jacques Lacan superimposed Saussure's structuralism onto the Freudian model. He asserted that the Freudian unconscious was in fact the system of language, whose structure is only partially discernible through its specific manifestations or through speech.

Roland Barthes adapted the Saussurian/structuralist model to semiotics, opening the gates of serious analysis to a huge array of cultural phenomena, from avant-garde literature to laundry detergent and the annual cycling race the Tour de France. For Barthes, these practices and products formed units within a semiotic system, analogous to words within a linguistic system. Instead of a "language," however, the popular cultural practices Barthes analyzed were specific instances of a system of cultural myth making geared toward providing the illusion of drama and meaning to a neutralized and modern quotidian existence. Barthes's work was an early indication that although structuralism was meant to be the scientific redemption of the human sciences, its other aspect was cultural criticism. The idea that the system of cultural signs was itself a kind of production and system of exchange provided an attractive alternative to Marxism, which was plagued with ideological concerns in the postwar period. Marxists such as Henri Lefebvre showed a great deal of interest in structuralism, and Louis Althusser embarked on a rigorous structuralist re-reading of Marx's works.

As structuralism was disseminated throughout the academy, its critical aspects came to the fore. Determining the elementary structures within various disciplines meant casting off many old paradigms. As these models were "deconstructed," it became apparent that some were imbued with incredible ideological significance. Namely, structuralism initiated a new critique of several fundamental, modern concepts; diachronic history, western metaphysics and phenomenology, and the unified human subject were the most significant of these. Picking up on earlier critiques of occidental humanism and history, Michel Foucault, Jacques Derrida, and Gilles Deleuze and Felix Guattari ushered in a new phase of structuralism that some have dubbed poststructuralism.

Foucault refurbished Nietzschean genealogy to serve as a new historical method that he used to interrogate the humanist legacy of the enlightenment and the industrial age. His studies of the history of insanity and reason, law and punishment, and later of sexuality unveiled the underlying concerns of cultural institutions, namely the exercise of power. Derrida, following up on Martin Heidegger's critique of modern philosophy, conducted close, deconstructionist readings of seminal texts. He demonstrated the moments in which the western discourse of reason and categorization collapsed on itself or revealed weaknesses and lacuna within its own structure.

In a sense, structuralism predicated its own destruction: What began as an objective method for the human sciences ended with a critique of the very notion of objectivity and the objects of scientific study. Derrida read Saussure as critically as he read Kant. By the late 1960s, structuralism itself had been added to the list of institutions being assaulted by intellectuals and the popular press. Especially in the French context, where Charles de Gaulle's Fifth Republic was so quick to institute modern methods of bureaucracy and city planning, the critique of technological modernity had deep implications. In May 1968, one of the many slogans students scrawled on walls and blackboards during the uprisings was "Structures do not march in the streets," indicating what was correctly perceived as structuralism's lack of social engagement.

Structuralism and Architecture

The exact effect of structuralism on architectural theory and practice is difficult to determine but should not be underestimated. However, it is clear that it was the semiotic aspects of structuralism that appealed to architects and critics much more so than the anthropological facet. However, the very ubiquity of structuralism, especially in Europe during the 1950s and 1960s, makes it possible to see connections even in cases in which direct influence is not apparent. For instance, one finds an emphasis on social infrastructure—explicitly opposed to architectural function—in the work of those architects associated with Team X, the youthful offshoot of CIAM (Congrés Internationaux d'Architecture Moderne): Alison and Peter Smithson, Aldo van Eyck, and the firm Candilis, Josic, Woods. For this vanguard, architecture was to provide a framework for the emergence of genuine social interaction—a conceptual model that parallels the notion of underlying structure and its specific manifestations, which is analogous to Saussure's *langue/parole* distinction. This lent to modernism a scientific and sociological dimension that had been lacking from the utopian functionalism of the 1920s.

However, it was the critical aspects of later structuralism and poststructuralism that appealed to architects and theorists, such as Barthes's critique of cultural mythology, Foucault's genealogies of institutional power, and Derrida's notion of deconstruction, the latter having evoked architecture as a foundational metaphor. Without exception, these three writers acknowledged the importance of architecture and urbanism within any semiology of modern society. Surprisingly, only a few notable architects and critics made serious attempts to acknowledge or incorporate their theories: Peter Eisenman, Bernard Tschumi, Diana Agrest and Mario Gandelsonas, and Manfredo Tafuri are examples of those who did. Although they are very different from one another, the work of these practitioners and theorists used concepts from structuralism and Marxism to question, analyze, and deconstruct the founding ideologies of architecture.

Though not strictly speaking structuralist, a much more widespread development is apparent in the 1960s and 1970s: an interest in semiotics and its Anglo-American equivalents, "communications theory" or semantics, all of which are related to "postmodernism" in architecture. The interest in architectural meaning, or language, and specifically the use of historicist elements such as classical ornamentation and devices is characteristic of this movement. Charles Jencks and Robert Venturi and Denise Scott-Brown were the foremost theorists of this tendency and called for the use of conventionalized, familiar architectural elements as a critique of a failed functionalist model.

Just as Lévi-Strauss's structural anthropology attacked the facile empiricism of his own discipline, architects have used structuralism to critique—more and less effectively—architecture's most basic assumptions and myths.

LARRY BUSBEA

S*ee also* **Deconstructivism; Postmodernism; Postructuralism**

Further Reading

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STUDIO PER

Architectural firm, Spain

Studio Per was a collaborative group formed in 1964 by Pep Bonet (1941–), Oscar Tusquets (1941–), Cristian Cirici (1941–), and Lluis Clotet (1941–). Primarily because of political considerations, Spanish culture remained relatively isolated from the main currents of Western European art. Therefore, critics in Western Europe and the United States largely ignored Spanish architecture. As Spain became more open, both politically and culturally, a new generation of architects began to attract international recognition. The four men of Studio Per came together in the burgeoning artistic climate of 1960s Barcelona and soon emerged as leaders of this movement. The designs of Studio Per and others provided the foundations for the development and consolidation of contemporary Spanish architecture. The work of this group continued into the postdictatorship period of democratic Spain, and they participated in the dramatic refurbishing of Spain's architectural reputation, both nationally and internationally. In general, their work can be characterized by a qualified acceptance of the International Style tempered with pragmatic revisions, including a legacy of the organic and an avoidance of unnecessarily utopian theory. They contributed to general currents of postwar architecture that rejected or modified the ideology of modernism.

All the men had been students of Federico Correa at the Escuela Técnica Superior de Arquitectura and inherited a tradition of Catalan architecture going back to Antoni Gaudí i Cor-net, Josep Puig i Cadafalch, and Lluís Domènech i Montaner. The group was part of the newly recognized but loosely organized movement of Spanish architects, including Ricardo Bofill and Oriol Bohigas, known as the School of Barcelona. Although a single firm, Studio Per was actually the combination of two distinct tendencies: the

Postmodernism of Clotet and Tusquets alongside the postrationalism of Bonet and Cirici. This singular combination enabled the group to produce multivalent works that featured a mixture of opposites. The group took inspiration from the architectural philosophies of Robert Venturi and Aldo Rossi. An emphasis on form and composition along with an unabashed faith in the value of historical tradition became important tenets of Studio Per's artistic philosophy. Despite this reverence for traditional forms, the architects avoided slavish devotion to past styles and always injected their projects with the very latest design elements and structural materials.

The work of Studio Per was characterized by a fine attention to detail and an honest pragmatism. They viewed each project as a unique problem and opportunity, and the group rejected adherence to rigidly programmatic solutions. The architects attacked basic problems of location, client wishes, and legal constraints with an eye toward simple, elegant solutions. The work of Studio Per questioned established norms and avoided the blind implementation of romantic ideals. Instead, the architects constructed synthetic designs aimed at achieving unorthodox yet convincing solutions. They often employed high doses of irony and a respectful misappropriation of the past.

The guiding principles of Studio Per's architectural philosophy can be seen in the Casa Regás and Belvedere Giorgina (1972). The project was designed as a summer home in the mountains near Girona, Spain. The site already contained the massive ruined foundation of an ancient dwelling. The architects chose to build on the antiquated walls while also constructing a new section of the house. This fusion of the traditional and modern, the existing and the new, is one of the most important legacies of Studio Per. The original home provided the location for the service elements of the household, whereas the new building contained the living quarters. A short while later, the client envisioned a second structure for the same site. In this project, the designers had to deal with an extremely small space of approximately 40 square meters. The solution was a single structure topped by a neoclassical belvedere. The work became somewhat controversial at the time for its ironic appropriation of classical elements.

The House on the Island of Pantelleria (1974) continued the elements seen in the Casa Regás and Belvedere Giorgina. The building is situated on a small island between Italy and Tunisia. The site was in a protected natural park, and this imposed limitations on new building. Clotet and Tusquets, the principal designers, chose to retain the ancient walls and foundations. They reconstructed the dwelling with local volcanic rock and formed simple volumes that echoed the modular form of traditional buildings on the island. The home extended over two levels, one containing the sleeping quarters and the other the kitchen and other service areas. The dual levels flow over the landscape, following the natural slope to the sea. The most innovative design elements are the open-air terraces, marked by rows of simple columns that again recall the island's traditional architectural elements. The house was a simple, elegant design that respected local materials and forms while at the same time seeming modern.

In addition to being an architectural firm, Studio Per also constituted itself as an industrial design and furniture maker. A separate design studio, BD Ediciones de Diseño, was formed in 1972. As designers, they helped raise international awareness of the innovative artistic culture of both Spain and Barcelona in particular. The group achieved some success as furniture and industrial designers, winning numerous Spanish and international awards.

Although disbanded, the individual architects and designers of Studio Per have continued to exert a great influence on Spanish and international architecture and design. Tusquets and Clotet in particular played large roles in the 1980s rejuvenation of Spanish design and construction. The project culminated in the Olympic Games of 1992, for which Clotet designed apartment buildings in the Olympic Village and Tusquets a hotel.

BRIAN D.BUNK

Biography

Established in Barcelona, 1964 by: Josep Bonet Bertran (born 19 November 1941 in Barcelona); Lluis Clotet Ballús (born 31 July 1941 in Barcelona); Cristian Cirici Alomar (born 26 September 1941 in Barcelona); Oscar Tusquets Guillem (born 14 June 1941 in Barcelona). Until 1980, Clotet and Tusquets and Bonet and Cirici worked in pairs on separate projects. After 1980, each member followed his own course, but continued to belong to Studio Per.

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STUTTGART, GERMANY

Stuttgart, capital of the German state of Baden-Württemberg, derives its architectural distinction from its remarkable geographical position: the city lies in a basin of the Neckar highlands and is almost completely surrounded by a high ridge. The only opening is a narrow pass on the northeast leading toward the Neckar.

The city that grew from a horse farm founded around 950 (hence the name, derived from *Stuten-Garten* or mares' garden) gained its charter in 1250 and was enlarged, especially during the 18th century, as the capital and princely residence of the counts and later dukes of Württemberg. The first systematic expansion plans occurred in 1832, just as industrialization began to affect the capital as it transformed into a metropolis.

After an uninspired period of construction in the second half of the 19th century, the 20th century brought exemplary architectural achievements to the city, making Stuttgart one of the most important centers of modern architecture in Germany.

One of the most influential buildings in the history of the new architecture in Stuttgart is the Central Station (1914–27) by Paul Bonatz and E.F.Scholer. In this monumental, cubical building clad in shell-limestone blocks, all of the amenities of a modern train station were cogently realized, from the passage of trains over optimal traffic and transport ways, to travelers' needs, to the Station Hotel and other functions. The architects made effective use of steel and concrete, using construction techniques inherent in these materials' properties. Despite this innovation, they were unwilling to use the same materials on the stone-clad façade that features a tall, columned hall facing the city center.

Another striking building that defines the cityscape is the newspaper headquarters, Tagblatt Tower (1928), designed by E. Otto Osswald as Stuttgart's first skyscraper. Originally planned as a counterweight to the Erich Mendelsohn's Schocken Department Store of 1928 (demolished 1960), the eighteenfloor, sixty-one-meter-high reinforced concrete construction of the press tower was an important symbol of the new architecture in Stuttgart and remains a milestone in the history of skyscraper construction in Germany.

Originally built in 1927 as part of an exhibition of the German Werkbund in the north of the city, the Weissenhofsiedlung represents one of the most decisive steps in the development of modern housing and constituted the high point of avant-garde architecture of the 1920s in the Württemberg capital. The Weissenhofsiedlung essentially created a model housing estate in which seventeen of the leading architects followed the design motto *Die Wohnung für den modernen Großstadtmenschen* (The Dwelling for the

Modern Metropolitan Man) in designing innovative structures. Architects included Ludwig Mies van der Rohe (who designed the overall plan), J.J.P.Oud, Mart Stam, Victor Bourgeois, Le Corbusier, Josef Frank, Peter Behrens, Walter Gropius, Ludwig Hilberseimer, Hans Poelzig, Adolf Rading, Hans Scharoun, Bruno Taut, and Max Taut as well as the Stuttgart architects Richard Döcker and Adolf G. Schneck. The project pursued the programmatic goal of demonstrating ways in which rationalization was possible in housing construction and showing how planned development of affordable and reduced-cost housing could provide, in the words of Lord Mayor Dr. Karl Lautenschlager in 1925, an "improvement of total housing culture." Critics of the project claimed that although the small, affordable apartment stood in the foreground of conceptual interests, in reality—with the exception of the J.J.P. Oud—the architects did not design houses for the working class.

Approximately twenty-one individual buildings were finally constructed, with a total of sixty-three apartments. Generally using steel skeleton construction, the individual buildings showed a remarkable degree of uniformity manifest in their straight lines, absolutely unadorned and shimmering white facades, flat roofs, and the balcony treatment reminiscent of ship railings. Likewise, technical materials such as steel and concrete were used within the interiors. Technical apparatus such as pipes and heating units were not hidden but were placed demonstratively on the walls to underscore functionality. Textiles as well as conventional furniture were generally rejected. The walls had neither paneling nor molding, and the doors had neither frames nor curves.

After the Nazi seizure of power in 1933, the Weissenhofsiedlung was defamed as Stuttgart's eyesore *(Schandfleck)*, its architects castigated as "cultural Bolsheviks." World War II left the project damaged from bombing and still unappreciated; the project was neither protected nor rebuilt but was rather neglected and in part disfigured through careless modifications or additions. Resurgence in interest in the project began in the 1950s, when the Weissenhofsiedlung was recognized as an architectural monument in need of protection and restoration, which was ultimately completed in 1987.

The first renewal of postwar modern design was the Liederhalle, designed and built in 1955–56 by Adolf Abel, Rolf Gutbrod, and Blasius Spreng. The Liederhalle was a music center with three large concert halls of various sizes, joined into a common complex through a two-story foyer with a restaurant. A paved courtyard with shallow steps and terraces leads to the squat main entrance on the west front. The exterior of the bastion-like, projecting Mozart Hall is decorated with an overlay of quarzite plates of alternating colors and sizes. The wide wall spaces of the high main building, however, had to be satisfied with a plain segmentation into fields. The rear is pierced with countless rectangular skylights.

The *Neue Staatsgalerie* (New National Gallery of Art) has been considered the most important building in Stuttgart of the last 20 years and as one of the most important new museum buildings constructed in Germany since 1945. It was built between 1979 and 1984 by James Stirling, Michael Wilford, and Associates, London. The first concrete plans for enlargement of the museum arose in 1974, but the present gallery dates from an international competition for the design held in 1977, which set the task of architecturally expanding the state art collection and new construction of a small theater. In total, eleven participants were invited to compete, including seven of the most outstanding from the first competition in 1974 as well as four foreign architectural firms. They were invited to develop proposals with special consideration for urban renewal. In particular, the

Weissenhof Row Houses, designed by J.J.P.Oud for the Weissenhofsiedlung, Stuttgart (1927)

Photo © Donald Corner and Jenny Young/GreatBuildings.com

architects were challenged to improve green spaces and pedestrian spaces and, in part, ameliorate the scars on the city center infrastructure left from World War II. With the close of the competition in 1977, Stuttgart found itself in the middle of a controversial architectural debate between two different schools of thought and aesthetics: that of Functionalism, which traced its roots in Stuttgart to the Weissenhofsiedlung, and that of Postmodernism, a new import from Great Britain with a marked preference for stylistic pastiche and even whimsy. Immediately adjacent to the preexisting national gallery building, and joined to it by a “bridge” on the gallery level, the New National Gallery is topographically sensitive. Stirling designed a public footpath through the museum complex to integrate the historical buildings of the old National Gallery into the overall conception.

Stirling’s epoch-making achievement was to bring together these historicist elements with the modern formal vocabulary of Functionalist architecture such as colored steel construction, visible concrete, or curving forms. Through the contradictions in form and many-layered conception the museum gains in dynamism and seems predestined as a house for the art of the 20th century.

STEPHAN BRAKENSIEK

S*ee also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France); Neue Staatsgalerie, Stuttgart; Mies van der Rohe, Ludwig (Germany); Oud, J.J.P. (Netherlands); Postmodernism; Weissenhofsiedlung, Deutscher Werkbund,**

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SUBURBAN PLANNING

The evolution of suburbia as a distinct, and now predominant, terrain of American life and culture is tied to broad shifts throughout American and global culture in the 20th century, particularly in transportation, economics, building technology, ideology of family and home, and leisure. Already by the middle of the 19th century mechanized transport facilitated daily commuting between home and work in major cities. Steam ferries had connected New York to suburban Brooklyn and Staten Island as early as the 1810s, and by mid-century trains extended to New Jersey suburbs such as Llewellyn Park. By the 1870s distinct lines of railroad suburbs extended outward from such cities as New York, Philadelphia, Cincinnati, and Philadelphia. From the opening of the 20th century expanding trolley services filled in a nexus of “streetcar suburbs” surrounding most major cities. Predominantly residential, the typology of rail and streetcar suburbs varied from gated, exclusive tracts of single-family houses on plots of several acres, to “three-decker” and other sorts of multiple-family dwellings, depending on such factors as proximity to the city and the developer’s means.

The distinguishing shift in the 20th century was the proliferation of the private automobile, especially from the 1920s onward, and the freedom it afforded for the dispersal of dwellings at distances and densities that previously had been uneconomic. Catering to the growing professional-managerial and other segments of the middle classes, most developers responded with suburban layouts that only repeated low-density 19th-century patterns based on horse and carriage transport, while higher-density multiple-family units such as Sunnyside Gardens (Queens, New York) could take advantage of urban subway connections. But the introduction of faster, limited-access highways and parkways in the 1920s and 1930s, especially in the New York and Los Angeles areas, also forced changes in the scale of suburbia, changes that were only accelerated with the establishment of the interstate highway system in 1956.

Shifts in economic relations were equally crucial. Suburbia primarily evolved at the hands of small-scale speculators, subdivi ders, and builders who developed tracts ranging from a few houses to several acres at a time, most frequently on a piecemeal basis, quite often according to street plans predetermined by prior subdivision or municipal authorities. With the enormous increase in demand for housing following World War II, as well as the availability of Federal Housing Administration (FHA) mortgages, extensive government infrastructure programs, and standardized subdivision patterns such as those provided by the FHA Land Planning Division, individual large-scale developers now could consolidate in one enterprise the tasks of assembling land parcels, subdividing them into house lots, providing infrastructure and landscaping, providing sites for shopping centers and schools, and in some cases even building all the homes.

Federal government intervention transformed the economics of real estate, with century-long consequences, beginning with establishment of the Home Owners Loan Corporation (HOLC) in 1933 and then the FHA (1934). Endorsing the single family house above all other types, the FHA eventually made it cheaper to own than to rent; and by establishing minimum standards for housing and development, favoring homogeneous tracts of detached, single-family, automobile-dependent dwellings, the FHA contributed substantially to the postwar transformation and standardization of suburbs across the nation. Even during World War II the urgent need to house defense workers had begun to set the pattern for large-scale suburban expansion.

Since the early 18th century origins of modern residential suburbs in the Thames

Valley west of London, suburban planning and design have been substantially informed by ideologies of individualism, privacy, and the nuclear family. These basic interests underlie the predisposition of American suburban design toward private lots, single-family houses, distinct front and back yards and, by the mid 20th century, a driveway and garage for one or more cars. While individuality could be reinforced by encouraging economic and environmental homogeneity among large lot owners in 19th-century elite suburbs efforts to maintain individuality in 20th-century middle-class suburbs have produced quite the opposite effect. Uniformity to the point of anonymity, and conformity to the point of oppressive monotony, are exemplified in many subdivisions, especially following World War II, when new production techniques facilitated mass replication of houses of a single type, size, and plan in vast tracts seemingly stamped out in "cookie-cutter" fashion (e.g., in the 1950s in Panorama City, California, or Park Forest, Illinois).

Already in 1931 President Herbert Hoover had proclaimed the private dwelling to be deeply embedded in Americans' consciousness: "I am confident that the sentiment for home ownership is so embedded in the American heart that millions of people who dwell in tenements, apartments, and rented rooms… have the aspiration for wider opportunity in ownership of their own homes" (quoted in Jackson 1985, 193–194). This confidence in the private individual as the principal constituent element of American society, and in the private house as the archetypal American dwelling, both of which notions long predate Hoover, have continued to inform shifts and innovations in planning during the last third of the century. Planned Unit Developments (PUDs), gated communities, and similar homogeneous and exclusive subdivision types frequently are marketed explicitly as effective means for articulating the individual residents' status, privilege, and position. Such exclusive enclaves, along with architectural shifts that increasingly have emphasized withdrawal to indoor spaces, have served to intensify the character of suburbia as a space of consumption, privacy, and the culture of the nuclear family.

Suburban planning also reflects the importance of leisure, evidenced in the visual paradigm to which much of suburbia continues to adhere, a quasi-pastoral setting of lawns, trees, and meandering streets, explicitly differentiated by means of landscaping and zoning from proximate nexuses of commerce, transportation, and labor. Within residential areas, both planning and architecture have accommodated the growing penchant for personal, family, and community leisure activities, commonly through such amenities as community sports fields and recreation centers, backyard barbecues, and household recreation rooms, fitness areas, and entertainment centers.

The progressive theme that informed much of early 20th century planning originated in Ebenezer Howard's *To-morrow: A Peaceful Path to Real Reform* (1898), soon revised as *Garden Cities of To-morrow* (1902). An English manifesto for social reform that took aim at the evils of the "teeming metropolis," Howard's tract was an effort to tame the evils of capitalism by promoting a new approach to community organization that he termed "social individualism." Critical to this process would be a new form of community design, the garden city, which offered an attractive, almost romantic, vision of housing at far lower density than the industrial city, and in far greater visual and ecological harmony with the surrounding countryside, a design that with multiple replications he expected could effect broadscale social, economic, and political change.

In America as in England, however, the city was not to be economically outmoded or abandoned. Still, in designs for suburban adjuncts to America's growing cities, American designers did look to such figures as Howard and Sir Raymond Unwin, whose *Town Planning in Practice: An Introduction to the Art of Designing Cities and Suburbs* (1909) offered practical examples. What American designers took was a disposition toward medium density, low rise, well landscaped, multiple family dwellings, together with a conviction that such types of design could effect certain social reformist goals. John Nolen based his design for Mariemont (1921), east of Cincinnati, explicitly on English Garden City models, incorporating detached, semidetached, and row houses. His plan combined a formal town center, framed by baroque radiating avenues, with outlying residential areas consisting of curving avenues circumscribing tracts of house plots and parklands. Consistent with the ideals of Howard and Unwin, Mariemont's design incorporated a philanthropic goal of establishing an affordable and healthy working-class community; but unlike the ideal Garden City, Mariemont remained a commuter adjunct to, not a replacement for, the industrial city. Palos Verdes, California, initially developed in the 1920s according to a plan prepared by Frederick Law Olmsted, Jr., was a more ambitious effort at social engineering, incorporating a mix of large and small single-family dwellings along with some multiple family units, grouped into discrete neighborhoods, each with an elementary school and adjacent shopping areas. Olmsted argued that his design, along with the originally isolated location of this development, would make it among the most stable and permanent of communities in an otherwise changing and troublesome era.

The Regional Planning Association of America, founded in 1923, initiated an activist approach to social reform through housing. In 1924–1928 two members of the group, architects Henry Wright and Clarence Stein, working under the auspices of the limited-dividend City Housing Corporation, laid out a section of already grid-platted Queens, New York, within commuting distance of the central city, in an innovative pattern, with low-rise terraces surrounding open interior courtyards. Abandoning the custom of detached dwellings on individual house plots in favor of common interior greenswards this development, called Sunnyside Gardens, was intended to improve both housing and community for working-class people. Wright and Stein's next project afforded comparable innovation for white-collar families with automobiles. Radburn, New Jersey, begun in 1929, was organized as a series of row-house terraces fronting on lawns and walkways, with automobile access diverted to cul-de-sacs at the rear of the terraces. Vehicular traffic thus was separated and screened from pedestrian walkways. Promoted as "A Town for the Motor Age" and "A Town for Children," it remains a well articulated example of a planning type that ultimately succumbed to American predilections for privacy, autonomy, and the trappings of automobile culture. Nevertheless some of the strategies first articulated in Radburn continued to be elaborated in the 1930s New Deal Greenbelt towns (Greenbelt, Maryland, Greendale, Wisconsin, and Greenhills, Ohio), and enjoyed a revival in the 1960s and 1970s in developments such as Columbia, Maryland, and Jonathan, Minnesota.

Apart from the garden city, the other principal paradigm for early 20th century suburbia was the private enclave of singlefamily dwellings, generally inhabited by members of elite and near-elite social classes. Nineteenth-century exemplars of this type, such as Tuxedo Park, New York (1886), in effect defined themselves as communities of exclusion, often reinforced through gated perimeters. Indeed residence sometimes was limited to those who could pass a social test, such as personal approval by the community's founder, or ability to gain membership in a private association such as the community's country club. While not all subsequent suburbs could even approach the elite tenor of Tuxedo Park, the protection of social homogeneity remained paramount in numerous developments well into the 1920s, notable examples being the Country Club District developed by J.C.Nichols in Kansas City (1922) and the comparable Country Club District in Edina, a suburb of Minneapolis (1924), both of which were explicitly promoted as implements of an exclusive social milieu and lifestyle—amenities that would be conserved through such devices as minimum lot sizes and racial exclusions. Even in subdivisions targeted to a broader economic range of residents, such as Shaker Heights outside of Cleveland (1911 ff.), developers used restrictions against two-family houses, apartments, front porches, and other design and use characteristics to pointed effect in marketing the suburb as a place where "standards" brought status and restrictions safe-guarded a lifestyle.

The reformist and privatist-individualist trends in American suburban planning converged, to an extent, in Frank Lloyd Wright's series of designs for a paradigmatic American community that he termed Broadacre City (1913–16). Renewing a long-standing American ideological aversion to the city, Wright's design foresaw wholesale replacement of all cities with uniformly low-density, single-family, automobile-dependent dwellings.

Government too played a role in the shift toward the single-family suburban landscape, first in zoning initiatives concurrent with municipal reform movements of the 1920s, and then especially in housing programs that were among early efforts to address the Depression. Empowered by a Supreme Court decision enabling a proliferation of zoning codes in the 1920s, local zoning boards intent on refining suburbs' residential character commonly banned or restricted commerce and manufacturing, legislated minimum lot sizes, and otherwise favored single-family dwellings. By establishing both locational and design standards for affordable government-backed loans in the 1930s and 1940s, the HOLC and FHA assured that the bulk of new housing in America would be single-family dwellings located in neighborhoods that were preferentially newer, lower density and, well into the 1950s, racially white.

Small-scale builders and developers continued to produce a considerable portion of post-World War II suburbia, but the demands of the acute postwar housing shortage and the stimulus provided by the Servicemen's Readjustment Act of 1944 (or GI Bill) set the stage for the use of mass-production processes, and production on a larger scale than ever before. The most prominent figure in this transformation was the firm of Levitt and Sons, who prior to 1945 had rapidly mass-produced thousands of homes for the war effort. Their postwar showpiece was the community of Levittown, in the Town of Hempstead on Long Island, where by 1947 they had completed, ready for occupancy, the first of some 17,447 houses. Like many other postwar subdivisions, Levittown was exclusively white; yet there were also a number of African-American subdivisions, mostly in the South, such as Hamilton Park, a suburb of Dallas, and Bunche Park and Richmond Heights, suburbs of Miami.

As developed tracts soon backed up against each other, however, lack of community-and region-wide planning often left little opportunity to alleviate the monotony of the homogeneous domestic environment. Efforts to articulate some sort of community focus often were limited to building shopping centers. As early as the 1920s it was recognized that an elegant, convenient, high-quality retail center could enhance the desirability of a subdivision, as demonstrated by the opening in 1923 of the nation's first automobile-oriented shopping center, Country Club Plaza, as a much-vaunted amenity of J.C.Nichols' subdivision in Kansas City. The need remained, however, to address the lack of civic focus and activity in areas of vast subdivisions. One effort to remedy this was the country's first fully enclosed shopping mall, Southdale Shopping Center (designed by Victor Gruen, 1956) in Edina, Minnesota.

Occasional attempts of a different order in the 1960s and 1970s to restore the full breadth of civic and community life to suburban subdivisions are perhaps epitomized in Reston, Virginia, developed beginning in 1962 by Robert E.Simon. Considerably indebted to examples of contemporary governmentfunded new town planning in Europe, Simon's private-sector effort envisioned a town with a comparable range of housing opportunities, civic and educational institutions, and possibilities for employment and recreation, all to be kept in harmonious relation with the landscape. Despite major changes of ownership and direction in the 1960s through 1980s, Reston fulfilled much of that vision, becoming a town of seven village clusters plus a town center, and a wide range of recreational facilities, as well as a corporate business center employing over a third of the town's residents, all laid out on a well-landscaped, hierarchized system of major through roads, looping residential streets, and separated pedestrian pathways, serving a mixture of detached houses, townhouses, and apartments.

Reston was part of a shift, beginning in the 1960s, toward suburban planning that aimed to afford a greater sense of identity, community, and security through consistency of design and centralized, long-term management. Some of these efforts were on a deliberately limited scale, as with Planned Unit Developments (PUDs), which in many cases incorporated considerable sensitivity to landscape, community, and design quality, often trading an increase in housing density for more continuous open space between and around the houses. In many of these developments, however, as with larger-scale Master Planned Communities (MPCs), standards of design and rules for land use were appropriated to a central authority, either the developer or a community board empowered to maintain the developer's original restrictions. One of the largest MPCs is the Irvine Ranch, a tract of over 50,000 acres southeast of Los Angeles, originally planned in 1960 by William Pereira as a collection of village clusters centered around a university campus, along with adjacent industrial, commerical, and agricultural tracts. In 1970 Pereira's plan was superseded by the SWA Group, who began by laying out Woodbridge, one of Irvine's earliest villages, in a highly controlled yet picturesque fashion that incorporates a complex combination of mixed housing types and public and private spaces. A recent and controversial example is Celebration, near Orlando, where the Disney Corporation has both imposed rigid design restrictions and retained considerable authority over municipal government and influence in the school system. But perhaps the ascendant form of development at the end of the century is the gated community. Harking back to such smaller-scale prototypes as Llewellyn Park or Tuxedo Park, these enclosed tracts emphasize privacy, security, and in many cases status; but as

Blakely and Snyder (1997) have shown they also have the pernicious effect of decoupling residence and community from the civic realm.

However closely planned and managed some communities may be, the predominant mode of suburban development is thoroughly piecemeal, producing the wasteful and chaotic consumption of land known as sprawl. Seeking to reverse this trend on both local and regional bases, the nationwide Congress for the New Urbanism (CNU) has sought since its establishment in 1993 to restructure design, policy, and planning practices in ways that reconcentrate existing communities and incorporate new communities with compact centers, public spaces, coherent plans, and a diverse mix of facilities and activities. Architects working in this vein include the firm of Andres Duany and Elizabeth Plater-Zyberk, and Calthorpe Associates. Parallel efforts, undertaking development in conjunction with explicitly ecological and conservationist objectives, are found in communities such as Prairie Crossing (Grayslake, Illinois), opened in 1994. Here development has been limited to approximately one fourth of a 2500-acre nature preserve, concentrated in ways that safeguard the natural landscape, protect native vegetation and wildlife, conserve energy, and afford long views of open space, while maintaining a sense of place and sustainable community.

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S*ee also* **Broadacre City; Duany and Plater-Zyberk (United States); Edge City; Greenbelts and Greenbelt Towns; Gruen, Victor David (United States); Levittown, New Jersey and New York**

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SUBWAY

The subway is a 19th-century idea realized largely in the 20th century. The industrial revolution was the primary catalyst for the advent of underground transportation; without it the iron horse that pulled the trains, the tunneling technology that bored through the earth, and the iron walls that held those tunnels up would have been impossible. The problem of the subway also had its political and social implications. Mass transit meant reform, for increased mobility freed the working classes from the urban center and gave them greater share of the public realm.

The leader in the industrial revolution, Great Britain came to the forefront of subway design as well. The Metropolitan Railway was opened to the public to much acclaim in 1863. The stations on this first line were architecturally undistinguished; the line's engineers quite naturally borrowed their architectural vocabulary from the established railroads, and so a distinct Underground aesthetic would not be developed until the first years of the 20th century, when consolidation finally allowed a cohesive architectural expression to develop, as ably accomplished by Leslie Green. Green designed more than 50 stations for the Underground; the details of these stations are closely associated with the Arts and Crafts design movement, as extensive tilework unifies the entire station: the exterior, the interior of the booking hall, and the platform. The Underground continued to expand and change throughout the century. After World War I, the lines were routed farther into the suburban hinterlands. Charles Holden designed many of the Under ground's stations for this expansion, those on the Northern Line in a stripped classical mode that continued the Underground's signature use of thermal windows. In 1930 Holden traveled throughout Northern Europe, experiencing firsthand Continental modern architecture. His stations for the Piccadilly Line evince his conversion to the modern cause and continued the Underground's excellence in design. Postwar expansions and new lines have not always maintained this architectural excellence, but they have consolidated a uniform corporate identity through the use of supergraphics and typography.

Although the first Continental subway was constructed in Budapest, the Paris Métro is the early European subway best remembered for its architecture. Hector Guimard's stations interpreted plant and animal forms to create an otherworldly art. Guimard himself thought of these designs as being entirely rational, and in fact the Métro was at the time on the cutting edge of French industrial technology, and Guimard's stations are very much industrial products. They were designed to be mass produced, being made of enameled steel and manufactured glass, and yet the form that Guimard adopts is anything but a machine aesthetic and not simple transformations of natural forms. For example, Guimard's lamp standards were designed not after a plant stem but after the sap within the plant stem. Three different station types were designed to give the entire system a coherence and a corporate look. The simplest and most common were the balustrades and signposts, the second topped these balustrades with an iron-and-glass canopy, and the third comprised an entire pavilion into which a ticket booth and newspaper stand were incorporated. Guimard's tenure with the Métro was short-lived, and subsequent designs have been less adventurous, conforming to the engineering requirements of the systems. Opportunities for inventive underground public spaces, such as at the massive interchange at Châtelet, were missed. However, public art and signature graphics emboldened the visual experience of the Métro in the final decades of the century.

The Vienna Stadtbahn, more of a depressed railroad than a true subway for most of its run, is one of the best designed and aesthetically consistent systems in the world; it was Otto Wagner who made it so. Wagner was made the artistic director of the subway system and the Nüssdorf and Kaiserbad Dams in 1894. Few men in Vienna were as well qualified for the task. Wagner had studied civil engineering and understood the interdependent roles that the engineer and the architect must play in order to bring a complex public works project to a successful conclusion. A comprehensive design program prevailed at the Stadtbahn. Wagner and his design team designed the stations, the bridges, the tunnels and cuts, and just about everything except the rolling stock and the locomotives. Wagner built 36 stations from 1894 to 1900, most which survive in some form. All are located in the inner city and along the Wien River. The stations' forms vary according to the site conditions and the mood of the architect, but all share a similar vocabulary and material and are unified by their structural logic, proportion systems, and decorative motifs. Many of the stations are unapologetically classical in their vocabulary, and others are less overtly "architectural." Bridgelike forms are frequent, particularly on the elevated lines. Probably the most famous of the stations along the Stadtbahn is that at the Karlsplatz. The twin entry pavilions are modeled on the Turkish kiosk, a referent equally important to subways under construction in Budapest and New York. This exotic form fits the Karlsplatz stations perfectly, as the strong curvilinear rooflines of the pavilions respond to the elliptical dome of the Karlskirche across the square. The highly ornamented walls of the pavilions were composed of standardized panels, allowing them, in theory, to be mass produced. Wagner understood the importance of the emerging technical society and embraced it. He was able to reassemble his versatile forms in many ways in order to solve the numerous different sites the Stadtbahn demanded, thus ensuring a corporate look to the enterprise. This is a quality that other systems lacked.

New York's subway also owes its existence and initial appearance to a brilliant engineer. After numerous abortive attempts at subway building on Manhattan, the Interborough Rapid Transit Company finally realized the plans of William Barclay Parsons between 1900 and 1904. Although New York's system was only the second in operation in North America (Boston's subway was inaugurated in 1897), it quickly became the most extensive system in the world. Although the system was largely constructed using excavation techniques perfected in London and Paris, Parson's greatest engineering achievement might be his establishment of a four-track main trunk. Architecturally, the first stations on the line were fairly simple affairs that again combined features of Parisian and London station design. A station's street presence was marked by mass-produced iron-and-glass kiosks, recalling the entry pavilions in Budapest. The stations themselves were largely rectangular in section, as appropriate to their shallow cut-and-cover construction, and distinguished by the forest of steel supports supporting the street above and the terra-cotta and tile murals that identified each stop. The most elaborate station, at City Hall, was designed by Heins and Lafarge and vaulted in Guastavino tile—the effect was intended to induce a spiritual response among the throngs who used the station. As the New York system expanded into Brooklyn and Queens, the architectural qualities of the original line were sacrificed to economy and efficiency. Stations became less uniquely identifiable, and lines in the outer boroughs were as often as not perched on bents several stories above the street, remnants of the el system that was slowly supplanted by the subway across the East River.

While many subway systems purposefully projected a modern, industrial design stance, in Stalin's Moscow political symbolism prevailed over any avant-garde aesthetic. Begun in 1931, construction of the Moscow subway was led by Lazar Kaganovich, the labor boss of the Dnieper Hydroelectric Dam and Nikita Khrushchev, and the labor was supplied by tens of thousands of conscripted unfortunates, thousands of whom died in the works. The initial line was completed in May 1935, but construction continued under accelerated conditions until the Nazi invasion of Russia in the early 1940s. Whereas the engineering of the Moscow subway was quite forward looking, the architectural presentation of the subway stations was by contrast decidedly traditionalist. The classical vocabulary of many of the stations was designed to allude to great moments in Russia's past and was a part of the larger public works effort, the "Columns for the People" campaign. The monumental classical spaces of the subway, such as the rococo foyer of the Komsolskaya station, were intended to demonstrate that the wealth of the nation, once squandered on the nobility and their palaces, was as graciously serving the needs of the proletariat under the Soviet regime. Although Western architects may not have found Moscow's historicist vocabulary worthy of emulation, the Moscow subway did demonstrate that architecturally significant spaces could be achieved five stories underground.

Ironically, the subway most akin to Moscow's in its emphasis on architectural space was built in Washington, D.C.Whereas most postwar subway design aspired to nothing more than functionalism, the Washington, D.C., Metro achieved a meaningful architectural experience; this success is due to the genius of Harry Weese. Weese was trained by both Alvar Aalto and Eliel Saarinen in the grammar of modern architecture, yet he was also the restoration architect of Adler and Sullivan's Auditorium Building in Chicago and Daniel Burnham's Union Station in Washington, D.C.Weese's sensitivity to the classical heritage of the District of Columbia fused with his functionalist sensibilities to produce a dynamic set of station designs that were at once monumental, almost sublime, and yet were produced from a limited set of architectural elements, most notably the deeply coffered concrete vault. Allusions to Washington's classical heritage are made by Weese but are never literal, as in Moscow. With their soaring intersecting groin vaults, the primary interchange stations at Gallery Place and Metro Center are particularly effective and have become memorable spaces in their own right in a city of overscaled interiors.

The formal design of the subway station depended very much on the personal philosophy of the architect. Where that philosophy was in tune with the artistic movements of the day, contemporary architecture resulted. Where the architect was not so moved, nothing in the subway problem prevented a revivalizing aesthetic. The best subway systems hired designers who understood the complex contextual problems of the subway and responded with an architecture that melded the technical requirements of the building type with their own aesthetic vision.

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S*ee also* **Metro Station, Paris; Urban Planning; Wagner, Otto (Austria)**

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SULLIVAN, LOUIS 1856–1924

Architect, United States

Louis Henry Sullivan was the first internationally recognized architect in the United States to pursue the idea of a modern architecture independent of historic styles. He was supremely gifted as a designer of architectural ornament, an important component of almost all his major buildings and central to his thinking about architecture as art. Sullivan was the first American modernist to write extensively on architecture—

critically, theoretically, and philosophically. He was the most outstanding creative figure of the Chicago School of the 1880s and 1890s, particularly because of his designs for tall office buildings. His work and thought inspired a number of younger contemporaries throughout his later life, including Frank Lloyd Wright, who was Sullivan's assistant from 1887 to 1893. From 1880 to 1895, Sullivan was continuously associated with Dankmar Adler (1844–1900), whose skills in architectural engineering complemented Sullivan's design abilities to make Adler and Sullivan one of the most extraordinary partnerships in U.S. architectural history.

Louis Sullivan was born in Boston on 3 September 1856, the younger son of Patrick Sullivan, an Irish dancing master, and his wife, Andrienne, a Swiss-born pianist. After graduating from Boston's English High School, Louis studied architecture for one academic year (1872–73) at the Massachusetts Institute of Technology, where his principal teacher was William Robert Ware, who had founded the institute's Department of Architecture in 1865 as the oldest in the United States. Sullivan worked for Frank Furness, at the office of Furness and Hewitt in Philadelphia, from the summer to November 1873. Following his parents to Chicago, Sullivan then worked there in the office of William Le Baron Jenney from December 1873 to June 1874, after which time he went to Paris, where he gained admission to the École des Beaux-Arts in October 1874 as a student in the atelier of Joseph-Auguste-Émile Vaudremer. Sullivan studied at the École only into the spring of 1875, when he took an extended trip to Italy, visiting the Sistine Chapel in Rome and recalling a stay of six weeks in Florence before leaving from Paris to return to the United States in late May 1875. He then resumed work as a draftsman and designer in Chicago, for at least three architectural firms, and independently, between 1875 and about May 1880, by which time he had probably begun his continuous association with Adler, with whom he had worked at least once in 1876. Sullivan became an equal partner in the firm of Adler and Sullivan from 1 May 1883 to July 1895, when Adler briefly left architecture. Afterward, Sullivan practiced in Chicago with a series of assistants (most importantly, George Grant Elmslie, from 1889 to 1909) and then alone until his death there on 14 April 1924, when he was impoverished.

When Sullivan joined Adler, Adler had recently begun independent practice after working with a series of architects in Detroit and Chicago and three years of service in the U.S. Army during the Civil War, partly as a topographical engineer. Adler's skills as a planner, engineer, and acoustic designer and Sullivan's unique abilities as an architect of ornamental, richly colored interiors meant that by 1885 their firm was considered without peer in Chicago in the field of theater design. This led to their being given the commission to design the Chicago Auditorium Building (1886–90), then the largest private architectural project in the city and the structure that did much to launch Chicago's reputation as a major center for early modern architecture. For their client, Ferdinand W. Peck, Adler and Sullivan designed the Auditorium Building as a ten-story block containing a 4,200-seat theater, a 400-room hotel with a set of elaborate public interiors, and rentable stores and offices. The building's massive granite and limestone street fronts, inspired in part by Henry Hobson Richardson's Marshall Field and Co. Wholesale Store (1885–87) in Chicago, combined with the Auditorium's 16-story tower to make the building a prominent landmark on the lakefront at Michigan Avenue and Congress Street. Inside, the Auditorium Theater was meant in part to contrast with the

Metropolitan Opera House (1880–83) in New York City, which was planned mainly for its wealthy box holders seated in 122 boxes set in horseshoe-shaped tiers around the theater, which sat a total of 3,045. In the Auditorium, there were only 40 boxes set to the sides of the house, whose vast parquet, balcony, and two upper galleries were meant to accommodate large middle- and working-class audiences for grand opera, orchestral and choral concerts, lectures, and other events. The theater's acoustics, acclaimed by leading singers of the period, depended in large measure on its innovative elliptically arched ceiling, which steps up and out in four segments from the proscenium. The acoustics, mechanical stage equipment, and Sullivan's original program of ornamental plasterwork and stencils, integrated with incandescent electric lighting and ventilation, combined to make the theater one of the world's outstanding rooms for opera.

The Auditorium Theater's opening in December 1889 was a national event that initiated Adler and Sullivan's international reputation. From 1890 to 1895, they designed other theaters inside multistoried business blocks, including the Schiller Theater Building (1890–92, demolished 1961) in Chicago. Sullivan was also the principal designer of the distinctively polychrome Transportation Building at the mostly neoclassical World's Columbian Exposition of 1893. Yet, historically, the firm's most renowned works of the early 1890s were their tall steel-framed office buildings. In addition to the Schiller, Adler and Sullivan's built works of this type were the Wainwright Building (designed 1890, built 1891) in St. Louis, the Union Trust Building (designed 1891–92, built 1892–93) in St. Louis, the Chicago Stock Exchange Building (designed 1892–93, built 1893–94, demolished 1972), and the Guaranty Building (designed 1894–95, built 1895–96) in Buffalo. After Adler left the partnership in July 1895, Sullivan designed the Bayard Building (designed 1897–98, built 1898–99) on Bleecker Street in New York City. Except for the Chicago Stock Exchange, all these tall office buildings had exterior street fronts wherein continuous vertical piers projected forward of windows and horizontal lintels. In his single most famous essay, "The Tall Office Building Artistically Considered," of 1896, Sullivan emphasized the accentuation of verticality in the exterior form of tall office buildings as the appropriate expression of their multistoried height and lofty steel frame. Sullivan's extensive use of terra-cotta ornament on the exteriors of his tall buildings demonstrated that, unlike some of his European contemporaries and many later modernists, Sullivan did not consider ornament to be an anathema in modern architecture. Rather, he was against the use of overtly historical ornamental and architectural forms. In his essay "Ornament in Architecture," of 1892, Sullivan had emphasized the complementary relationship between structure and ornament in the creation of buildings that embodied what he termed the organic ideal, meaning architecture as living form, analogous to forms in biological nature.

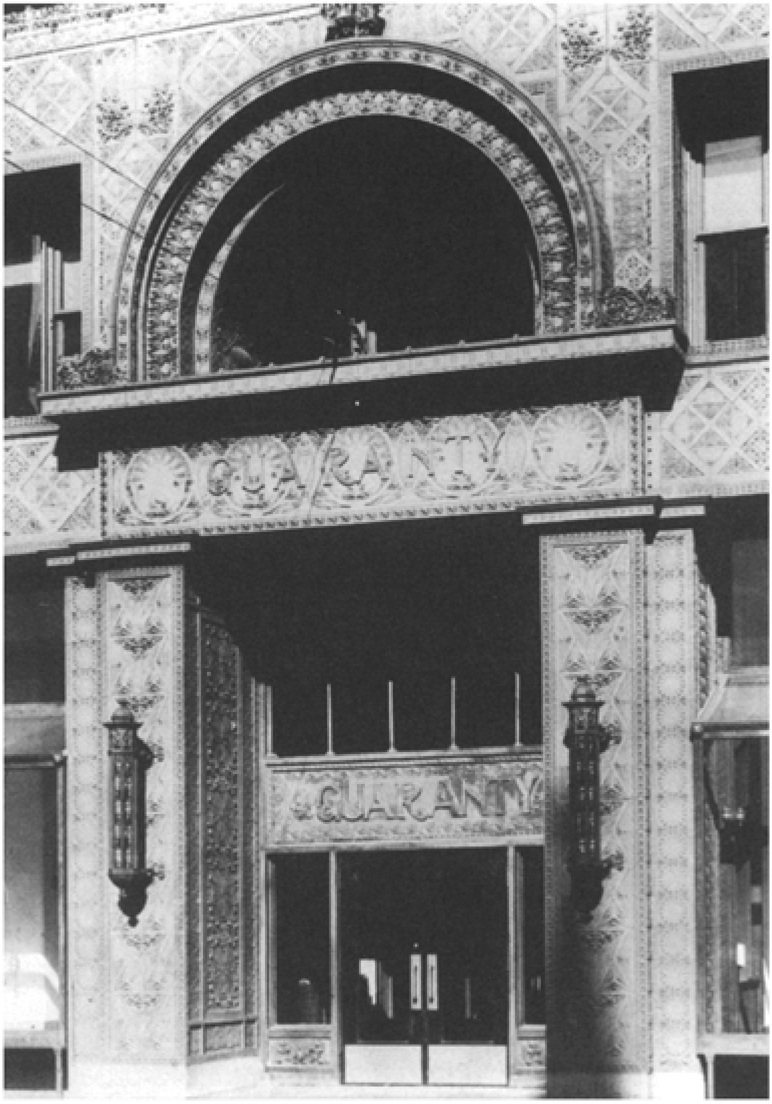
In the aftermath of the dissolution of his partnership with Adler in mid-1895, Sullivan received much professional praise from fellow architects and critics but relatively fewer commissions, especially after 1900, although he continued to write extensively. From his earlier partnership, he retained one major Chicago client, David Mayer, who in 1898 commissioned Sullivan to design the new Schlesinger and Mayer Store, to be a 12-story iron-and-steel-framed department store for retailing on State and Madison Streets at the center of Chicago's shopping district. Built in stages in 1899 and 1903–04, this structure was then acquired by Carson Pirie Scott and Co. and is historically known by that firm's name. The building featured a two-story base of ornamental cast iron (originally envisioned as bronze) framing plate-glass show windows for mercantile display. Above, the upper stories were clad in white terra-cotta (initially designed as white Georgia marble), with each structural bay filled with a Chicago window (a broad, central, fixed pane flanked by an operable sash window on either side). Unlike the subdivided interior floors of tall office buildings, the department store's floors were open lofts in need of maximal daylight. Carson Pirie Scott's upper elevation as the direct expression of its iron-and-steel frame made this building a canonical work of early 20th-century architecture, one often cited in modernist historiography of the Chicago School.

From 1906 to 1919, Sullivan designed a remarkable series of bank buildings in small Midwestern towns that served as centers for surrounding farming regions. At a time when bank buildings in the United States were almost uniformly neoclassical, Sullivan's essays in the type were richly colored, ornamentally elaborate, and highly individual designs. The most architecturally ambitious and historically acclaimed among these buildings was the first of the series, the National Farmers' Bank at Owatonna, Minnesota, designed and built from 1906 to 1908. With the support of the bank's president, Carl K.Bennett, Sullivan, assisted by Elmslie, created a unique structure, nearly cubic in its basic form. Lower walls were faced in cut brownstone as a base below upper walls faced in variably colored paver or tapestry brick, polychrome ornamental terra-cotta, and bands of glazed mosaic. Externally, the bank's form conveyed security of deposits, concentration of wealth, and association with agriculture, all elements of functional character consistent with the building's type and locale. Inside, the bank's main floor is one high spatial volume that receives daylight through a central sky-light and the art-glass panels set into the 36-foot-wide arched windows in the south and west upper walls. These sources illuminate the richly colored decorative plasterwork and stenciling that form the borders of the arches set in the opposite north and east walls. These mural arches framed paintings of regional land-scapes with dairy cows, the main source of local agricultural wealth and thus of the bank's deposits. Sullivan's later bank

Guaranty Building, Buffalo, New York (1896)

buildings explored similar ornamental themes. These surviving (though modified) works include the People's Savings Bank (1909–11) in Cedar Rapids, Iowa; the Purdue State Bank (1913–14) in West Lafayette, Indiana; the Merchants' National Bank (1913–14) in Grinnell, Iowa; the Home Building Association (1914–15) in Newark, Ohio; the People's Savings and Loan Association (1916–18) in Sidney, Ohio; and the Farmers' and Merchants' Union Bank (1919–20) in Columbus, Wisconsin. Sullivan's last multistoried building was the steel-framed dry-goods store (1911–14) for John D.Van Allen and Son in Clinton, Iowa, whose design partly recalls that of Carson Pirie Scott.

As an architectural thinker, Sullivan sought to broaden his influence through his many published writings, which appeared from 1885 until his death. These writings included Sullivan's 52 short essays titled "Kindergarten Chats," first published serially in Cleveland's *Interstate Architect and Builder* from February 1901 to February 1902 and later edited by Sullivan and others in subsequent editions. In these essays, Sullivan emphasized the need for an American architecture as the authentic expression of modern social, economic, cultural, and technical conditions. In this vein, his position is usually understood to be much like that of modernist European architects in the early 20th century. Sullivan's pursuit of these themes made him appear in retrospect to be a "prophet of modern architecture," the subtitle of his first



Detail of ornamentation, Guaranty Building

biography by Hugh Morrison, originally published in 1935. Yet Sullivan's concern for individual imagination, nature as a prime source of inspiration, botanically inspired ornament, and architectural expression of American ideals of democracy distinguished his work and thought from that of many modernists. In the 1980s, a new cycle of Sullivan scholarship coincided with the rise of Postmodern historicism, and his work was reexamined not only as prophetic of the later modern movement but also for its relation to 19th-century architecture and theory. There was renewed interest in his systems of ornament and color and in his idea of expressing the functional character of building types, a premise taught at the École des Beaux-Arts. Sullivan once cited this school as a chief source of the idea most often associated with him, that "form follows function," an aphorism that Sullivan thought applied to living forms in nature as models for an organic architecture.

JOSEPH M.SIRY

S*ee also* **Carson Pirie Scott Store, Chicago; Chicago School; Larkin Building, Buffalo, New York; National Farmers' Bank, Owatonna, Minnesota; Ornament; Wright, Frank Lloyd (United States)**

Biography

Born in Boston, Massachusetts, 3 September 1856. Attended the Massachusetts Institute of Technology, 1872–73; studied at the École des Beaux-Arts, Paris, 1874–75. Draftsman at the firm of Furness and Hewitt, Philadelphia, 1873; worked for William Le Baron Jenney in Chicago, 1873–74; draftsman in several Chicago offices, including that of Joseph Johnston and John Edelman, 1875–76. Joined the firm of Dankmar Adler & Co., Chicago, about 1880; partner in the firm of Adler and Sullivan, Chicago, 1881–95; Frank Lloyd Wright employed by the firm as draftsman and assistant designer, 1887–93. Went into private practice in Chicago, from 1895. Awarded the Gold Medal, American Institute of Architects, posthumously, 1946. Published several influential works including *Kindergarten Chats* (1901–02) and *The Autobiography of an Idea* (1924). Died in Chicago, Illinois, 14 April 1924.

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Auditorium Theater Building, Chicago, 1886–1890
Wainwright Building, St. Louis, Missouri, 1890–1891
Schiller Theater Building (destroyed), Chicago, 1890–1892
Transportation Building (destroyed), World's Columbian Exposition, Chicago, 1891–1893
Union Trust Building, St. Louis, 1891–1893
Stock Exchange Building (destroyed), Chicago, 1892–1894
Guaranty Building, Buffalo, New York, 1894–1896
Bayard Building, New York City, 1897–99
Schlesinger and Mayer Department Store (now Carson Pirie Scott Building), Chicago, 1898–1904
National Farmers' Bank, Owatonna, Minnesota, 1906–1908
People's Savings Bank, Cedar Rapids, Iowa, 1909–1911
Van Allen Dry Goods Store, Clinton, Iowa, 1911–1914
Purdue State Bank, West Lafayette, Indiana, 1913–1914

Merchants' National Bank, Grinnell, Iowa, 1913–1914
Home Building Association, Newark, Ohio, 1914–1915
People's Savings and Loan Association, Sidney, Ohio, 1916–1918
Farmers' and Merchants' Union Bank, Columbus, Wisconsin, 1919–1920
Krause Music Store Facade, Chicago, 1922

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SUPERMODERNISM

Critic and historian Hans Ibelings—borrowing from anthropologist Marc Augé—uses the term "supermodernism" (also called "hypermodernism") to describe a style of architecture emerging in the 1990s, characterized by structures that are often airy, minimalist or monolithic, and transparent or translucent and that use an abundance of glass. Although supermodern structures exploit technological innovation, they are generally visually and symbolically simple, with clean lines, a minimalist style, and neutral materials.

Theoretically, Ibelings situates supermodernism in relation to Postmodernism and Deconstructivism and in conjunction with some of the aims of modernism. Ibelings noticed common tendencies in several architectural books published in the mid-1990s: Terence Riley's *Light Construction* (1995), Rodolfo Machado and Rodolphe el-Khoury's *Monolithic Architecture* (1995), Vittorio Savi and Josep Ma Montaner's *Less Is More: Minimalism in Architecture and the Other Arts* (1996), and Daniela Colfrancescchi's *Architettura in superfice; Materiali, figure e technologie delle nuove facciate urbane* (1995). The almost simultaneous publication of these texts describing a similar aesthetic led Ibelings to condense formal and theoretical tendencies into a description of a coherent architectural style.

Contributors to this style include contemporary international architectural firms such as Rem Koolhaas's Office of Metropolitan Architecture (OMA), Jean Nouvel, Dominique Perrault, Herzog and De Meuron, and Iñaki Abelos and Juan Herreros. Noteworthy examples of supermodernist architecture include Jean Nouvel's beautifully transparent Cartier Foundation for Contemporary Art and Head Office of Cartier France (1991–94) in Paris as well as his design for the Tour sans Fin (1989), a glass-topped tower to be built in Paris's La Défense. Also significant are Dominque Perrault's new home for the Bibliothèque Nationale (1989–96) in Paris as well as her Hotel Industriel Berlier (1985–90) in Paris and Koolhaas and OMA's Educatorium (1997), a multipurpose building designed for Utrecht University in the Netherlands.

Supermodernism is a phenomenological architecture, an architecture that appeals to the experience of place rather than to ideas or symbols. Although postmodernist and deconstructivist approaches to architecture often appeal to intellectual and historical relationships among forms, supermodernism suggested a shift toward (perhaps even a return to) the formal qualities of space and the visual and tactile sensations that accompany them. According to Ibelings, the emphasis on space and place rather than on form (or style as an end it itself) contradicts one of the main tenets of postmodern architecture—that a particular building is an often-contradictory composite of symbols or signs that carry cultural and linguistic meanings. Supermodern architecture rejects the desire or need to decode symbols and instead appeals to a range of physical as well as psychological qualities perceived through the experience of the forms. Supermodern buildings reflect neither the history of architecture nor extraarchitectural ideas.

The supermodern structure in part appeals to universal concerns (a stronghold of modernist ideology of the earlier part of the century). This emphasis on universality reflects the current interest in globalization, which Ibelings links to homogenization and commodification in art and architecture. Global homogenization has generated a rash of chain stores, internationally recognized products, and expressionless, nondescript architecture in world cities that resemble one another as well as architecture that is no longer built by local architects in local styles.

Linked to globalization is the development of what Augé calls “nonspace.” Nonspaces are spaces that “cannot be defined as relational, or historical, or concerned with identity” (Augé, 1995). Rather than social centers where communities gather for collective activity, nonspaces function as common places where groups of people come together yet experience the space separate from others. The current built environment is, according to Augé's somewhat relativist reading, meaningless. However, meaningless space arises as a reaction to three kinds of abundance: an abundance of space, an abundance of signs, and an abundance of individualism. The plethora of nonspaces creates what Augé calls the supermodern condition, an obvious reference to French philosopher Jean-Francois Lyotard’s 1979 seminal study *La condition postmoderne: rapport sur le savoir* (The Postmodern Condition: A Report on Knowledge).

Because globalization has increased world travel to a phenomenal extent, the airport perhaps functions as the quintessential nonplace, although supermarkets, hotels, and oversized malls could be added to this list. Ibelings argues that the airport structure has evolved into a universal type he describes as “an exposed

Hotel Industriel Berlier, Paris, designed by Dominique Perrault and Partners (1990)

steel construction (a space-frame or gigantic trusses), a marked preference for vaulted roofs, a colour palette of grey, white, pale blue and light green and, above all, acres and acres of glass" (1998). Examples of this design include Kansai International Airport Terminal, Osaka (Renzo Piano Building Workshop, 1988–1994); Hong Kong International Airport, Hong Kong, Chek Lap Kok (Foster and Partners, 1992–98); Stansted Airport, Essex, England (Foster and Partners, 1981–91); and Europier, Heathrow Airport, London (Richard Rogers Partnership, 1992–95). Functionally, the contemporary airport encompasses services such as shopping in addition to a means of travel, and further serves as an economic center for the surrounding area, a trend that reflects the transition of the symbolic city center to the periphery.

Supermodernism maintains particular traditions of modernism; namely, an aesthetic of neutrality, minimalism, and abstraction. Yet supermodernist architects seek expressivity; buildings are intended to be as autonomous and obviously separate from their surroundings; as contemporary and new, reflecting the present; as technically innovative; and finally, as a clean slate, an intended break from the past. Nonetheless, contemporary critics and stress the need to not only examine these qualities but to locate them within our contemporary global experience.

LINDA M. STEER

S*ee also* **Foster, Norman (England); Herzog, Jacques, and Pierre de Meuron (Switzerland); Hong Kong International Airport, Hong Kong; Kansai International Airport Terminal, Osaka; Koolhaas, Rem (Netherlands); Nouvel, Jean (France); Piano, Renzo (Italy); Postmodernism; Rogers, Richard (England)**

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SUSTAINABILITY AND SUSTAINABLE ARCHITECTURE

Buildings consume one-third of the total energy produced in the United States, produce 40 percent of the carbon dioxide emissions that have been linked to global warming and air pollution, and generate 33 percent of landfill construction waste. These statistics have resulted in a growing trend whereby buildings are designed, constructed, operated, reused, and deconstructed in ways that will enhance human health and protect environmental quality. *Sustainable architecture* is the expression coined for environmentally responsive building practices. It differs from conventional design by considering the environmental impacts of design decisions throughout the entire building life cycle from cradle to cradle instead of cradle to grave. It provides a comprehensive examination of all aspects of architectural design including site selection, energy conservation, passive solar strategies, low-energy systems, building materials, indoor air quality, water conservation, waste minimization, lighting, and use of renewable energies.

The roots of sustainable architecture can be traced to the ancient theoreticians that include Vitruvius, who in *The Ten Books on Architecture* discussed the benefits of designing with the local climate and indigenous materials (Morgan 1960). The skills of preindustrial builders, the mastery of using on-site resources such as proper orientation, thermal mass, shading, ventilation, and local construction materials, were all but abandoned after the invention of artificial lighting and air conditioning. Except for several notable exceptions (i.e., organic movement), architecture of the first half of the

20th century disregarded the environmental context of buildings. The energy crisis brought about by the 1973 Arab oil embargo hastened the return to energy-efficient design. The passive solar architecture movement of the 1970s responded by offering appropriate technical solutions that, for the most part, failed to address broader environmental and architectural concerns. The sustainability movement emerged in the late 1980s as an outgrowth of this period, adding to a heightened environmental awareness determined to achieve more comprehensive and integrated design solutions.

The term *sustainability* has its origins in the 1987 World Commission on Environment and Development report, *Our Common Future*. The concept was central to "a global agenda for change" in current development patterns focusing on both underdeveloped and industrialized countries. The term recognizes the interdependency of economic, social, and environmental factors necessary to sustain life on Earth. The defining quote from this report is: "Sustainable development seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future" (WCED 1987). Buildings and sites that utilize natural systems to minimize their global, regional, and local environmental impacts on land, energy, water, and materials form the basis of "sustainable" or "green" architecture. Human health, economic affordability, and social equity are also considered attributes of sustainable design.

Sustainable architecture involves both design philosophy and technology. Practitioners in the field have written manifestos, statements of principles, and guidelines to clarify the goals, intentions, and aspirations for sustainable design. One such widely published document is the *Hannover Principles* by William McDonough, named after the World's Fair 2000 city in which the principles were drafted. The statements in this document elucidate the inherent value of nature and our need to seek a more symbiotic relationship with it. Guidelines for sustainable design by contrast tend to focus on applications of design strategies or technologies. The journal *Environmental Building News* of Brattleboro, Vermont, provides one such checklist, which serves as a concise listing of building design and construction practices for any home owner, builder, or designer interested in building sustainability.

Technologies for sustainable architecture form a long, cross-cutting list of alternatives that need to be adapted to local environmental conditions. Daylighting design (Guzowski 2000), passive solar heating (Mazria 1979), passive cooling (Givoni 1994), water recycling and reuse, and biological wastewater treatment are primary sustainable design strategies that combine innovations in technology with extensive design knowledge and expertise. Computer tools are still mostly segmented providing design assistance for particular building performance issues such as energy *(Energy-plus, DOE2,* and *Energy-10)* and lighting design *(Lightscape* and *Lumen-micro)*. A design tool that links disparate design and analysis components is Lawrence Berkeley National Laboratories' *Building Design Advisor*. The *Green Building Advisor* by the Center for Renewable Energy and Sustainable Technology (CREST), E build, Inc., and Design Harmony, Inc. gives designers qualitative recommendations for sustainable design including bibliographic, video, and electronic resources as well as documented case study buildings.

Selection of building materials is another key focus of sustainable architecture. Construction materials and methods are sought that are low impact throughout the entire material life cycle; that is, the materials should create less environmental damage in their extraction, processing, use, waste, and disposal phases than conventional alternates. Green building materials typically have one or more of the following traits: they are durable, compostable, recyclable, re-usable, and nontoxic to humans. Many of the green building materials not only demonstrate superior environmental performance but also do not degrade indoor air quality when strict adherence to non-toxic content is heeded in installation as well as in the material. Recent history of sick building syndrome calls attention to the health risks of creating sealed buildings with insufficient ventilation and finish materials that cause chemicals to disperse into the indoor environment. In 1996 the American Institute of Architects published their guide to environmental building products called the *Environmental Resource Guide*. This book gave qualitative descriptions of the impacts of common building materials. Alternative building construction materials also play an important role in sustainable design (Elizabeth and Adams 2000). Straw bale (Bainbridge et al. 1994), rammed earth (Easton 1996), cob, recycled tires (Reynolds 1993), and fired ceramics (Khalili 1986) are the most familiar alternatives to conventional construction systems used in sustainable building.

There are a number of exemplary buildings that illustrate the principles of sustainable architecture spanning a wide range of building types, scales, and geographical locations. The examples presented here highlight the qualities that differentiate sustainable design from conventional practice.

The Center for Regenerative Studies at California State Polytechnic University at Pomona is an example of an integrated design solution demonstrating ecological site planning as well as sustainable building strategies. The project, built on 16 acres across from the main university campus, completed the first phase of construction in 1993 although design ideas originated in the classroom almost 20 years earlier under the tutelage of the late Professor of Landscape Architecture at Cal PolyPomona, John Tillman Lyle. Professor Lyle elaborated on the design process and solution in his book, *Regenerative Design for Sustainable Development*. The specific sustainable design strategies applied to the landscape include biological wastewater treatment through pond ecosystems, a solar farm with experimental solar electric technologies, habitat preservation for wildlife, and edible landscapes woven throughout the building site. The buildings were designed by the architectural firm Dougherty and Dougherty as demonstration facilities, with a variety of passive solar heating and cooling strategies. Building materials were selected for their durability, low maintenance, and low embodied energy. Recycled materials were used in the landscapes such as recycled tires for retaining walls and recycled concrete paving for outdoor patio spaces. The Center also enjoys its unique status as a social experiment for participatory student cohousing.

Another example of an integrated building and landscape solution is the passive solar subdivision, Village Homes, in Davis, California, by Mike and Judy Corbett that was started in 1975 (Corbett 1988). This 70-acre site with 220 homes manages storm water drainage using natural landscape features, narrow shaded streets to decrease exterior summer temperatures, a street layout that supports solar access, and edible landscapes throughout. Shared open space is developed between units adding to recreational use as well as a sense of community. Energy consumption for the passive solar homes in this subdivision is less than half that of conventional homes in the surrounding area. Less than 10 per cent of the homes use mechanical cooling, which is a testimonial to passive cooling in a climate that has many days reaching 100 degrees Fahrenheit in summer.

An example of a retail project utilizing the principles of sustainable architecture is the Real Goods Headquarters in Hopland, California. Real Goods, a retailer of renewable energy products, commissioned a building design that reinforced their corporate philosophy toward environmental stewardship. Architects from the Ecological Design Institute of Sausalito, California, designed a straw bale structure finished with "PISÉ" (pneumatically installed stabilized earth). The south-facing semicircular plan optimizes interaction with the sun, with tall clerestory windows on the southeast to capture morning light and shorter clerestories on the southwest to reduce late afternoon solar gain. An exterior trellis protects lower windows from the hot summer sun where visitors can enjoy the evaporative cooling effect from a water fountain in the entrance courtyard. Light shelves on the interior diffuse and reflect light creating a soft glow. Thermal mass is achieved through the concrete floor and interior PISÉ walls. The site has additional sustainable design elements, some built, others planned. There is a solar powered water pump at the entry, flow forms that can be used in water treatment as sculptural water elements, and retention ponds that form part of the landscape ecology. The parking lot utilizes biofilters to minimize the effects of nonpoint source pollution from automobiles. The restrooms for this complex are touted to passersby on the nearby highway as a "must-see." Waterless urinals, recycled plastic toilet stalls, and reused toilet tank tops as wainscoting are the predominant features. This project and a more general discussion of the design team's sustainable design philosophy are described in *Ecological Design* by Sim Van der Ryn and Stuart Cowan (1996) and *A Place in the Sun* by John Shaeffer (1997).

To illustrate that sustainable design can be achieved in a more extreme climates, the Rocky Mountain Institute in Snowmass, Colorado, ofifers an excellent example of combining home, office, and indoor farm into an exceptionally energy efficient and aesthetically pleasing environment. The owners, Hunter and Amory Lovins, have created a building that mirrors the resource-efficiency concerns that occupy their professional lives (Hawken, et al. 1999, Lovins 1977). Although the 4000-squarefoot building is located in a cold (8700 Fahrenheit heating degree day) climate, it is 99 per cent passively solar heated. The building, built in 1984, uses high-performance window technology, daylighting, energy-efficient electric lighting, high insulation levels, thermal mass, a sunspace, interior water features, and photovoltaics. The building boasts a ten-month payback period in energy savings to recover the initial cost of the energy improvements.

Office buildings, because of their emphasis on lighting and the high monetary value placed on the employees occupying these buildings, are a prime candidate for sustainable design. Worker productivity studies, as well as student performance in sustainable buildings, are beginning to connect design quality and occupant health, as illustrated in the studies by Dr. Judith Heerwagen of Seattle, Washington, and researchers at the Heshong-Mahone Group near Sacramento, California. Two notable office building examples discussed in more detail here are the ING Bank by Alberts and Von Huut and the C.K.Choi Building by Matsuzaki Wright Architects.

The ING Bank (formerly NMB) headquarters building near Amsterdam, the Netherlands is a corporate bank headquarters consisting of 10 vertical towers connected by a serpentine plan linking offices and support spaces. The towers use daylight, stack ventilation, plant materials, water features, and orientation devices to enliven as well as enhance the transition zones between buildings. Office workers are guaranteed natural light either from the exterior windows, with no worker being more than 20 feet from a window, or from the interior borrowed light. Site development includes several gardens placed in part to conceal a parking garage below. The building, built in 1987, is unique in terms of the participatory process used, which involved representatives from all future building occupant groups as well as all members of the design and consultancy teams from the beginning of the process. The 538,000 square foot building is also renowned for using 90 per cent less energy per square meter than the previous bank building, recovering the costs of energy improvements in energy savings after four months and reducing absenteeism by 15 percent (Roodman and Lenssen 1995). The bank is not only energy efficient, but it is also evocative in the variety of spatial experiences and environments it creates.

The C.K.Choi Building at the University of British Columbia utilizes a surprising array of bold and more common sustainable design strategies that are well integrated into the final design solution. The three-story 30,000-square-fbot office building has a long north-south axis to preserve adjacent forest land. Although this could pose a challenge for passive solar heating, the architects skillfully used roof forms to maximize north daylighting while creating a surface for mounting solar electric panels in the future. Reclaimed materials used in the building include salvaged wood trusses from a neighboring building undergoing demolition at the same time and recycled bricks. The architects experimented with a trickle ventilation system at the windows to encourage the infiltration of limited quantities of fresh air and utilized stack ventilation through the daylight atriums to avoid a conventional ducted ventilation system. The immediate landscape utilizes the building's gray water. One of the building's more unusual features for the building type is its use of composting toilets in an office building.

There are many more examples of sustainable office buildings worthy of further examination. These include the Audubon Building in New York City by the Croxton Collaborative, the Building Establishment (BRE) Headquarters in Hertfordshire, England, by Feilden Clegg Architects, the Menara Mesiniaga in Selangor, Malaysia by Kenneth Yeang, the Thoreau Center for Sustainability at the San Francisco Presidio by TLMS Architects, and an environmental studies building at Oberlin College in Ohio by William McDonough.

As seen in these projects, sustainable design goes beyond the energy savings goals of the 1970s by creating buildings that satisfy energy as well as ecological, aesthetic, and functional considerations through the overall design of building envelope, components, systems, and siting. Besides computer analysis of building systems, much of the decision-making and evaluation of sustainable architecture, however, is of a highly qualitative nature. Quantitative assessments that benchmark sustainable buildings for performance is a logical next step in the mainstreaming of sustainable architecture. A few of the current assessment methods are discussed next.

An attempt to combine economic and environmental measures for sustainable building materials has produced a number of computer-based life-cycle assessment tools. BEES, *Building for Environmental and Economic Sustainability,* from the National Institute of Standards and Technology allows comparative analysis of material selections on their environmental merit (e.g., global warming, ozone depletion, embodied energy) as well as their economic cost. Other life-cycle assessment tools, such as the Canadian product ATHENA, allow a detailed environmental accounting of a product throughout its entire manufacturing and use cycles in terms of energy, water, air, and solid waste effects. A concept called the "ecological footprint," developed by Mathis Wackernagel and Bill Rees at the University of British Columbia, considers the far-reaching energy, water, and material resource effects involved in everyday patterns and products of consumption but does so in terms of replacement resources to ameliorate the environmental impact.

Another means for assessing environmental performance of sustainable architecture is through the use of green building rating systems. Rating systems assign building performance categories a value judged against a set of prescribed baseline criteria. Malcolm Wells's 1969 *Wilderness-based Checklist* is one of the earliest rating systems using ecologically based accounting to tally the rewards of designs that improve environmental quality against the penalties of those with the opposite effect. More recently, the U.S. Green Building Council developed a national rating system called *Leadership in Energy and Environmental Design* (LEED). Regional adaptations to the categories in this system allow jurisdictions, such as cities, to tailor the ratings to their locality. Other examples of rating systems include the Austin, Texas, *Green Builder Program* and *Building Research Establishment Environmental Assessment Method* (BREEAM) in the United Kingdom.

Sustainable architecture developed in response to a cascade of environmental concerns of the late 20th century described by such authors as Rachel Carson, Donella and Dennis Meadows, Aldo Leopold, Buckminister Fuller, David Brower, Amory Lovins, Paul Hawken, and others. A series of international commissions, from the 1987 Bruntland Report to the 1992 Earth Summit's Agenda 21, to the Montreal Protocol and the Kyoto Agreement, have crystallized the global importance of environmental issues that serve as a backdrop for design intervention. These concerns are echoed at the beginning of the 21st century when emerging fields such sustainable architecture, ecological engineering, sustainable agriculture, industrial ecology, and others begin to address the complexities of balancing environmental, economic, and social factors. Design decisions that affect land, energy, water, and material resource consumption, as well as human health and the human spirit, set sustainable design apart from conventional design and will continue to do so for years into the future.

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S*ee also* **Energy Efficient Design; Solar Architecture**

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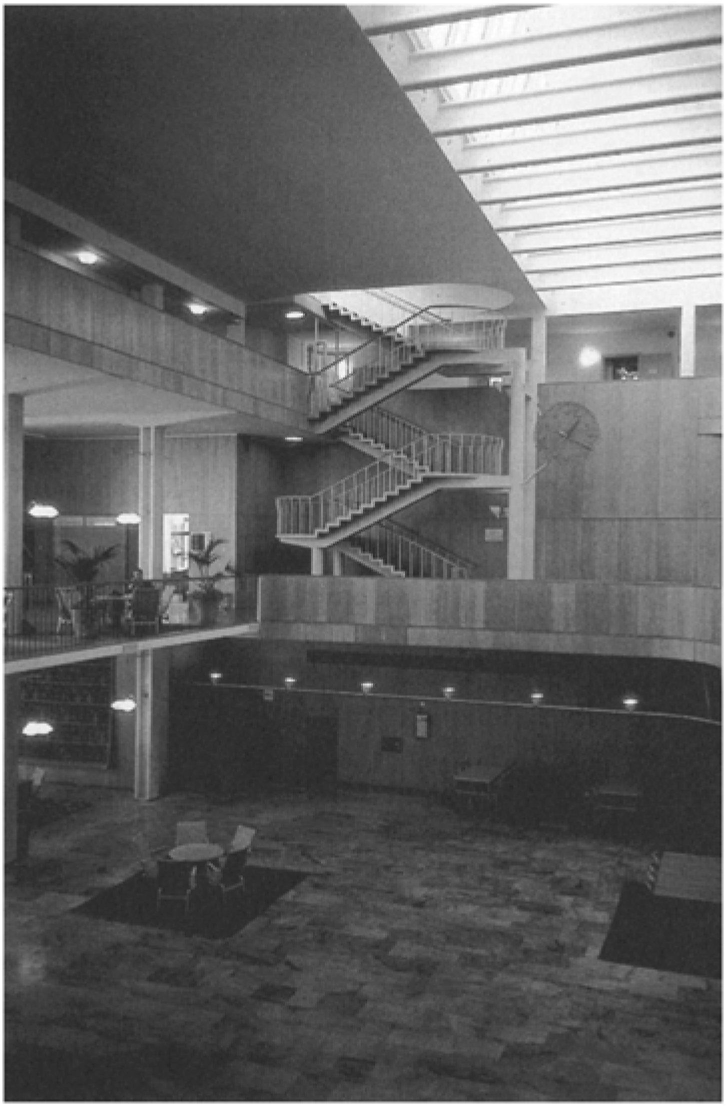
SWEDEN

Swedish architecture at the beginning of the 20th century was characterized by the same search for an appropriate style that was taking place on the European continent at the same time. In addition to a range of stylistic tendencies, architects faced new tasks resulting from social and political changes, housing shortages, rapid urban growth, and the development of new materials and principles of construction. One of the most significant responses to the advent of novel materials and construction techniques came from Ferdinand Boberg, the architect of the 1897 Stockholm Art and Industry Exhibition. Boberg rejected the prevalent adherence to a neo-Renaissance style, instead employing simpler medieval and Romanesque forms and reevaluating the role of ornament (Electricity Works, 1889–92; Rosenbad Bank Building, 1899–1904). Although he did not reject the uses of ornament, Boberg believed that a building's form should be based on function and that the inherent properties of materials used in its construction should be a primary consideration. These notions would be further developed and find their fullest expression later in the century.

Governed by economic necessity, commercial buildings constructed around the turn of the century employed new, more efficient materials and methods of construction imported from outside Sweden. In 1898, Johan Laurentz constructed the first building for commercial purposes in Stockholm using iron and glass as the major elements for the facade. One year earlier, in 1898, Ernst Stenhammar had used a steel frame to construct a facade devoid of ornament derived from historical references; Stenhammar was also the first Swedish architect to use reinforced concrete in the Myrstedt and Stern Building (1908–10).

Like materials and methods of construction, stylistic tendencies were subject to importation and further contributed to the debate over what was appropriate. One end of the spectrum was represented by Carl Bergsten, whose Industrial Hall at the 1906 Art and Industry Exhibition in Norrköping was clearly influenced by the work of Otto Wagner and other architects active in Vienna at the time, and the other by Georg A.Nilsson, whose stripped-down facades and clear plans anticipated functionalism. Reacting to the former tendency, Carl Westman criticized the Royal Dramatic Theatre in Stockholm, completed in 1908 by



Gothenburg City Hall Extension (1913–37), by Gunnar Asplund

Fredrik Lilljekvist, for its adherence to style at the expense of function and the inconsistent use of ornament derived from the Art Nouveau and Jugendstil movements that had developed in continental Europe. Westman's own position was made clear in the Medical Association Building (1904–06) in Stockholm, which is characterized by clear expression of material and simple facade treatment. The work of Westman and those influenced by it, such as Ragnar Östberg (Östermalm Teacher's College, 1906–10; Stockholm Town Hall, 1902–23), Lars Israel Wahlman (Engelbrekt Church, 1905–14), and Sigfrid Ericson (Masthugget Church, 1907–14), has been categorized as part of a movement known as "National Romanticism."

Reactions to National Romanticism included a return to a classical form language, as exemplified in Ivar Tengbom's Enskilda Bank Building (1912–15) and Swedish Match Corporate Headquarters Building (1926–28). During this period, influences from neighboring Denmark were readily apparent and served to inspire the return to classicism, as in Carl Petersen's Faaborg Museum (1912–15). The influence of classicism is apparent in the early work of Gunnar Asplund and Sigurd Lewerentz. Of particular note is the proposed crematorium for Helsingborg designed by Lewerentz and Torsten Stubelius in 1914 and the development of the original proposal for the Woodland Cemetery developed by Lewerentz and Asplund in 1915. While continuing work on the Woodland Cemetery, Asplund completed the Lister County Courthouse (1919–21), a decidedly classical building based on pure geometric forms, and the Stockholm Public Library (1924–28), which can be seen as indicative of the shift from neoclassicism to functionalism.

During the mid-1920s, attention turned to developments occurring on the European continent. One of the major proponents of the ideas developed there was Uno Åhrén, who had traveled to the 1925 Paris Exhibition and reported on the work of Le Corbusier. The 1927 Stuttgart Exhibition and new housing being developed in Germany influenced architects in Sweden at the time, as did the periodical *Kritisk Revy,* published by the Danish architect Poul Henningsen between 1926 and 1928.

Among the earliest functionalist buildings designed by Swedish architects were the industrial structures and housing in a company town known as the Kvarholm Complex in Nacka (1927–34) and the Tiden office building (1929), both designed by the Cooperative movement's architects office headed by Eskil Sundahl. Other significant functionalist buildings included an office building on Drottninggatan in central Stockholm, designed by Wolter Gahn, and the Student's Building (1930) at the Royal College of Technology and the Helsingborg Concert Hall (1932), designed by Sven Markelius.

The 1930s was a time of great change in the social and economic structure of Sweden. High unemployment, housing shortages, and substandard living conditions plagued the country. The response by architects came via the 1930 Stockholm Exhibition and the accompanying manifesto titled *acceptera,* or "accept." The manifesto was written by Gregor Paulsson (director of the Swedish Handicraft Association and general commissioner of the exhibition), Gunnar Asplund, Wolter Gahn, Sven Markelius, Eskil Sundahl, and Uno Åhrén. This document and the exhibition out of which it grew attempted to outline an approach based on "everyday" issues. The main Exhibition Building (1930), designed by Asplund, who was appointed principal architect, clearly reveals his affinity for functionalism. Asplund would go on to complete other significant buildings in Sweden, including the crematorium and adjoining chapels at the Woodland Cemetery (1935–40), the Bredenberg Department Store (1935), the extension to the Gothenburg Court House (1936), and the National Bacteriological Laboratory (1937).

One of the major themes of the Stockholm Exhibition was housing, and of particular interest were the open-plan terrace houses designed by Uno Åhrén. Problems associated with housing continued to plague Swedish society well into the 20th century, and the Housing Commission was appointed in 1933 to investigate the problems and propose solutions. Out of these investigations came the concept of "collective" housing, and the most significant contributions to this building type were the apartment block on John Ericssongatan by Sven Markelius in 1935 and the Yrkeskvinnornas House (1939) by Albin Stark and Hillevi Svedberg.

Throughout the 1940s, the government worked to establish guidelines for housing. During this time, many architects reacted against the monotony resulting from the rows of parallel blocks of apartments built to solve the housing shortage throughout the 1930s; notable proposals included the first tower block houses in Sweden, known as "star houses" because of their starlike plan configuration, built in Stockholm by Sven Backström and Leif Reinius in 1945. Backström and Reinius were responsible for other inventive proposals, including a large housing area in Gröndal built between 1945 and 1952. The concern for large-scale solutions to housing problems is also manifest in plans for the area of Årsta in Stockholm, initiated in 1942 by Uno Åhrén and continued by Erik and Tore Ahlsén into the 1950s.

The 1940s brought increased international attention to architecture in Sweden as a result of the work of Backström and Reinius and others. Attention was once again focused on Sweden with the publication of *Sweden Builds* in 1950 by G.E.Kidder Smith. In a 1947 article, the English periodical *Architectural Review* labeled the work in Sweden as a part of a movement known as "New Empiricism," which was characterized as a way of building on the basis of experience and a practical knowledge of material traditions. One the most significant contributions came from Nils Tesch, who, just as the previous generation of architects, turned to Denmark for inspiration, particularly the work of Kay Fisker and C.F.Møller. A number of Danish architects had emigrated to Sweden during World War II, and a number of them worked for Tesch, including Erik Asmussen, who would go on to become the main architect for the Anthroposophical movement and complete a series of buildings for this group in Järna between 1968 and 1992.

In 1942, the English architect Ralph Erskine began to work in Sweden. Although clearly influenced by developments in Sweden, Erskine's work is highly expressive and incorporates a wide range of seemingly disparate materials. Of particular significance are the Tourist Hotel in Borgafjäll (1948); a housing, school, and commercial center (1945–55) in Gyttorp; the Luleå Shopping Center (1955); the Byker housing development (1968–82) in Newcastle, England; and a series of buildings done for Stockholm University since 1972.

Many of the large-scale projects initiated in the 1950s would carry over into the 1960s, including the central area of Stockholm and a suburban area of the city known as Vällingby, both based on plans by Sven Markelius. Another large-scale undertaking, the "Million Program," was initiated to construct one mil-lion dwellings between 1965 and 1974 and exerted great influence on architecture and planning during these years. The center of Stockholm was transformed during the 1960s by the pureglass PUB Department Store (1960) by Erik and Tore Ahlsén, Ahléns Department Store (1964) by Backström and Reinius, and the Culture House, Town Theatre, and Bank of Sweden Building, all designed by Peter Celsing between 1966 and 1976.

Celsing was also responsible for the Härlanda Church, which was awarded as a result of a competition in 1952 and completed in 1958. Just as at Härlanda, Celsing went on to complete a series of simple churches built from dark-fired Helsingborg bricks, including the Church of St. Thomas in Vällingby (1959), Almtuna Church in Uppsala (1959), and Bolinden Church (1960). Although Celsing introduced a building style that explored the role of brick in religious structures, it was Sigurd Lewerentz who demonstrated the full potential of brick construction in religious buildings with St. Mark's Church (1960) and St. Peter's Church (1963–67).

The last building to be constructed by Lewerentz was a small flower kiosk (1969) within the Malmo Eastern Cemetery that he had planned and worked on since 1916. The influence of Lewerentz is apparent in the work of friend and colleague Klas Anshelm, including the Lund Town Hall (1961–66), the Lund Art Gallery (1954–57), the Malmö Art Museum (1976), and the buildings completed for Lund University between 1948 and 1978. Bernt Nyberg, an architect who had worked with both Lewerentz and Anshelm, reveals his indebtedness to both of them in the Lund County Archive (1971), the Höör Chapel (1972), and the "Sparta" student housing complex and Lund University (1964–71).

The oil crisis in 1974 greatly affected Sweden's economy and contributed to the collapse of the Million Program. Large-scale building programs were no longer feasible, and much of the work for architects involved renovations and the upgrading of existing buildings. Economic recovery in the 1980s generated new building commissions resulting from urban-renewal programs and a number of "new towns" planned as an alternative to urban sprawl. Of particular relevance is the area of Skarpnäck on the outskirts of Stockholm.

The search for an appropriate style that characterized turnof-the-century debates has reappeared in Sweden, accompanied by a multiplicity of approaches and stylistic tendencies. Whereas the Vasa Museum (1990) by Månsson and Dahlbäck was clearly influenced by contemporary architecture based on complex geometries and a divorce of plan and section, architects such as Gunnar Mattsson and Carl Nyrén have adopted a classical form language reminiscent of Postmodern architecture, but with a greater care for material and detailing. The work of contemporary architects Gert Windgårdh, Anders Landström, and Johan Celsing represents efforts to reconcile Postmodernism and the clean lines that characterized Swedish architecture during the 1930s and 1940s.

Although architecture in Sweden during the 20th century has been characterized by intense exchange of ideas with other countries, actual buildings by foreign architects did not appear in the country until the final part of the century, with the notable exception of a series of houses by the Austrian architect Josef Franck in the late 1920s and early 1930s and two apartment complexes by Swiss architects Alfred Roth and Ingrid Wallberg in 1930. Recent buildings by architects from other countries include the Volvo Headquarters (1984) by the American Romaldo Giurgola, the SAS Headquarters (1987) by the Norwegian Niels Torp, and the Malmö Town Library by Henning Larsen from Denmark. In 1990, an international competition for the Museums of Modern Art and Architecture was won by the Spanish architect Rafael Moneo. Completed in 1998, this complex thoughtfully considers the development of architecture in Sweden during the 20th century and offers a significant contribution to the debate about its future directions.

Like other European architects during the latter part of the 20th century, Swedish architects have considered issues of sustainability and ecology. Contributions in this area come from the HSB:S Architects Office at the Understenshöjden Residential Development (1990–95) by Christer Nordström and White architects. With broad-based popular and political support, Sweden has the possibility of developing an economically and ecologically sustainable architecture. However, the question remains whether architects in Sweden can mediate between international influences and the high level of architectural production that has warranted praise from historians and critics of 20th-century architecture.

KEVIN MITCHELL

Further Reading

For an introduction to architecture in Sweden at midcentury, see Kidder Smith. A comprehensive account of Swedish architecture in the 20th century is presented in Caldenby et al. (1998), which also includes brief biographies of significant architects and an extensive bibliography. For in-depth treatments of the work of individual architects, see Coates, Collymore, Dymling, Rudberg, Walton, Wang, and Wrede.

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SWITZERLAND

Like other European countries, Switzerland's architecture was dominated by historicism at the turn of the century. This style emphasized correctness and distinction in design and produced buildings that excelled in formal and aesthetic aspects. The Swiss National Museum (1898) in Zürich by Gustav Gull exemplifies this approach with an irregular, picturesque grouping of building shapes inspired by medieval architecture.

At the beginning of the 20th century, Art Nouveau became the choice for architects intent on expressing a new beginning, a new "spring." In Switzerland, this style emphasized superficial qualities above all else and is found primarily in the decorative treatment of structural parts. Buildings were assembled from heavy elements, in utter contrast to the delicacy of Belgian and Austrian Art Nouveau. These forms were derived from historical styles but transformed into seemingly lighter structures. Through decoration, individual forms merge fluidly into one another. The ornamental treatment emphasizes relationships and influences between parts and focuses on movement expression. This is demonstrated especially in large building complexes that are articulated as pillar architecture, an example of which is the main building of the University of Zürich (1914). Its architect, Karl Moser, was a pivotal figure in early 20th-century architectural development in Switzerland. During the 1920s, he would become a champion of modern architecture, even designing the Church of St. Antonius (1927) in Basel in reinforcedconcrete construction.

Modernism in Switzerland presents the efforts of architects to transform an imported style into a nationalized idiom. The machine aestheticism of the International Style seemed to complement Switzerland's propensity to manufacture quality products. Thus, Swiss architects excelled in adapting modernism and did not need to create a distinct version. A close contact with the design cultures surrounding the country has always been a trademark of Swiss architecture. Architects simply experimented with the new constructional means and materials instead of producing creative transformations.

The Swiss national ethos of sobriety manifested itself as a combination of practical reason and moral claims in this style. Rational logic was at the heart of this modernism. Thus, the International Style became a mirror for the Swiss self-view. This view was based on values that were identical to the ideological intentions of modernist architecture. Buildings were solidly constructed in pure, slick cubical forms with flat roofs. In housing settlements, the buildings were differentiated according to typology, and groupings took into consideration the exposure to sunlight. Interiors tended to be open and well lit, thus allowing for grand vistas in rather small spaces. Things inside were placed into the light to allow easy orientation. The buildings used setbacks and had balconies, and the plans are efficiently laid out. The "dwelling for the existence minimum" was a big theme. For modernist architects in Switzerland, dwelling almost defined the profession. The best modernist work in the 1920s and 1930s is found in housing, either in individual structures or in communal settlements. In 1929, the Swiss Werkbund sponsored the Neubühl settlement in Zürich (finished 1932), which continues to be considered a standard.

Apart from having educated one of the masters of the International Style, Le Corbusier, who designed a few exemplary houses in La-Chaux-de-Fonds in an attempt at a regional version of Art Nouveau, Switzerland also boasts a masterpiece of Expressionist architecture, the main alternative to the International Style. Rudolf Steiner's Goetheanum (1928) in Dornach exemplifies this more intuitive, mystical interpretation of the industrial age. Its amorphous building mass uses a particular formal language, expressing the shell that harbors renewal and whose purpose is to find the way to the spirit. William Lescaze and Sigfried Giedion are two other Swiss names that are synonymous with the International Style.

The political influence of German Fascism during the 1930s created a strong opposition to modernism in Switzerland. The contrasting forces fought over stylistic choices, particularly in the temporary exhibition structures for the national exhibition of 1939 in Zürich. This event became a watershed that pitted sobriety against sentimentality. Ultimately, the authorities compromised by charging modernist Hans Hoffmann with the master plan but distributing individual pavilions to members of both camps. Consequently, regional Romanticism was side by side with a socialist modernism. Famed bridge builder Robert Maillart designed a parabolic reinforced-concrete shed for the Swiss cement industry, and there was also a nostalgic little village containing examples of regional houses. The temporary buildings were constructed in wood and had to represent national contents through associations. Architects were forced to express the spiritual program of the exhibition, which had been set along notions of Swiss community. Architecturally, these political demands produced a mixed bag. Demands of representation and symbolism were made of modernist forms that they were not able to accommodate by their nature. It became clear that soberness was not sufficient as an ideological content. Architecture also had to cater to feelings, not just the intellect. Consequently, architectural images became conventional. Picturesque groupings replaced abstraction, and typological investigations of communal space became important. The previously mentioned Maillart had opened new horizons in modern reinforcedconcrete bridge construction. The shape of the supporting arch was used to stabilize the bridge and also became a trademark icon.

However, the slowdown in building activity during World War II allowed the nascent modernist attempts to mature into a competent stylistic expression that provided a solid foundation for future architecture. After the war, the characteristics of building materials and their impact on structure, proportional systems, high quality of execution, and simplicity of form became trademarks of Swiss architecture. Nevertheless, the prewar design elements were reorganized. Rationality was now contrasted with sensuality, feeling, and emotion. Pragmatism was combined with aesthetic design. Human needs and a newly found respect for traditions changed functional design. However, typical Swiss character traits—freedom of thought, high standard of living, justice, and neutrality—are hard to represent and thus have not had a dramatic effect on architecture. Consequently, modernist functionalism continued to be the mainstream of architectural development.

Especially the sculptural vehemence of Le Corbusier's postwar work served as inspiration. Atelier 5's Halen Settlement (1961) in Berne, as well as buildings by Dolf Schneebli, adapted the master's concepts to local patterns of housing. Halen spread collective services over a gently sloped site. Such designs experimented with the sculptural potential of reinforced-concrete construction. Other Swiss architects exploited sloping sites for terraced housing settlements. The Swiss sense for precision and refinement came out in luxuriously detailed adaptations of Mies van der Rohe's steel-and-glass boxes. Some architects excelled in designing for the traditional materials, wood and brick, and exploited them for interesting spatial explorations. Ernst Gisel's Park Theater (1954) in Grenchen is almost a literal copy of Alvar Aalto's Säynätsalo Civic Center.

These propitious beginnings would later fizzle out into empty applications of technology to generate profit. This shoe box architecture was balanced by wildly shaped concrete buildings that were for the most part trivial. There was also a large number of buildings, especially for tourist functions, that used a typical "Heimatstil." Especially large hotels in the mountains were shaped like overfed chalets or other farm and vernacular buildings. Nevertheless, Swiss architects hardly ever indulged in the historicist frivolities that Postmodern architects produced in the United States. Good architecture was still thought to rest on pragmatic principles. Swiss architects chose either to adapt modernist forms to the topography or to expressively interpret the site. An example of the former is the megalomaniac Cité du Lignon (1971) in Geneva. This is a huge apartment building in the form of a bent, one-kilometer-long slab with smooth facades that lacks any human scale.

During the 1960s, urban design in Switzerland was characterized by integrations of new structures into existing environments. Multifunctional buildings expressed the high civilization of the country. Housing settlements of sequential units interspersed with open areas were built. Diversity was felt to be commensurate with the liberal and multicultural Swiss society. Swiss architects also began building in developing countries. Andre Studer's innovative 1954 apartment building in Casablanca is a successful example of the exportation of such Western standards to developing countries. In the Swiss Ticino region, architects such as Luigi Snozzi and Aurelio Galfetti integrated modernist shapes into the rustic landscape and created a strong regionalist typology. There was a rediscovery of primitive architecture, which was praised for its rootedness in topography. The Ticino School advocated an architecture of rational technology, displayed in impeccable details and execution. Their architecture was to focus on its most objective features. This, after all, is what the Swiss generally excel in. The main part of Galfetti's Communal Swimming Pool (1970) in Bellinzona is a footbridge that allows visitors to survey the entire complex. The renovations and remodelings of the castle in Bellinzona have served many an architect to excel in combinations of new and old. Nevertheless, Swiss architects did not advocate taking history only as myth or imagery but also as a source of knowledge and continuity. The Collegiate Church (1966) in Sarnen by Naef, Studer and Studer embedded references to oval baroque plans into its bulging forms. Thus, sculptural shapes on the outside become rich spatial experiences inside.

The younger generation of Ticinese architects, led by Mario Botta, has fashioned for itself an image of craft, even though their buildings are machine built. For these architects, architecture represents through abstraction. It intends to continue the tendencies inherent in the land and in history, thus the title "Tendenzen" of the 1975 exhibition that put this architecture on the map.

The various movements of the 1970s in one way or another provided updated interpretations of modernism. Continuing into the 1980s, Swiss architects produced a good number of qualitatively excellent high-tech buildings. Theo Hotz's Tele-phone Exchange (1980) in Zürich marks the edge of the city and stands out in its drab environment as a cathedral to technology. Structure and mass of the building enter into a mutual dialogue.

Historic preservation became a significant architectural task as well. An example is the Museum of Contemporary Art (1980) in Basel by K. and W.Steib. The new addition adds a moment of development to the existing context of warehouse buildings.

Emphasis on pure materiality was transmitted from the Ticino School to Herzog and de Meuron and Diener and Diener, two firms that were actively involved in the international reevaluation of Swiss architecture during the late 1980s and early 1990s. However, the globalization of the information age has resulted in an utterly superficial approach to building materials. Herzog and de Meuron's buildings use contrasting materials in an autonomous manner that is no longer structurally determined so that they ultimately lose all meaning. The materials form simple contrasts without ever reaching a synthesis. Together with the abstract forms of their buildings, this produces pure geometry without details. None of the materials is allowed to dominate, and there is no effort to integrate them. Instead, each part is treated as a separate element, and the viewer is charged with their integration. Effects are created only through the materials, not through forms or other conventional features. Thus, imagery is purely material. The buildings then become spiritual expressions; that is, there is no metaphor, no iconography, no personal manner, and no attempt to create a complete, fulfilled form. The buildings present an architecture of entropy in which accepted notions and conventions are not applicable. Through this, the viewer is given a mere projection, just like reality is condensed on thin film in a movie.

However, there is hope yet for Swiss architecture. Successors have taken this aesthetic level of materiality to a more mundane level and attempted to create beautiful buildings with everyday materials, such as wood and brick, and with traditional forms, such as pitched slate roofs. This contemporary architecture rests on the foundations of modernism but also considers the properties of materials and construction as well as the characteristics of the topographical situation. These architects do not see the need to produce original masterworks. It almost seems as if the current generation of Swiss architects has learned the lessons that the modernist architects realized and spread after World War II. The present generation's flag bearer is Peter Zumthor. His architecture is characterized by a virtuoso treatment of materials, first of wood, later also of stone and glass. This is a far cry from the blasé materials of the stars of the 1980s. His Chapel Sogn Benedetg (1989) at Sumvitg imitates stone masonry, but because it uses wood, it reintegrates the building back to the people, making this religious structure look and age as the people's own houses. Wood here gained a layer of symbolism. For Zumthor, architecture is not what is in the materials but what these materials mean. His is an architecture of reduction—to the essential forms and constructions without imposed meanings. It is the building that needs to spark the imagination.

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SYDNEY, AUSTRALIA

From the top of the Sydney Harbour Bridge (1932), the city is divided in two by its famous harbor and to the north by the Hawkesbury River, which circles around the back of Sydney and limits the Cumberland Plain, joining the Pacific Ocean at Broken Bay. To the south is Botany Bay, which was proposed as the original site of settlement and later discarded because it lacked a reliable source of fresh water; beyond it, the Illawarra Escarpment shuts the city off to the south, and on the west, the escarpment of the Blue Mountains bars the way to the inland. Sydney is imprisoned by its geography.

The hard Hawkesbury sandstone tabletop on which the city rests has been deeply cut into by water, lifted, and then partly submerged and tilted up at its ocean edge; Port Jackson and Middle Harbour, once separate harbors with their own outlets, are now merged into one extensive harbor that breaks through to the ocean between two lofty heads a little over a mile apart. Sydney occupies a difficult if alluring site, hidden from the oceanside by its narrow entrance.

Following the revolt of the American colonies in 1776, at the suggestion of Joseph Banks, Botany Bay was selected for the site of a new penal settlement to replace what had been lost. The institution was founded in 1788 by 1,487 souls who reached Australia in 11 ships after a prolonged voyage. A little over half their number were convicts. Captain Phillip, the naval officer in charge of the enterprise, selected a cove 8 kilometers from the entrance on the south shore for the settlement because it possessed the best springwater, and its depth permitted his ships to anchor close to the shore. The developing township was named after British Home Secretary Thomas Townsend, Lord Sydney.

Sydney began as a collection of tents and huts. Organized along military lines, it soon acquired a makeshift, disorderly aspect that provoked successive governors to propose orderly town plans that were resisted by the inhabitants on the principle that the example of civic order in architecture would inspire social discipline and respect.

A small settlement sprang up on the west shore of Sydney Cove known today as The Rocks because it was built against a rocky ridge, one of two that framed the site. The early buildings were primitive: Bricks were laid with clay or mud, the native timber was cranky and iron-hard, and only the she-oak provided fine roof shingles. The Government House, a modest two-story dwelling in a plain Georgian style on the east side of the cove, was occupied by Governor Phillip in June 1789 and was the first building of importance. Walls were whitewashed for additional protection, giving the settlement the air of a Mediterranean village.

During the late 18th and 19th centuries, Australian architecture faithfully mirrored stylistic developments, as it followed the succession of English styles: Georgian, then Regency, followed by Gothic Revival, Victorian, and a diluted version of Arts and Crafts and Art Nouveau. American influence increased after the gold rush, especially in commercial and domestic architecture, causing a split in the sourcing of style influences. The esteem with which such mimicry was greeted depended largely on its fidelity to the original. Architecture was appreciated according to how well it reproduced English models and had an important nostalgic function to re-create a New World version of Old England. Local political and historical factors, the tyranny of distance (which delayed the taking up of new styles), the unavailability of materials, and shortages of skilled craftsmen forced innovation and together distanced Australian architecture from its stylistic models, helping sound a false note of independence. Until recently, the measure of architectural quality has been fidelity of interpretation, not idiosyncratic originality.

Mortimer Lewis (1796–1879), who arrived in Sydney in 1829, was typically schizophrenic in his choice of style, moving fluently between classical and Gothic. An adept at Gothic Revival, this did not prevent him from applying Greek Revival to the courthouse at Darlinghurst, which was his finest essay. He supervised the military-Gothic Government House (1845), de-

Rugby Field and Stands of Stadium Australia (1998), Homebush Bay, designed for the 2000 Olympic Games

signed and unsuitably oriented to the northern hemisphere by Edward Blore in England. It supplied a political symbol, an architectural climax, and a harbor focus for the city until the Sydney Opera House (1973) replaced it.

In 1842, wild land speculation led to a collapse of the money market and brought ruin to many people. Following a period of considerable prosperity and optimism, it hit the pastoral economy hard and brought colonial building to a halt. In 1851, the discovery of gold west of Sydney altered the complexion and mood of Australian architecture, bringing with it a new expansionism.

In the decade after 1841, Sydney's population jumped by 14,267 to 44,240. By 1901, half a century later, it would be 481,830. Sydney expanded to the south and west as the wealth of the gold fields flowed back to it. The early Victorian period started innocently enough, incorporating Gothic for ecclesiastical work and schools and classical for public buildings. Saint Andrew's Anglican cathedral by Edmund Blacket was consecrated in 1868, having been finished in stages. A vastly busy William Wardell commenced St. Mary's Cathedral beside Hyde Park in 1865. Commercial buildings set out to catch the eye of customers by what might be called a potpourri style of fanciful frippery. By 1860, terrace houses began to be built in large tracts spreading out from and surrounding the city center.

The Victorian period was notable for the rise of ornament and the blurring of architectural fashions. It was a period of grand public buildings. Sydney's General Post Office (1894) was commenced in 1864 by James Barnet, and Town Hall (1888) by J.H. Wilson set an example for the richer banks and commercial buildings that were to follow. The boom style of the 1880s, Italianate, which touched many residential buildings, had its origin in the English fascination with Romantic traditions and the picturesque. The application of Italianate style to commercial buildings led to the mass production of cast-iron columns and beams, whereas domestic architecture acquired decorative trims, gabled roofs, corner towers, and bull-nosed verandas. The florid phase of High Victorian design, which reached its peak in the 1880s, ended with the 1893 depression, which was sparked by a financial collapse three years earlier in Argentina.

In the 1880s, four stories was the rule for ornate office buildings built with traditional stone and brick exterior walls. The first Otis-type passenger lift was installed in the Farmer's Store (1881). The effect of lifts soon became evident, and by 1892 there were several buildings reaching 10 to 12 stories. Some towers, such as the Lands Department Building (1890) by James Barnet on Bent Street, rose well over 33 meters. Skyscraping got off to a shaky start with Spain and Cosh's Culwalla Chambers (1912), which rose to a height of 52 meters and frightened the city into enacting a height limit of 46 meters, a limit that survived until 1957.

The Australian domestic version of Queen Anne Revival consisting of terra-cotta roofing tiles and exposed deep red bricks was called "Federation." Substantial Federation and Arts and Crafts residences were built in the northern harborside suburbs for the upper-middle class in Mosman and Cremorne, whereas the lower-middle and working classes were housed at Haberfield and Dacey Gardens Estate (Daceyville) west and south of the city.

An outbreak of the bubonic plague caused by poor sanitation led to the reconstruction of port facilities; new standardized wharf structures, such as the Walsh Bay finger wharfs and Woolloomooloo Deep Sea Wharf; and a seawall barrier to prevent rats from coming ashore during the first two decades of the century.

After winning the competition for Australia's capital, Canberra, Walter Burley Griffin (1876–1937), who had previously been Frank Lloyd Wright's office manager in Chicago, settled in Australia. He planned and established the suburb of Castlecrag, where he later built a small cluster of seven houses. His ideas on integrating nature and architecture and his reverence for the native flora produced a unique result.

Wyldefel Gardens (1936), by W.A.Crowl and John Brogon, and Prevost House (1937) at Bellevue Hill, by Sydney Ancher (1904–78), signaled the arrival of modern architecture in Sydney. Wyldefel consisted of 20 terraced garden apartments on either side of a cascading central garden and copied a housing scheme that existed outside Oberammergau, Bavaria. The apartments had flat roofs, round corner glazing, steel windows, and concrete frames. The nautical-style Prevost House was a compact version of Mies van der Rohe's Tugendhat House (1930) at Brno.

The former City Mutual Life Building (1936), an Art Deco design by Emil Sodersten, was the first building in Sydney to be fully air-conditioned. It used a serrated zigzag window treatment and was the most impressive and innovative building at the time. The 1920s and 1930s were eras that saw the building of huge atmospheric cinemas with streamlined interiors in the American style, an example of which is the New Orpheum

Theatre (1930) at Cremorne by G.N.Kenworthy.

The weakness that the British showed when challenged by Japanese expansionism in the Pacific during World War II and America's role in avoiding defeat led to a reconsideration of Australia's defense relationship with London and a gradual weakening of ties with the home country. After the war, a mass immigration program from Britain and Europe changed the cultural face of Australia. By 1958, Sydney's population had doubled, from one million in 1926 to two million.

The period since World War II has been one of increasing international influence in Australian architecture, with a shift away from Britain and a much greater awareness of European, Japanese, and American influences. Sydney, situated in the southwest Pacific, was well situated to take advantage of these shifts. Its hedonism and lack of well-considered theory resulted in a superficial borrowing of ideas rather than a deeply considered and well-assimilated style. In the 1950s, a split occurred between the supporters of Frank Lloyd Wright's Romantic organic interpretation, led by what became known afterward as the "Sydney school," a misnomer insofar as it referred to Oak Park, Chicago, not Sydney. Arrayed against the neo-Wrightian camp were the proponents of the European modern cause, with Gropius, Breuer, and Le Corbusier as its exemplars. As a division, it hid a deeper split between those supporting an Australian national identity and those wanting Sydney architecture to be more international. The arrival in 1948 on the Sydney scene of the Viennese-born and Harvard-trained Harry Seidler (1923–) would serve to heighten this division later. The neo-Wrightians in the opposing camp were represented by Peter Muller (Audette House, Castlecrag, 1953; Whale Beach house, 1954, for his family; and the ambitious "Kumale" residence at Palm Beach, 1956), Neville Gruzman (Goodman House, 1956, and Holland House, 1962, both at Middle Cove), and Bruce Rickard's "Mirrabooka" at Castle Hill (1964). All testify to the extent of Wright's influence at the time.

Seidler's first work was the Rose Seidler House (1950) at Killara, built for his mother. He had designed this house in New York for another client and later relocated it to Killara. Its uncompromising modern character, flat roof, and open planning, as well as its New England modern, Breuer-inspired detailing and contrast of smooth industrial steel windows against rough mass sandstone walls, shocked Sydney residents and provoked wide debate.

Australian architecture since 1945 has largely been about two architects: Harry Seidler (1923–) and Glenn Murcutt (1936–). Both are Sydney architects, and both are committed to modern architectural principles, yet they manage to exemplify the two quite different, if not opposed, architectural currents: a place-based modernism versus a modernist internationalism.

Seidler's career spans 50 years and includes a large number of high-quality houses. In the 1960s, he designed the 183-meter-high Australia Square Tower (1967) with Nervi as his structural consultant and the 65-story MLC Centre (1978). In the 1980s, Seidler became increasingly engaged in office tower projects, resulting in a geometrically disciplined series in Melbourne and Perth as well as Sydney's Grovernor Place (1988) and a radical departure from his customary freestanding approach, the Capita Centre (1990), which, like the Ford Foundation Headquarters (1968) in New York, was based around a garden atrium.

In 1956, Sydney held an international architectural competition for the design of a performing arts center—a long-needed addition to its musical and theater cultural infrastructure. Jørn Utzon, a Dane, won the competition in a field of 230 submissions for a remarkable design that he set about developing from Hellebaek. After three years of intense investigation by his structural consultant, Ove Arup and Partners, for the dramatic shell roofs, Utzon proposed a spherical geometry to suit prefabrication of the elements. In 1966, Utzon withdrew from the project and was replaced by a Sydney consortium led by Peter Hall that completed the project for its opening in October 1973.

Utzon employed Australian assistants; of these, Richard Le Plastrier (1939–) has been the most faithful follower in terms of an anonymous landscape-based, organic domestic idiom. The principal legacy of Utzon was the contribution of his Opera House to the city itself and recognition that as a sculpture it completed and gave the city a climax that oriented it toward the harbor. Utzon's personal influence, which was small, survives through a few of his young Australian assistants, including Richard Le Plastrier. The Sydney Opera House remains unchallenged as Australia's greatest work of architecture and as an international synonym for the city.

Glenn Murcutt's career began with the Marie Short farmhouse (1975) near Kempsey, and although much of his work has been done in Sydney, his best houses are reserved for its fringes or beyond. This has given him an undeserved reputation as a rural designer. In Sydney, his Carpenter house, Point Piper (1982); Stuart Littlemore house, Woollahra (1986); Tom Magney house, Paddington (1990); and Ken Done House, Mosman (1991) testify to his ability to deal with tight city sites and to inject a degree of lyricism and environmental common sense into the urban context.

Compared to Seidler, who ignored local factors in his identification with an international modern tradition inspired by Gropius, Breuer, and Le Corbusier, Murcutt's veranda-inspired spaces and celebration of vernacular verities, such as corrugated iron, glass louvres, and standard ridge ventilators, together with his poetic response to landscape, were widely perceived as distinctively Australian.

Besides giving an enormous stimulus to the Homebush Bay site west of the central business district, the 2000 Olympic Games boosted architectural activity in terms of hotels, rail, airport, and road transport. Barcelona was adopted as a model in terms of the way in which the Olympics could be used to upgrade the city by investing more than $300 million in new pedestrian squares, a Barcelona-derived rail/bus interchange at Central Station (1999), and the Cook and Phillip Park swimming complex (1999), with a 240-meter-long square on its top creating a major new urban plaza and meeting place south of St. Mary's Cathedral. Sculpture walks, new smart lighting, granite paving, and widened footpaths improved the city for pedestrians. Opposed to this is the crass addition of three luxury apartment blocks at Circular Quay East (1999) that obstruct the view of the Opera House and disconnect it from the city.

The 110,000-seat Stadium Australia (1998) is typical of the new Olympic venues: it impresses more by its size, engineering, and straightforward planning than by any imaginative qualities. Only the main Olympic Park railway station (1998) by Hassel Pty Ltd and the Archery 2000 building (1999) by Stutchbury and Pape rise much above the mundane.

Clearly, Sydney is struggling to deal with its size and its uncontrolled expansion to the west and north. The investment in facilities at its center is matched by the poor air quality, road congestion, and underfunding of public transport at its fringes.

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Further Reading

There is a lack of reliable general and architectural histories of Sydney. Most sources fall within the category of popular tourist guide. Students researching Sydney's architecture will find Jahn of great benefit, but as an edited work it lacks a coherent voice. Morrison is compact but only concerns itself with contemporary architecture. Clune gives a detailed history of the city center, whereas Fitzgerald supplies a history of the City Council. The Morris book is a readable popular mix of history and biography with an outsider's critical eye for the odd and entertainWinston. ing. Urban design and planning matters are dealt with by Webber and

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SYDNEY OPERA HOUSE

Designed by Jørn Utzon; completed 1973 Sydney, Australia

The force behind the Sydney Opera House was Eugene Goossens, who was appointed conductor of the Sydney Symphony Orchestra in 1946 and a year later started an "opera house" movement. He was supported by the Labor politician Joseph Cahill (1891–1959), who held the local government portfolio and subsequently became premier of New South Wales in 1952.

The project languished until November 1954, when Cahill sponsored a conference that led to the establishment of a public committee that later agreed to hold an international architectural competition in 1956 for which Jørn Utzon's design was awarded first prize in a field of 230 entries. Utzon's scheme was enthusiastically endorsed by a jury comprising Sir Leslie Martin and Eero Saarinen.

Conceived in the mid-1950s, the Sydney Opera House project brief was formulated as a performing arts center with facilities for opera, concerts, and theater under one roof. The enterprise was fraught with party politics from the outset. It was seen as a project of a Labor Party premier who sought to enlarge access to music and theater for all the citizens of Sydney during a period of acute postwar shortages. Popular opposition arose even within his own party, and Cahill cleverly circumvented these arguments by establishing an Opera House Lottery to pay for the building.

The Opera House supplied Sydney with a much-needed civic climax that recognized the concentrating visual effect of its magnificent harbor and that, in the process, cemented its identity. Today, it is an international architectural icon and is regarded by many people as one of the ten greatest architectural works of the 20th century.

In 1956, when Utzon made his design, there was great interest in shell structures. Vilhelm Lauritzen had built two remarkable shells in Copenhagen before this: the first airport terminal in Kastrup (1939) and the Radio Building's Studio 1 (1945). Utzon's Sydney design resembled these in its adoption of an inner acoustic shell suspended from a heavier outer shell. Felix Candela in Mexico and Eero Saarinen in the United States, in his TWA Terminal (1962), which was designed the same year with a paired arrangement of balanced flower-petal shells, are other examples.

Both Saarinen and Utzon chose "free" structural forms that lacked circular, rectangular, or parabolic geometries. Although the TWA Terminal kept its free form, Utzon was criticized for his design's lack of geometry, which was essential to standardize the formwork. When, after three years of intense research, Ove Arup and Partners failed to establish a satisfactory mathematical description of the shell shapes after applying parabolic and then elliptical systems, Utzon broke the impasse in mid-1960 by proposing a spherical geometry.

In May 1965, there was a change of government. The incoming minister for public works placed himself in charge of the Opera House project, withheld permission for Utzon to proceed with his scheme to use plywood for the interior acoustic shells and glass wall mullions, and delayed fee payments. In February 1966, Utzon withdrew and was replaced by an Australian team led by Peter Hall, who completed the third stage for the interiors in October 1973. Hall attempted to realize the work as Utzon intended, but a *Review of Programme* submitted in December 1966 recommended that the Major Hall should be a single-purpose hall and that the opera should be transferred to the Minor Hall, thereby eliminating the latter's use as a theater on the grounds that the multipurpose hall would not be functionally satisfactory. The acceptance of this flawed advice resulted in the elimination of grand opera and invalidated the composition of the roofs, whose size had been determined by the volumetric requirements of the interior functions; the demolition of the stage tower and the stage machinery from the Main Hall permanently crippled the Opera House. Its cost rose from $50 million to $102 million, and the building's completion was delayed four years.

The changes to the interiors were attended by a severe aesthetic loss when Peter Hall failed to continue in the same spirit as Utzon. Fortunately, the outside was largely unaffected, and the fame of the Opera House today rests largely on the brilliance of the building's external relationship to its maritime surroundings.

Le Corbusier completed his chapel at Ronchamp in June 1955. It is no accident that the Ronchamp chapel and Utzon's Opera House are formidable sculptural achievements: Le Corbusier reacted to the four horizons and its isolated situation atop a sacred acropolis; Utzon's approach was similar: he visualized a promenade from the city to the Opera House leading to its theaters and heightened its isolation further by pushing it to the end of Bennelong Point to increase the surprise of arrival. Like Le Corbusier, who similarly applied the idea of a "Promenade Architecturale" to Ronchamp, Utzon incorporated a promenade into his architecture to enhance the pedestrian experience and increase the interaction between his building and the site and its surroundings.

Utzon's great concern was to devise the most dramatic route to approach his work by entering it from below and moving upward through its interior spaces to reach the opera and concert and theater halls. The building juts out into the harbor on a platform that he shaped and extended vertically and that contains all the performance services. At its highest, he scooped out a pair of Greek amphitheaters, treating the platform as an artificial hill. With the two stages adjoining the south foyers, the two principal halls, placed lengthwise side by side, have dual foyers

Sydney Opera House (1973)

at their north and south ends but are entered along the sides. To reach the halls, patrons climb a monumental external flight of stairs at the front or use an internal staircase to reach the southern foyers and then move around the stage backs and up the platform to access the halls. The north foyers, used at intervals, face the water. The side spaces are pressed between the auditoriums and the V-shaped ribs of the precast-concrete roof vaults.

The glory of the Opera House is its white-tiled roofs surmounting the pink precast-concrete platform. The Main Hall is straddled by three asymmetrical vaults and the Minor Hall by similar smaller vaults, and a separate vault encloses the restaurant on the southwest edge of the platform. Between the two main vault groups, a narrow canyonlike cleavage is formed; below this, a tunnel street gives access to the main under-stage service areas. The open ends of the original shells were intended to be enclosed by gull-wing saddles of suspended glass between hollow plywood tubes, but Utzon's proposal was crudely simplified into stiff glass hoods supported on steel trusses.

The sculptural expressiveness and romantic immersion in the harbor setting went beyond and challenged the prevailing functional ethic of modern architecture in 1957. Its assertion of humanist values rooted in Gunnar Asplund and Alvar Aalto proclaimed a new experiential sensibility that sought to soften the image of a machine aesthetic by an appeal to the simple verities of an anonymous vernacular building. The freshness of the Opera House has not dimmed with time; it seems as ageless as the Australian bush. Utzon was inspired by an anonymous language of technique, the building creating its own style from the perfection of its means in the same way that a yacht achieves beauty through the refinement and ultimate perfection of its shape in meeting the challenge of the sea and wind.

In tying his Opera House so perfectly to its peninsula, Utzon created for Sydney a symbol and identity of such extraordinary power that it is impossible to conceive of the city as complete without it.

PHILIP DREW

Further Reading

Utzon's resistance to scholarly research and documentation and his reticence to cooperate with critical assessment have created severe problems for the serious historian, with the unfortunate consequence that there is a proliferation of errors resulting from an overreliance on secondary source material. There has been far more publication and interpretation than research into establishing reliable facts. The Fromonot account, for instance, is largely a compilation of material copied from *Zodiac* numbers 5, 10, and 14, with additions. Because these issues are rare, their republication in this way is undoubtedly useful. Utzon scholarship remains at an early stage.

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SYMBOLISM

If architecture is as a system of cultural symbols expressing the identity, technology, and condition of a society—or of one group within a particular class or location—at a specific point in time, then the symbolism attributed to individual buildings constitutes one way of interpreting cultural context and the built environment. Form, ornamentation, and the choice of materials are all critical elements articulating symbolic content in architecture.

Symbolism was especially crucial for architecture in the Western world during the 20th century, reflecting the tremendous meaningful changes occurring in everyday life, in spiritual and political values, and in society. Because these changes were both synchronic and diachronic, different styles of architecture were produced and promoted simultaneously by professionally trained architects as well as amateur builders. Sometimes this diversity recorded differences in economics, application, and intention, but in other instances stylistic distinctions reflected profound oppositions in thinking. For example, at the beginning of the century, Beaux-Arts-trained architects produced both Neoclassical and Arts and Crafts-inspired buildings. The structures following in the classical tradition indicated a desire for monumentality, formality, and the continuance of traditional values, societal hierarchies, and building typologies, whereas the Arts and Crafts-inspired buildings used local materials, changes in building form and plan, and motifs selected from medieval vernacular architecture to represent ideals of home, handicraft, and the simplicity of a preindustrialized world in reaction to the political, economic, and social turbulence of the time.

The beginning of the 20th century is also notable for the work of other architects who experimented with form, materials, and ornament to create a new style of architecture expressive of the Zeitgeist. Art Nouveau was one new aesthetic resulting from this exploration exemplified in the organic designs of Victor Horta, Hector Guimard, and Henry van de Velde. These Euro pean architects and designers sought inspiration in nature in the same way that their contemporaries, such as Josef Hoffman, Charles Rennie

Mackintosh, and Antonio Gaudí, looked to local building traditions for inspiration. Another new aesthetic celebrated the materials and capabilities of industry. The exposedaluminum rivets in Otto Wagner's Post Office Savings Bank (1904–06) in Vienna and Peter Behrens' steel stanchions in the AEG factory (1908–09) in Berlin are early examples of architects using building components to express innovations in building construction and the wider promise and potential of the machine.

By the 1930s, the machine aesthetic evolved into what came to be called International Style architecture by Henry-Russell Hitchcock and Philip Johnson in the catalogue accompanying the 1932 Museum of Modern Art (New York) exhibition. The machine aesthetic was utopian at its core and aimed at improving the lives of the working classes through the introduction of affordable, utilitarian, machine-produced goods and economic construction. Conventional applied ornamentation, considered a demonstration of the class systems and social ambitions that led to World War I, was rejected as historical and emblematic of an outmoded way of life. In its place, designers substituted factory-sash and ship railings to symbolize their belief in the propensity of new industrialized societies to house populaces in clean, safe, and healthy environments and to address problems scientifically, efficiently, and unemotionally. Consequently, the dramatic change in architecture and aesthetics inherent in the International Style signified a new highly disciplined, standardized, and organized life that, in the extreme, eliminated individual character and emotion and in all phases celebrated the belief that the new architecture appropriately demonstrated the rational thinking and technical capabilities characteristic of the period.

The machine age was also celebrated in the stylized motifs and exotic materials of Art Deco, in the contours and materials of Streamline Moderne, and even in the pared-down simplicity and machine-produced aesthetic of Beaux-Arts-trained architects such as Bertram Goodhue and Paul Cret. The acceptance of the International Style in the United States in the 1930s and after World War II lacked the social purpose and initiative of European modernism and instead became adopted by corporate clients as a symbol of progressive business practices and financial success. This thinking, coupled with the prosperity and pride following World War II, prompted the transformation of regionally expressive, human-scaled American cities to concentrations of curtain-walled skyscrapers placed within recently leveled downtowns in the process of implementing the radical urbanplanning ideas of Le Corbusier.

By midcentury, the disruption and destruction of the traditional fabric and the proliferation of high-rises, symbolizing the regularized working and living environments of their inhabitants, failed to produce a vital, rich environment with positive social solutions. In response, architects, including Eero Saarinen, Louis Kahn, and even Le Corbusier (Notre-Dame-du-Haut, Ronchamp, France, 1950–54), introduced dramatic forms in concrete and other materials to create expressive, sculptural, and monumental forms, or architecture as art rather than architecture as social program. This reaction was compounded in 1966 with the publication of Robert Venturi's book, *Complexity and Contradiction.,* which condemned the banality and reductivism of

Post Office Savings Bank, Vienna, interior detail of doorway (1906)

modernism and advocated the reintroduction of communicative symbols to produce a richer architecture of multiple meanings, articulations, and intentions. Charles Jencks labeled Venturi's ideas and recommended style as "Postmodern," legitimizing a return to the incorporation of conventional architectural elements, to stylistic references, and to a renewed respect for historical urban context and specific places.

The expansion of architectural ideas and vocabularies in Postmodernism spurred a new pluralism in architecture, reflecting the compound nature and diversification of contemporary conditions and thinking and the perception of architecture as both a cultural product and a cultural symbol. This pluralistic attitude rejects the belief in universal narratives and global solutions and shifts the focus of the designer from the generic to the specific, realized in a conscious attempt to understand the nature of each task and to respond to the needs, problems, and circumstances of the particular client and location.

Some of the forms produced within this environment are outgrowths of modernism, seen in the work of High-Tech architects such as Richard Rogers and Norman Foster, who continue to venerate structural and technological innovation, and in the motifs and early modern aesthetic prominent in the work of Richard Meier. Another outgrowth of modernism is the abstraction and simplicity inherent in the International Style brought to a level of elegance and sublimity in the late 20th-century designs of Tadao Ando, Antoine Predock, and the late Luis Barragán. The most symbolic architecture at the end of the century, however, derives from the fields of philosophy and semiology. Deconstructivism and poststructuralism often use elements from 1920s Constructivism twisted and contorted to signify the end of meaning (absolute knowledge) and the realization of a world pushing technology beyond the limits of human comprehension and control. The fractured, distorted, and dynamic forms suggesting confusion and instability produced by Bernard Tschumi, Peter Eisenman, Coop Himmelb(l)au, and others represent linguistic, archeological, and deconstructive concepts from the philosophy of Jacques Derrida and Michel Foucault. Other architects, however, present a totally different worldview and aesthetic, demonstrated in works associated with Neoclassicism, New Expressionism, and an appreciation of vernacular constructions. Although this wide-ranging inclusiveness might suggest indeterminate architectural chaos, the variety of buildings produced can be understood as symbols of the divergent values and theories of their creators as well as significations of the complexity, multiculturalism, and diversity of contemporary culture.

CAROL A.HRVOL FLORES

S*ee also* **AEG Turbine Factory, Berlin; Ando, Tadao (Japan); Art Nouveau (Jugendstil); Arts and Crafts Movement; Barragán, Luis (Mexico); Behrens, Peter (Germany); Chapel of Notre-Dame-du-Haut, Ronchamp, France; Coop Himmelb(l) au (Austria); Cret, Paul Philippe (United States); Deconstructivism; Eisenman, Peter (United States); Foster, Norman (England); Gaudí, Antoni (Spain); Goodhue, Bertram Grosvenor (United States); Hoffmann, Josef (Austria); Hitchcock, Henry-Russell (United States); Horta, Victor (Belgium); International Style; Mackintosh, Charles Rennie (Scotland); Meier, Richard (United States); Post Office Savings Bank, Vienna; Postmodernism; Poststructuralism; Predock, Antoine (United States); Rogers, Richard (England); van de Velde, Henri (Belgium)**

Further Reading

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SYNAGOGUE

At the turn of the 20th century, the spirit of integration lay behind much of new synagogue construction in Europe and America. Some examples of the distinctive Moorish-style building continued to be erected, such as the Jerusalem Street Synagogue in Prague (Wilhelm Stiassny and Alois Richter, 1906). Other historic styles such as Romanesque and Gothic (Szeged, Hungary, 1900–03) continued late 19th-century traditions. A few distinctive synagogue designs broke with tradition such as Hector Guimard's striking Art Nouveau Rue Pavée Synagogue in Paris (1911–13), or adapted new traditions, such as the synagogue in Subotica, Yugoslavia (Komor and Jakab, 1901), combining Balkan, Hungarian, and Jewish folk and architectural traditions.

A strong trend toward classicism, however, especially in America, resulted in the notable Congregation Beth El, Detroit (Albert Kahn, 1903), Beth Ahabah, Richmond (Noland and Baskerville, 1904) Mikveh Israel, Philadelphia (William Tachau and Lewis Pilcher, 1909), Temple Society of Concord, Syracuse (Arnold Brunner, 1910), and scores of similar buildings. Brunner's designs for Syracuse and the Henry S.Frank Memorial Synagogue in Philadelphia (1901) were the first synagogues built to directly refer to archaeological finds of ancient synagogues in Palestine.

This form of classical Revivalism, which in most cases resulted in synagogues hardly distinguishable from banks, libraries, and government and university buildings evolved into the more distinctive Byzantine-Revival style, particularly popular after World War I. Here, following the earlier lead of Brunner, patrons and architects justified their designs by likening them to new archaeological finds from Palestine, but they also reinvented the distinctive exoticism that had characterized the Jewish Moorish style begun by Gottfried Semper at Dresden (1838–40) and continued so effectively for more than half a century. Unlike the Moorish style, however, the new Byzantine design emphasized plan and massing over decoration. Free standing buildings were often ingeniously sited in new urban parklike settings, and they often featured open plans that linked main sanctuaries to auxiliary administrative, educational, and social spaces—an innovation already hinted at in Kahn's Classical Beth El of 1903 and that would be more fully developed in the new suburban synagogues and community centers built after World War II. The central dome over the sanctuary space became especially common—it was given many meanings: the cosmos, community, and tradition. A frequent urban variation of this style—especially where synagogues still occupied traditional urban sites, emphasized a single giant facade portal, as at B'nai Jeshurun, New York (Schneider and Herts, 1918) and Temple Emanu-El, New York (Kahn Butler and Stein, 1930). Emanu-El's interior, with its enormous rows of arches, recalls contemporary modern architecture in Italy in its austerity and gigantism.

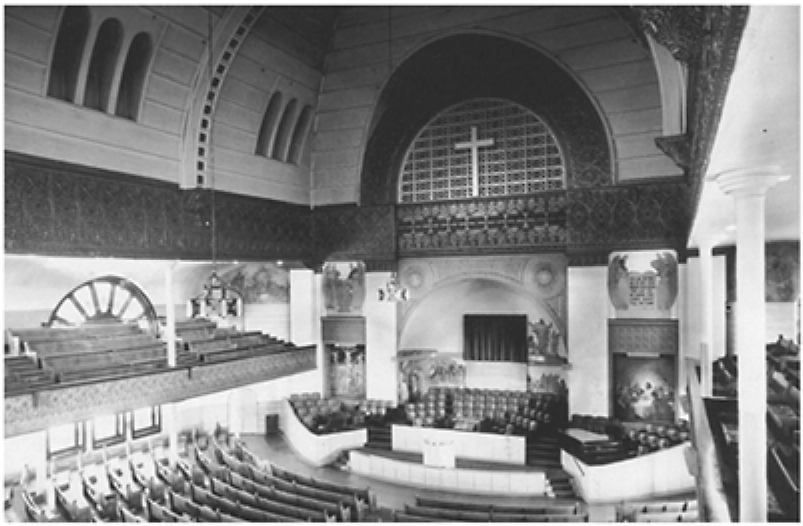
In Europe, similar simpler architectural forms prevalent in the nascent modern movement were easily adapted for syn agogue design. The synagogue of Zilina, Slovakia (Peter Behrens, 1928–30) was, in many ways, a stripped-down version of the Byzantine domed synagogue popular in Hungary and the Balkans. Behrens's design set a half dome on a rectangular block. Within, the dome rises on slender concrete piers from a square set within the rectangular mass. Outside, the ground floor is faced in stone, and the rest of the structure is of reinforced concrete. Despite the use of concrete, the building looks traditional due to its massing and the monumental stairway that leads to the main entrance. Nothing about the building's architecture identifies it as a synagogue. Applied Stars of David set on each exterior corner served this purpose. Like Zelina, the monumental Great Synagogue in Tel Aviv, Israel (*c.* 1930) combined traditional elements such as arched windows and a large central dome with the plain smooth wall surfaces and combined massing of blocklike forms typical in early European modernism. The Yeshurun Synagogue in Jerusalem (Friedmann, Rubin, and Stolzer, 1934–5) eschewed the complex hierarchical arrangement of multiple forms for a simple joining of two main masses—a rectangular block, entered on its long side, with a tall half cylinder housing the sanctuary joined to the rear.

There had been previous experiments with modernism in synagogue design before the war. In Amsterdam, Jewish architect Harry Elte built the Jacob Obrechtplein Synagogue in a Dutch-Cubist style in 1927–28. The building recalls early designs by Frank Lloyd Wright, especially the Unity Temple near Chicago. Perhaps the most radical and most modern synagogue design of the interwar years was that of Plauen, Germany. The synagogue was conceived as a white box elevated on stilts at one end. The arrangement of windows differentiates the discreet functions of the building, much as was done in contemporary industrial buildings.

Also in Amsterdam, the Lekstraat Synagogue (A.Elzas, 1936–37) is a plain stone box with simple square windows that emphasizes only the Ark and Bimah. Elzas won a competition among nine Jewish architects for the commission, which even today ranks as one of the sparest architect designed synagogues. The simplicity of the building's geometry and white concrete walls is offset slightly by the use of stone on the exterior and the introduction of vast amounts of natural light through large windows. Elsewhere, Sir E(van) Owen Williams designed the modern Dollis Hill Synagogue in London with a very open interior with galleries cantilevered from the wall rather than supported by piers of columns. The walls and roof are made of specially designed corrugated concrete that strengthens the structure. Hexagonal and shield-shaped windows recall the Star of David, now an accepted Jewish motif.

American and Canadian Jews had begun an exodus from the urban tenement neighborhoods in the years following World War I leading to new Jewish neighborhoods on city fringes. Large "synagogue-centers" developed to serve the religious and recreational needs of thousands of congregants. These large freestanding monumental buildings in the classical or Byzantine style stood as civic monuments. Immediately after World War II, however, demand for suburban synagogues created a boom of Modern-style community centers, which gave special attention to school facilities.

Modern architecture was preferred as an expression of this new Judaism—for historic, aesthetic, and financial reasons. Prewar trends in synagogue architecture made Jewish communities



Kehilath Anshe Ma'ariv Synagogue, Cook County, Chicago, IL, designed by Adler and Sullivan

receptive to modernism. Byzantine Revival and the Art Deco synagogues were primarily studies in spatial geometry that often emphasized qualities of the building material (most often brick and tile) and limited decoration to flat surface ornament. They emphasized variants on the cube and sphere and utilized natural light as much as possible. They also addressed the modern concerns of adjustable space and incorporation of multiple functions—including social halls, kitchens, gymnasia, swimming pools, libraries, schools, and offices—within a single complex structure.

The full expansion of the sanctuary and multiple-use of spaces was fully developed by Erich Mendelsohn, who developed important concepts for modern synagogue design, including the accentuation of the sanctuary section of a large complex using elevated and curvilinear forms and the creation of adaptable spaces, connectable by sliding partitions to serve diverse functions at different times of the day or year. At B'nai Amoona (St. Louis, 1950) a dramatic parabolic roof rises from the ark wall to the entrance wall, the top of which is glazed, allowing light to pour in over the congregation and onto the bimah and ark. At the Park Synagogue in Cleveland, Mendelsohn designed the sanctuary as a hemispheric dome that rose straight from the ground. B'nai Amoona also included adaptable spaces in a larger plan in which the sanctuary and spillover space were balanced by a classroom wing across a small open court. Connecting the two sections were a range of offices.

Mendelsohn's designs were quickly understood by Percival Goodman and formed the basis of most suburban synagogue architecture from the late 1940s through the 1980s. Goodman built over 50 synagogues in his lifetime. Although most lack the excitement and drama of Mendelsohn's plans, Goodman incorporated modern sculpture to accentuate certain elements, rather than sculpting space.

Influenced by Mendelsohn and Goodman, and continuing with Frank Lloyd Wright's Beth Shalom Synagogue (Elkins Park, 1959), congregations and architects replaced ties to history through the manipulation of form for symbolic association—often favoring building profiles recalling mountains or tents. Frank Lloyd Wright expressed his intent for the interior of Beth Sholom: "We want to create the kind of building that people, on entering it, will feel as if they were resting in the very hands of God." At Congregation Israel in Glencoe, Illinois (Minoru Yamasaki, 1964), a series of large concrete arches frame the building, but large gaps in the structure fill the sanctuary with filtered light. The interior is spacious, and the use of light, white walls and little ornamentation create a cerebral space. The tall thin gilded ark has been likened to a prayer shawl wrapping the Torah scrolls, but from the sanctuary entrance it also suggests a single flame—a burning bush or eternal light.

In postwar Europe, of note is the Ruhrallee Synagogue at Essen, Germany (Dieter Knoblauch and Heinz Heise, 1959). Like Mendelsohn's Cleveland synagogue, the primary element in Essen is a hemisphere that rises directly from the ground—there is no visible substructure. The simple unified shape may symbolize the monotheism of Judaism, but it also reflects current trends in architecture—which included a search for pure geometric forms. Inside, the half-dome includes more simple shapes. The ark is a rectangle inscribed within a broad triangle, set into the shell of the hemispheric dome. At the apex of the dome, a Star of David is inscribed, articulated with a series of small round windows that define the shape with light.

The most dramatic postwar European synagogue is in Livorno, Italy (1962), which replaced the famous but totally destroyed Renaissance synagogue. On the outside, the new expressive structure is defined by a series of crooked concrete buttresses, which are connected by concrete walls, appearing to exert intense pressure to keep the building together. This wall allows a large unimpeded interior sanctuary; like the Renaissance predecessor, this synagogue has ranges of seats all around.

In Israel, similar expressive tendencies are found. The synagogue in Beersheba (1961) nestles under a sweeping concrete vault that covers the sanctuary like a turtle shell. The vault is anchored in the ground to either side of the small prayer hall, which is lit by a wall perforated from floor to ceiling by hexagonal openings. Unlike Beersheba, which is so rooted to the earth, the Israel Goldstein Synagogue on the Givat Ram campus of the Hebrew University (Heinz Rau and David Reznik, 1957) appears to float. The windowless synagogue looks something like a giant balloon; its smooth white bulbous form seems to levitate off the ground, at which level it is pierced with wide arched openings that light the entire structure, including the sanctuary, which is encased in the building's upper part. Perhaps the most inventive of modern synagogues is the one at the army officer training school, Mitzpeh Ramon (Zvi Hecker, 1969), set in dreary desert surroundings. The exterior of the small sanctuary is concrete faceted like crystal creating a complex arrangement of colored shapes and patterns.

More recently, the Great Synagogue in Jerusalem (1982) continues the modernist vocabulary of the 1930s, albeit somewhat updated. The main sanctuary is hexagonal, recalling the shape of the Star of David. Unlike most Israeli synagogues, it incorporates some stained glass decoration in five tall, narrow windows over the ark. Common with the Jerusalem synagogue of 1934 and so many other buildings in the city, the Great Synagogue is built of local yellow limestone. For various reasons—tradition, climate, light, and security—Israeli synagogues tend to be built of stone or concrete and look massive, whatever their size. A synagogue at Hadera built in 1935 included a watchtower and courtyard to shelter up to 2,000 people in case of an attack. Although Israeli architects have sensibly not adopted the skin of glass, favored by many synagogue architects in America in the 1960s and 1970s, they have instead experimented with concrete to create sculptural forms.

An exception to abstract expressive and symbolic forms are the many buildings that refer in plan, elevation, detail, or material to the wooden synagogues of Poland, made known in publications since the 1950s. For example, Congregation Sons of Israel in Lakewood, New Jersey (Davis, Brody and Wisniewski, 1963) recalls Polish plan types and building profiles. Louis Kahn mixed pure geometric shapes and volumes at Temple Beth El (Chappaqua, New York, 1972), where the central wood-paneled light shaft recalls the Polish wooden sanctuaries, as does the selective use of wood in Norman Jaffe's Gates of Grove Synagogue (East Hampton, New York, 1989).

In the last quarter of the 20th century, stability and even complacency can be found in synagogue architecture throughout the world. Big synagogue projects declined, and resources shifted to the erection of large regional community centers and to Jewish museums and Holocaust memorials. In a reaction to modernism, some communities attempted to recreate the lost intimacy of Old World and inner-city synagogues—often by erecting smaller chapels adjacent to big sanctuaries, and incorporating historical styles or including symbolic elements referring to the lost synagogue culture of the Old World.

Similarly, many new congregations formed, as the traditional segmentation of Judaism was modified with new liturgical variations, including the increased involvement of women in the service—an issue that divided many congregations. The synagogues of new congregations, often small and struggling, were frequently adaptations of existing (nonsynagogue) buildings.

SAMUEL GRUBER

S*ee also* **Kahn, Albert (United States); Kahn, Louis (United States); Mendelsohn, Erich (Germany, United States); Yamasaki, Minoru (United States); Wright, Frank Lloyd (United States)**

T

TAFURI, MANFREDO 1935–94

Architectural historian and critic, Italy

Manfredo Tafuri was among the more dominant thinkers of architecture and society in the final third of the 20th century. Tafuri was born in Rome in 1935 to a Jewish mother and Catholic father. His early interests included painting and philosophy. Trained as an architect at the University of Rome, he moved quickly from design to research, becoming involved in issues of planning and urban organization in the early 1960s. In the late 1960s and early 1970s, he wrote a series of penetrating books that became the guides for advanced thinking about architecture in the modern world. In the later 1970s, he shifted his interests to Renaissance architecture, and though his work in that field did not achieve the same following, he became one of its keenest observers.

Although Tafuri studied architecture at the University of Rome, his was not a conventional education. His early years were marked by the formation of oppositional groups. He created seminars and discussion groups and founded a magazine *(Contropiano)* with other disaffected colleagues (notably Alberto Asor Rosa, Mario Tronti, and Massimo Cacciari). At one point Tafuri sought to form a union of architects and architectural students to bring an uncorrupted voice to the discussion of the regulatory plan for Rome. He was an assistant within the architecture department in Rome from 1964 to 1966. From 1966 to 1967, he taught at the University of Palermo. In 1968 he was brought to the University of Venice by Giuseppe Samonà.

The key work of Tafuri's early career was titled *Teorie e storia dell'architettura (Theories and History of Architecture)* (1968). There he took a stance against what he called "critica operativa" (operative criticism), the instrumentalization of the past to justify current actions or, more dangerously, the use of the past to validate the potentials of future freedom. In this formulation he leaned heavily on the writings of Martin Heidegger, but he was also very much interested in the writings of Marc Bloch and Lucien Febvre from the French Annales school of history, then little known in Italy.

In 1968 Tafuri took over the leadership of Istituto Universitario di Architettura at the University of Venice. He used it as a forum to bring together specialists from various disciplines in the university to study historical issues and gathered there a brilliant group of architectural historians, including Giorgio Ciucci, Marco de Michelis, Mario Manieri-Elia, and Francesco dal Co. Concerned with practical but fundamental matters of scholarly historical method, he also reached out to other disciplines and quickly developed a series of initiatives. A conference "Socialism: City, Architecture" (1970), for example, examined the nature of urban planning in the 1920s and 1930s in the Soviet Union, and a jointly authored book on the American city titled *La città americana dalla guerra civile al New Deal* (The American City from the Civil War to the New Deal) (1973) took up the nature of development under capitalism. Both were helpful in defining Tafuri's political position in this turbulent period, and he became a significant participant in debates on the role of the Italian Communist Party.

At the same time, Tafuri's work also began to be noticed in the United States. In 1974 he published his first essay in the periodical *Oppositions,* which later published more of his essays as well as those of his Venetian collaborators, most notably Dal Co and Ciucci. He helped to introduce the work of Aldo Rossi in the United States. Tafuri had, naturally, a particular reception in the United States. North American architects were engaged in the critique of modernism and intrigued by the revival of history and theory. Tafuri's first title that was translated into English was *Architecture and Utopia* (1976; Italian edition: *Progetto e utopia: Architettura e sviluppo capitalistico,* 1973), a work that, like *Teorie e storia dell'architettura,* attempted to redefine (and limit) the functions of the architect and historian within contemporary culture. Tafuri brought to American architecture an entirely new language of analysis based on "distance," "alienation," and "masquerade," terms borrowed from European philosophy that presume a tragic view of human history. For Americans accustomed to their own optimistic or descriptive readings of architecture, Tafuri's analyses were startling, and the influence of Tafuri has been traced by Ockman to the work of both Peter Eisenman and John Hejduk. Tafuri's thoughts on the avantgarde and on American architecture were collected in *La sfera e il labirinto: Avanguardie e architettura da Piranesi agli anni '70 (The Sphere and the Labyrinth: Avant-gardes and Architecture from Piranesi to the 1970s)* (1980; English edition, 1987).

One of the great difficulties in coming to grips with Tafuri's writing is his protean nature. He operated on many fronts simul-taneously and with equal effect. In the same year as *La città americana,* for example, he published a book on the Via Giulia subtitled *Una utopia urbanistica del '500* (Villa Giulia: An urbanistic utopia of the 1500s) (1973), which followed the fate of a single street through the process of its development starting with Pope Julius II in the early 16th century. From the later 1970s, in fact, Tafuri's interests shifted to a deeper past. *Venezia e il Rinascimento: Religione, scienza, architettura* (Venice and the Renaissance: Religion, Science, Architecture) (1985) and *Ricerca del Rinascimento: Principi, città, architetti* (Renaissance Research: Princes, Cities, Architects) (1992) defined the range of his interests in a total history of the sort that recalls earlier interest in the Annales school.

Efforts to define the stages of Tafuri's career tend to fall into the kinds of Hegelian stylistic categorization that Tafuri himself eschewed. It is true that his later withdrawal from contemporary issues of architecture entailed a retreat from some of the political issues that marked his work in the 1960s. Moreover, his involvement with exhibitions (notably Giulio Romano and Francesco di Giorgio) gives the impression of a return to more traditional forms of biography. Tafuri helped sponsor some of the most conservative scholars of Italian architecture at the University of Venice. All of this has led some to define the later, Renaissance-based period of his scholarly activity as conservative. Yet these decisions were probably strategic and personal rather than principled. Tafuri defined himself as an educator and saw exhibitions, even monographic exhibitions, as a way to raise historical issues to a broader public. Tafuri modeled his own scholarly practice on the architectural team and was anxious to have the best specialists around him.

Tafuri's scholarship concerning the Renaissance remains buoyantly transgressive. Giulio Romano and Francesco di Giorgio, to whom he devoted extensive attention, are figures whose willingness to run against the academic traditions of their own times appealed to him enormously, and he caught their contrary nature very well. He was even able to find the rebelliousness in a drably academic architect such as Antonio da Sangallo the Younger, as is revealed in his posthumously published essay and entries for the corpus of architectural drawings by that architect.

NICHOLAS ADAMS

S*ee also* **Eisenman, Peter (United States); Hejduk, John (United States); Rossi, Aldo (Italy)**

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Further Reading

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Any 25/26 (2000), titled "Being Manfredo Tafuri," with essays by Ignasi de Solà-Morales, Pierluigi Nicolin, Evelina Calvi, Anthony Vidler, K. Michael Hays, Jean-Louis Cohen, Mark Wigley, Kurt W. Forster, Peter Eisenman, and others

TALIESIN WEST

Designed by Frank Lloyd Wright; completed 1937 Scottsdale, Arizona

There were two significant transitional points in Frank Lloyd Wright's long career. One is marked by the abandonment of his first practice in Oak Park and the design of his rural Wisconsin home known as Taliesin (1911–14). The other is marked by his move beyond Wisconsin to the Arizona desert and the construction of Taliesin West (1937). During the early portion of his career, Wright had been engaged with the interior realm of the family and its relationship to the larger society beyond, ideas embodied in his "Prairie house" designs. His move to Taliesin is marked by the study of the relationship of man and mind to landscape. Almost 30 years later, Taliesin West marks the fulfillment of that effort as a giant step forward in Wright's ability to conceive architectural languages as expressions of the human condition.

The "desert compound," as Taliesin West was originally known, consisted of a loosely woven group of enclosures divided roughly into four quadrants by two crossing axes. The orientation of the primary north-south axis in the plan is about 20 feet west of south, facing the afternoon sun. Along with a drafting room, a large room for communal gatherings, and Wright's own study, the compound initially included quarters for the families of the architect and his apprentices, sheltered places for dining and kitchen duties, fireplaces, pools, and gardens. In its original form, these were not so much rooms as places for the designated activi-

Taliesin West, Scottsdale, Arizona (1937)

ties of the Taliesin Fellowship strewn about the desert in an openly ordered pattern.

Taliesin West was built by Wright and the apprentices of his Taliesin Fellowship with minimal help from professional builders. Large stones were gathered from the surrounding land-scape and stacked loosely together in battered wooden forms. A lean mixture of concrete and desert sand was poured over the rocks. The resulting recumbent walls are intermingled with level terraces stretching 300 feet across the desert floor, barely protruding above the ground in some cases, in others rising to create cavelike sanctuaries protected from the searing heat of the desert sun. The large drafting and gathering spaces, as well as Wright's private study, were spanned with redwood trusses. These reach across entire sections with skeleton-like repetition, acting as ribs beneath which were hung canvas stretched frames lapped to shed what little rain there was. Similar canvas frames added around the sides and under the eaves could be opened to regulate the presence of sun and wind. The contrast between the heavy raking masonry walls and these floating, light-filled canvas panels formed the architectural backdrop for the activities of the camp.

In its original form, the entire roof structure was disassembled each spring in preparation for the Fellowship's annual move back to Wisconsin. The canvas panels were taken down and stored, leaving only the low stone walls and open redwood frames to suffer the intense heat of the Arizona summer. In later years, as Wright began to stay longer into the summer season, the canvas was replaced by plastic, the open spaces were glazed, and the central parts of the building were eventually air conditioned, making it quite a different place today.

The plan of Taliesin West is organized by the use of two crossing axes that intertwine distant features of the landscape and its history with the pursuit of daily activities in the camp. The pattern of movement along these assumes a quartering of space and experience that was characteristic of Wright's domestic designs going back to his Prairie houses. Here in the desert, the quartered scheme is opened outward in a new way along axes that emerge from the land to direct attention through the man-made forms to the stark beauty of the natural world beyond. His own evaluation is perhaps the most poignant: "The whole opus looked like something we had been excavating, not building"

The entry establishes an axis of movement through the compound, from the public areas of contact with the city and the automobile to private areas of staff and family, cloisters, and walled gardens. The left side of the plan generally contains places of work. The right side of the plan contains places that contact with the stillness of the desert: the apprentice quarters and Wright's own Usonian dwelling. The pathway between these two spaces is sunk into the ground of the mesa. This pathway, dominated and sheltered by the mountains, brings the viewer into contact with another axis moving downward to the south. The point of crossing of these axes was originally dramatically marked. As the crossing was reached, the earth forced its way through the retaining wall and across a small pool of water directly on axis with the 6,000-foot height of Thompson's Peak in the distance. Here the architectural forms open to the right under a shaded loggia into which one is naturally drawn out of the heat of the Arizona sun. It is from this point that the immensity of the view southward across the desert first becomes apparent. One is drawn by this vista, unavoidably, down a few steps and out again into the full force of the sun to peer upward into the distance.

This experience is reached by a movement downward in plan, from shelter to exposure, from depression in the earth, where you are close to rock and water, to an elevated position in the full glare of the desert sun with almost infinite vista. The upper portions of the plan as originally built were left mostly natural and devoid of buildings and offered controlled views of the wall of mountains to the north. In contrast the lower portions of the plan offer exposure to the distance and to the desert sun. The first axis had led away from civilization into areas of recess, retreat, and privacy. This second movement is more elemental in nature. It leads from physical to ethereal, from solid to open, from earth to sky. Years earlier at Taliesin, the crest of a hill occupied the center of the architectural composition; here in the desert, at Wright's final home, that center was thrown out across the landscape in expression of the timeless quest for the bond that exists between the mind of man and the natural world.

J. MICHAEL DESMOND

S*ee also* **Broadacre City; Fallingwater, Bear Run, Pennsylvania; Wright, Frank Lloyd (United States)**

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TANGE, KENZO 1913

Architect, Japan

For the quarter century following World War II, Kenzo Tange was among the world's leading architects; his work defined post-war modernism in Japan. Tange's promising beginning, after graduating from the University of Tokyo in 1938 and then working for Kunio Maekawa for four years, was enhanced by the almost complete disappearance of architectural practice during the latter days of the war. This absence allowed him to return to the University of Tokyo in 1946, and he remained there as a student and member of the faculty until 1974.

In his spectacular debut, winning first place in the Far East Greater Coprosperity Sphere Competition of 1942, Tange engaged the nationalist spirit of the time, gaining recognition through the controversy that emerged. His proposal for a monument to Japan's fallen soldiers, to be built on a long axis beginning at the foot of Mount Fuji, was influenced by Japan's temple precincts. By blending Japanese traditions with European modernism, Tange took a very different position than others of his generation who wholeheartedly embraced an international style.

For many years Tange's work was unabashedly regionalist. Through 1960 Tange defined a new Japan, infused with tradition and optimistically reflecting the utopian hopes of the era. He embraced the symbols Japan's citizens held dear but overlaid them with an enthusiasm for new technologies. This approach is seen in some of his best built works: his first, the Hiroshima Peace Memorial and Museum (1955), was inspired by the *sukiya* character of buildings such as Katsura Imperial Villa; the surface treatments of the facades at both Kagawa Prefectural Offices (1959) and Kurashiki City Hall (1960) drew on Japan's timber traditions, but in concrete used at a monumental scale; and in the later Olympic Stadia (1964, Tokyo), Tange's roofs were structurally remarkable but comfortingly close to the form of Japan's traditional farmhouses. Critics, however, tended to disparage buildings with ties to tradition, favoring more sculptural efforts, such as the Children's Library (1953) at Hiroshima. Tange began to treat traditional nuances as a failing, but today it is those buildings that were initially dismissed by critics that better define his reputation. Yet while Tange's early sculptural works were clumsy, they served as the basis for several extraordinary buildings from the 1960s, including not only the Olympic Stadia but also St. Mary's Cathedral (1964, Tokyo) and the Memorial to Fallen Soldiers (1966).

From the beginning Tange also emphasized the urban and regional scale, using axiality as an ordering device. Throughout the 1950s and 1960s, Tange drew on an emerging political will, reflecting the introduction of democratic ideals through his "mass-human" spaces dedicated to collective activities. Many of his designs for government institutions sandwiched offices between publicly accessible roof terraces (the Kagawa Prefectural Hall had a popular cocktail bar on its rooftop) and an open ground plane slipped through first-floor *pilotis*.

In 1961 Tange founded URTEC, Urbanists and Architects Team, inspired by Gropius's The Architects' Collaborative. His designs from the 1960s tended toward structuralism. Complexes were organized into a three-dimensional system made up of service cores, circulation paths, and bridgelike blocks or figural units dedicated to programmatic needs, with opportunities for future additions. The most powerful of these is a 1961 plan for Tokyo Bay, developed with students at the University of Tokyo. Participants in this design—among them Fumihiko Maki, Arata Isozaki, Kiyonori Kikutake, and Kisho Kurokawa—went on to shape Japan's most exciting architectural movement, Metabolism. Although none of Tange's urban plans were executed, two notable buildings were completed using similar principles: the Yamanashi Press and Broadcasting Center (1966) and the Shizuoka Press and Broadcasting Center (1970) in Tokyo. The final Metabolist undertaking was Expo '70 in Osaka, the first full-scale demonstration of a Metabolist city. The public received the project more as an entertainment than as a rare opportunity to recognize the value of a comprehensive urban proposal, and the movement collapsed under its failure to be understood.

At roughly the same time, community resistance scrapped Tange's proposal for Yerba Buena (1969) in San Francisco, which was also based on structuralist principles. Suddenly, enormous size was no longer a merit: The architect whose works had deftly represented the conflicts and ideals of Japan's postwar boom found himself out of step. At first Tange found opportunities to work in Europe, but as the West and Japan began to address the ecological fallout of megaprojects, demand for Tange's work shifted to Arab nations and, in the early 1980s, Southeast Asia. At one point 70 to 80 percent of the firm's work came from abroad. His projects from this period often remained unbuilt, and those that were completed took an average of ten years from basic design through execution, making it difficult for Tange to respond to innovations in construction technologies. Furthermore, he was less able to develop a language that reflected the hopes of these unfamiliar cultures, and buildings from this period seem awkwardly fitted to their time and place.

Tange's architecture continued to draw on many earlier themes. He remained concerned with large-scale complexes organized in response to clear principles. In his interiors he often developed a polished monumentality, especially notable in the Akasaka Prince Hotel (1982). His architecture from this period is generally less appreciated, though, as strategies from his earlier work became formulaic. In the final years of his career, however, Tange began again to build symbolically important works in his native country, especially the New Tokyo City Hall (1991) and the United Nations University Building (1992). These buildings, while not as vigorous as works from his youth, retain a monumentality and sense of detail that are clearly related to his earlier masterpieces. Tange also found a way, in the end, to create a large-scale order in the city of Tokyo—not through his revisions to the Tokyo Bay Plan (1986) but in his design of two of Tokyo's tallest buildings. The New Tokyo City Hall and the nearby Tokyo Park Tower can be seen from the megalopolis's farthest suburbs and establish an order in the region that Tange once reserved for Mount Fuji.

DANA BUNTROCK

See also **Isozaki, Arata (Japan); Japan; Kurokawa, Kisho (Japan); Maki, Fumihiko (Japan); Metabolism; Peace Memorial and Museum, Hiroshima; Taniguchi, Yoshio (Japan)**

Biography

Born Imabari, Shikoku, Japan, 1913. Graduated from the University of Tokyo (bachelor's degree, 1938; Ph.D., 1959). Taught at the University of Tokyo, 1946–1974; visiting professor at Massachusetts Institute of Technology, Cambridge, (1959–1960) and Harvard University (1972). Established URTEC in 1961; selected awards include the annual prize of the Japanese Architecture Institute in the years 1954, 1955, 1958, and 1965, including highest honors in 1986. Awarded Royal Gold Medal, the Royal Institute of British Architects (RIBA) in 1965; Gold Medal, American Institute of Architects (AIA), 1966. Received the Pritzker Prize in 1987 and the Praemium Imperiale in 1993. In 1979 Tange was acknowledged as a Person of Merit in Japanese Cultural Achievement and was recognized as a Sacred Treasure (Japan) in 1994.

Selected Works

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Hiroshima Peace Memorial and Museum, 1955
Tokyo City Hall, 1957
Sogetsu Arts Center, 1958; replaced with a new design by Tange, 1977
Kagawa Prefectural Offices, 1959
Kurashiki City Hall, 1960
WHO headquarters (unbuilt), 1959
Tokyo Bay Plan, 1961; revisited in 1986
Tokyo's Tsukiji district, 1964
St. Mary's Cathedral, Tokyo, 1964
Tokyo Olympic Stadia, 1964
Memorial to Fallen Soldiers, 1966
Yamanashi Press and Broadcasting Center, 1966
Shizuoka Press and Broadcasting Center in Tokyo, 1970
Expo '70 master plan and Festival Plaza, 1970

Akasaka Prince Hotel, 1982
New Tokyo City Hall, 1991
United Nations University, 1992
Shinjuku Park Tower, 1994
Fuji Sankei Communications, 1996

Notable Competition Entries

Far East Greater Coprosperity Sphere Competition (First prize 1942)
Japan-Thai Culture Center (First prize 1943)
Hiroshima Peace Park (First prize 1949)
Tokyo City Hall (First prize 1952)
New Tokyo City Hall (First prize 1986)

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TANIGUCHI, YOSHIO 1937

Architect, Japan

Yoshio Taniguchi is rare among architects, being steadfastly unwilling to dedicate any effort to promoting his work. He seldom lectures or participates in symposia, he refuses interviews, and he is notoriously difficult to the few journalists and academics who do gain access. However, this taciturn position is justified by his architecture. Although his buildings are certainly photogenic, it is impossible to appreciate their spatial and contextual strengths without physically experiencing them.

Taniguchi's maternal grandfather was one of Japan's earliest architects and later became the head of the Tokyo branch of a major construction company. Taniguchi's father, Yoshiro Taniguchi, was a contemporary of Kunio Maekawa and a respected architect in his own right. Although little known abroad, Yoshiro Taniguchi was entrusted with several commissions on behalf of Japan's royal family, and he also designed notable religious and commemorative structures. Originally inspired by northern European modernism, Taniguchi's father also designed his own house—a laboratory for the father and an inspiration to his son. In some ways Yoshio Taniguchi's work is the fruit of two generations; he shares many objectives with his father, especially an appreciation for serial experience and for compositionally pure organization.

Yoshio Taniguchi holds fond memories of childhood visits to construction sites, but he also feared that his father's reputation stood as too significant a challenge. He initially decided to pursue a related field, taking a degree in mechanical engineering from Keio University in 1960. His father, however, conspired with Kiyoshi Seike to encourage the younger Taniguchi to go to the United States; Taniguchi graduated from Harvard University with a master's degree in architecture in 1964. He was the first Japanese architect to receive licensing following an architectural education exclusively gained abroad, and he took Japan's licensing examinations only following some difficulty.

While at Harvard, Taniguchi met Kenzo Tange, and he joined Tange's office and his Tokyo University research laboratory on his return to Japan in 1965, staying with the firm until 1972. Taniguchi's approach from this period closely resembles his mentor's methods, with an inclination to pursue culturally significant projects, enriching them through collaboration. Taniguchi works frequently with graphic designers, sculptors, and other artists, most notably Gen'ichiro Inokuma and the tea master Hiroshi Teshigahara. Both Taniguchi and his father collabo rated with sculptor Isamu Noguchi, and Yoshio Taniguchi is currently on the Noguchi Foundation board. The landscape architect Peter Walker has also worked with Taniguchi, expressing architecture and landscape as a seamlessly integrated art form. Together they have designed the IBM Makuhari Building (1991), the Marugame Museum of Contemporary Art (1991), and the Toyota Municipal Museum of Art (1995).

Taniguchi's first working experiences were as part of a design team (along with Arata Isozaki) working on Tange's plans for the rebuilding of Skopje, Yugoslavia. Two features of this plan, an encircling "City Wall" punctured by prominent "City Gates" at crucial locations, seem to have influenced Taniguchi's work. Embracing protective walls with highlighted entry points recur in his exquisite, carefully proportioned plans. Amplifying this strategy, boxes nested within boxes establish an increasingly removed domain where Taniguchi controls a heightened experience. His architecture is precise, serene, and understated, often informed by contrast. Movement through his earliest buildings juxtaposes centripetal and centrifugal spaces, and in later works, dark alternates with light.

Despite the crisp, modernist appearance of his work, Taniguchi strives for a timeless character and is comfortable embracing Japan's design traditions. Many of his finest works, including the Tsukuba City Theater (1999) and the Tokyo National Museum of Horyuji Treasures (1998), are successors to Katsura Imperial Villa: delicate, complex, and highly refined. His sparing use of exquisitely apt materials demonstrates both artful restraint and subdued elegance. Diaphanous screens, slender columns, and tapered extremities are evident in his frequently published sections and detail drawings and result in an exaggerated thinness. These knifelike planes demarcate expansive, fluid spaces. Buildings extend into their surroundings through the controlled use of *shakkei* (borrowed landscape), and the edge between interior and exterior is often articulated by a stepped configuration said to resemble geese flying in formation, further blurring the distinction between inside and outside.

With the exception of the Tokyo Sea Life Park Aquarium (1989), Taniguchi's work is at its best when it is strictly orthogonal. His architecture is based on movement through an uncompromising three-dimensional spatial matrix, determined not only by an organizing lattice but also by a complex layering of horizontal and vertical planes. Sharply drawn lines link contiguous spaces whereas taut, uninterrupted planes extend from one room to the next. Taniguchi is concerned with the processional character of his buildings and their spaces; as a consequence the quality of light has become increasingly important in his designs. Glowing interiors draw one deeper into these buildings through bounded, cavelike enclosures. He plays with a notable range of light effects, from single beams breaking dim rooms to large, brightly lit volumes. Taniguchi has also experimented with varying degrees of translucency, from the extraordinary clarity resulting from the insubstantial-looking glass cage of the Kasai Rinkai Visitors' Center (1996) to the milky surfaces of the Toyota Museum of Art, achieved with two mullion-free layers of fritted glass.

In 1975 Taniguchi opened his own office, but the intervening years have yielded a relatively small number of published buildings. Most of Taniguchi's buildings are public works, and many of these are art museums, including the Higashiyama Kai'i Gallery for the Nagano Prefectural Shinano Art Museum (1990) and his competition-winning proposal for the Museum of Modern Art (1997) in New York. Despite the public nature of these commissions, he has been able to develop supportive relationships with his clients. His buildings are often the result of generous budgets and schedules, and a number are repeat projects for the same client. Even among Japanese architects, who enjoy a great deal of support and flexibility during design and construction, Taniguchi's craftsman-like design process and his constant presence on the construction site are considered extreme. As one frequent collaborator has noted, "Every step of the process of design and building is lovingly overseen and often reviewed. No detail remains unconsidered. No idea is unchallenged, often changed even during construction. Basic materials are considered and reconsidered right until their final installation." Taniguchi makes a point of acknowledging the contributions of experienced constructors, and he uses these relationships to exploit the latest material and technological innovations.

The result of his intense focus on each project is a pristine perfection. Taniguchi's dignified and uncompromising architecture has led more than one author to revive the idea of an architectural morality that sets him apart.

DANA BUNTROCK

S*ee also* **Japan; Tange, Kenzo (Japan)**

Biography

Born Tokyo, Japan, 1937. Graduated from Keio University, Bachelor's of Mechanical Engineering, 1960, and Harvard University, Master of Architecture, 1963. Taniguchi worked for Kenzo Tange, 1964–72. Established Taniguchi, Takamiya, and Associates in 1975; Taniguchi and Associates was established in 1979. Selected awards include an award from the Architectural Institute of Japan (for the Shiseido Art Museum, 1980), the Japan Academy of Art Prize (for the Ken Domon Museum, 1987), the Togo Murano Memorial Prize (for the Marugame Gen'ichiro Inokuma Museum of Contemporary Art, 1994), and the Public Building Award (for the Tokyo Sea Life Park, 1994). Taniguchi has also won awards from the Building Contractors Society for five of his buildings: Kanazawa Municipal Library (1980), Hotel Appi Grand (1987), Tokyo Sea Life Park (1991), Sakata Kokutai Kinen Gymnasium (1994), and the Marugame Gen'ichiro Inokuma Museum of Contemporary Art (1994).

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Ken Domon Photography Museum, Sakata, Japan, 1987
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Higashiyama Kai'i Gallery for the Nagano Prefectural Shinano Art Museum, 1990
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Marugame Gen'ichiro Inokuma Museum of Contemporary Art, 1991
Toyota Municipal Museum of Art, Tokyo, 1995
Kasai Rinkai Park Visitors' Center, 1996
Tokyo National Museum of Horyuji Treasures, 1998
Tsukuba City Theater, 1999

Further Reading

Because of Taniguchi's notorious reticence, there is very little available on his work.

There are, however, two monographs that offer an up-to-date overview of his work. These are listed first. In addition, two articles attempt to summarize his work, and these are also noted.

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TAUT, BRUNO 1880–1938

Architect and urban planner, Germany

Bruno Taut was one of the leading architects in the development of a modern architecture in Germany. He worked from a traditional historicist style to a colorful Expressionism before World War I and then helped create a rationalized "New Building" in which he maintained a sense of color and creativity that transcended the austere machine aesthetic and objectivity of his International Style peers. His career can best be divided into four major phases: training and early works, 1903–12; Expressionist experiments, 1912–23; large-scale social housing projects in Berlin, 1924–31; and exile in Russia, Japan, and Turkey, 1932–38.

Taut was born in Königsberg, East Prussia (present-day Kaliningrad, Russia), the son of a merchant and older brother of prominent architect Max Taut. He was educated at the local building college and received further training in the offices of leading contemporary architects Bruno Möhring in Berlin (1903), Theodor Fischer in Stuttgart (1904–08), and the urban designer Theodor Goecke at the Technical University in Berlin (1909). In 1909 Taut opened an office in Berlin with Franz Hoffmann and was joined by his brother Max in 1914, although they maintained separate design practices. The first commissions were for apartment buildings in Berlin in which Taut created abstracted, Secessionist-style compositions within a traditional framework.

In 1912 Taut was appointed advisory architect to the reform-oriented German Garden City Association, which led to commissions for two housing developments: the "Reform" Siedlung (housing estate) in Magdeburg, Germany (1913–14, 1921–23), and the Falkenberg Garden City southeast of Berlin (1913–14). In both developments Taut combined traditional garden city ideals and small, plain pitched-roof houses with brightly colored facades as an inexpensive, expressive way to enliven architecture without traditional historicist ornament.

Beginning in 1912, Taut also received a series of commissions for important experimental exhibition pavilions to advertise new construction materials, including the "Monument to Iron" in Leipzig (1913) and the famous "Glass House" at the Werkbund Exhibition in Cologne (1914). The Glass House, a propaganda building for the German glass industry, contained glass-block floors, a sparkling waterfall, walls lined with brightly colored tiles and prism glass, and a multifaceted, colored-glass dome with reinforced-concrete ribs. The pavilion was dedicated to the poet Paul Scheerbart, whose fantastical writings praised glass as the material of the future. The important critic and Taut's friend Adolf Behne championed glass in the popular press as the harbinger of a new, modern architecture for the future.

As a committed pacifist, Taut refused to participate in World War I, but in December 1918, within days of the German surrender, he and Walter Gropius formed the short-lived revolutionary Working Council for Art. This was an organization of young artists and architects intent on promoting a visionary new architecture of colorful, magical forms that were free of all the burdens of past traditions, ornament, and materials. Taut publicized his own dreams in several books, including *Alpine Architektur* (1919; *Alpine Architecture)* and *Die Auflösung der Städte* (1920; The Dissolution of Cities), and a series of utopian writings circulated among his friends that were later dubbed the "Crystal Chain Letters." All advocated the dissolution of existing cities in favor of a purified, crystalline architecture of colored glass. Throughout his life Taut used the power of the press to circulate his ideas to a larger audience, writing 21 books and nearly 300 articles over the course of his career.

In 1921 the newly elected socialist government of Magdeburg hired Taut as chief city architect, offering him an opportunity to implement some of his utopian ideas. He oversaw the extension of his own colorful Reform Siedlung, built a large concreteframe exhibition hall, and initiated a controversial but widely publicized program of colorizing existing urban facades to enliven the drab cityscape of postwar Magdeburg. Rampant inflation and increasing criticism of his avant-garde ideas, however, soon ended his tenure.

The most productive phase of Taut's career began in 1924, when he accepted an offer to oversee the design of large socialized housing developments in Berlin for the communal building association GEHAG in cooperation with the chief city planner of Berlin, Martin Wagner. In seven very productive years, Taut designed more than 10,000 units of affordable housing that proved to be among the most important achievements in public housing of the century. Alongside Wagner, Taut became increasingly committed to rationalized, standardized, and largely prefabricated construction systems, and functional and efficient apartment layouts and furnishings that became models for housing all over the world. Large-scale developments, such as the "Horseshoe" Siedlung in Berlin-Britz (21,374 units, 1925–31) and Onkel Tom's Hütte in Berlin-Zehlendorf (1915 units, 1926–31), were built in a radically modern architecture of mostly flat roofs, unornamented facades (except for Taut's trademark color), and plenty of green space that provided a welcome relief for Berlin's working class. The developments helped alleviate a dire housing shortage and, along with built-in social institutions such as libraries, sports fields, communal laundries, dining facilities, and social clubs, helped promote worker solidarity and the socialist political ideals of Berlin's city government.

The success of these projects earned Taut a prestigious professorship in housing and city planning at the Technical University of Berlin from 1930 to 1932 as well as an honorary membership in the American Institute of Architects. The worldwide economic depression and an increasingly conservative and rightwing press and political machinery, however, once again forced him out of work and office. After 1931 he accepted various offers to work in the young Soviet Union, which had been relatively untouched by the worldwide economic depression and which offered great promise to many important German architects in search of opportunities to implement their dreams of a new architecture for a new socialist society. Taut moved to Russia in 1932 and began plans for a hotel and several institutional buildings as well as a master plan for Moscow. However, political pressure soon forced him on the move again, briefly to Germany, where Adolf Hitler had started to campaign against all modern architects in 1933, and then on to Japan.

Taut stayed in Japan for three years, writing books, designing well-crafted furnishings and household objects, and studying the ancient building traditions of Japan, which he found surprisingly similar to European modern architecture. He was, however, unable to build anything in Japan because of his émigré status. Eager to build, in 1936 Taut once again followed a number of German colleagues and accepted an offer from the Turkish government for a professorship at the Academy of Art in Istanbul and a position in the Ministry of Education. His attempt to combine local Turkish building traditions with European modernism in several university and institutional buildings, and his attempt to use architecture to create a new society for postrevolutionary Turkey, earned him great fame and respect and put Taut back in his element in an adopted homeland. When his life was cut short by failing health in December 1938, he was honored by being the only European buried in the national cemetery.

KAI K.GUTSCHOW

Biography

Born in Königsberg, Germany, 4 May 1880; brother of architect Max Taut. Attended the Baugewerkschule, Königsberg; studied at the Technische Hochschule, Stuttgart under Theodor Fischer 1903–05; studied urban planning under Theodor Goecke at the Technische Hochschule, Charlottenburg, Berlin 1908–09. Married Hedwig Wollgast: 1 child. Worked in the office of Bruno Mehring, Berlin 1900–03; employed in the office of Theodor Fischer, Stuttgart 1904–08. Private practice, Berlin 1908–21; city architect, Magdeburg, Germany 1921–23; partnership with Max Taut and Franz Hoffmann, Berlin 1923–31; advisory architect, GEHAG (Gemeinnützige Heimstatten-, Spar-, und Bau-Aktiengesellschaft) 1924–32; practiced in Moscow 1932–33; practiced in Tokyo 1933–34; worked for Crafts Research Institute, Sendai; practiced in Ankara and Istanbul, Turkey, from 1935; head of architectural office, Turkish Ministry of Education. Professor, Technische Hochschule, Charlottenburg 1930–32; professor of architecture, Academy of Arts, Istanbul. Founding member, Arbeitsrat für Kunst 1918; member, Der Ring 1924. Died in Ankara, 24 December 1938.

Selected Works

Monument to Iron, International Building Trades Exhibition, Leipzig (with Franz Hoffmann), 1913

Garden City Reform, Magdeburg, 1914, 1923

Falkenberg Garden City, Berlin, 1914

Glass House, Werkbund Exhibition, Cologne, 1914

Hufeisensiedlung Housing Estate, Britz, Berlin (stage I with Martin Wagner), 1931

Forest Housing Development, near Onkel Toms Hütte, Zehlendorf, Berlin (stage I with Hugo Häring and O.R.Salvisberg), 1931

Bruno Taut House, Ortakoy, Turkey, 1938

Ministry of Culture Exhibition Buildings, International Exposition, Izmir, Turkey, 1938

Language and History Faculty Buildings, University of Ankara, Turkey, 1938

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N*ippon mit europäischen Augen gesehen,* 1934

A*rchitekturlehre: Grundlagen, Theorie, und Kritik,* 1936

Further Reading

Although Taut's papers were destroyed in World War II, the first study of his socialist-inspired architecture was done by Kurt Junghanns in communist East Germany. As interest in Expressionism and the "New Objectivity" of interwar Germany increased over the years, so too did scholarship on Taut. Bletter, Sharp, and Whyte are good English-language sources. Speidel's recent catalog for an exhibit in Japan and Magdeburg provides spectacular color illustrations of Taut's work with complete reprints of his hard-to-find utopian writings.

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Volkmann, Barbara (editor), *Bruno Taut, 1880–1938,* Berlin: Akademie der Künste, 1980
Whyte, Iain Boyd, *Bruno Taut and the Architecture of Activism,* Cambridge and New York: Cambridge University Press, 1982
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TÁVORA, FERNANDO 1923-

Architect, Portugal

Fernando Távora can be considered one of the most important exponents of contemporary Portuguese architecture; he symbolizes the deep cultural renewal that has gradually allowed Portugal to again play an important role in European architecture. His poetical language is the fine result of a particular cultural background that has led him to create a new Portuguese architecture based on a careful dialogue between modernity and tradition. Most of his works show that he has explored new paths to enhance the traditional values of rural Portuguese architecture: Each project evokes the past, but his designs follow principles of modernity, including functional spaces, accurate details, refined shapes, perfect integration to natural sites, and traditional materials. In other words, Távora's architecture is not "something different, special, sublime, but work made for man by man." Thanks to his long teaching experience (university professor, Faculty of Architecture in Oporto and Coimbra), he has become one of the main reference points for a new generation of Portuguese architects.

Fully aware of architecture by Le Corbusier and Mies van der Rohe, Távora sought ways to blend traditional Portuguese architectural forms with those of the modernists. In 1947 he wrote an essay titled "O problema da casa portuguesa" (The Problem of the Portuguese House), in which he explained his point of view for reinvigorating Portuguese architectural language: "The typical house will provide us with many important lessons when properly studied, since it is the most functional and less fanciful; in short it comes closest to the new intentions. …In contemporary architecture, a promising consistency is looming on the horizon…with which Portuguese architecture should merge, without fear of losing its identity…. It does not fade away like so much smoke; if we do possess this individuality, nothing will be lost by studying foreign architecture." However, in the works of this period (1947–52), Távora appears not yet to be able to adapt these principles to his projects.

Távora's efforts to combine modernity and tradition show promise in one of his first public projects for Oporto, the Municipal Park of Quinta da Conceiçao (1960), which included the simple Tennis Pavilion, his first masterpiece. The park shows elements of its past: an old monastery, founded in the 15th century. In the quiet landscape of the old cloister, the chapel and the pools fit well with the elegant design of new modernist spaces. Távora himself describes the Tennis Pavilion as the work of "a young architect torn between reality and dream, the local and the international, the model and the history." The design recalls traditional elements of Portuguese rural architecture and Japanese religious structures. With its balanced proportions and the use of traditional materials (wooden trusses and white concrete), the small pavilion "contains a certain remote oriental influence, as does traditional Portuguese architecture from the sixteenth century onwards."

Távora's experiments continue to blend different elements, modern and traditional, in the Summer House (1958) in Ofir. Placed in a Mediterranean pine grove, the house is divided into three functional blocks (living room area, services, and bedroom area) connected by a large covered passage. The whole building evokes local rural architecture with its geometric white surfaces, wooden trusses, red-tiled roof, paved loggias, and colored chimneys.

Throughout his career, Távora has incorporated modern and traditional Portuguese forms to create simple and clean spaces where various cultural references coexist. His literary discussion about architecture carries on and generates other complex works, such as the Gondomar Convent (1971), the Convent of Santa Marinha da Costa Inn (1984), and the Agriculture High School Refoios do Lima (1993). They highlight the evolution of his thinking about traditional and modern architecture in Portugal.

The Gondomar Convent is articulated into various blocks, each fulfilling a different function (dormitories, chapel, meeting rooms, and refectory). Linking buildings with the site, Távora arranged the blocks to follow the natural slope of the landscape. Materials (gray granite, white concrete, and red-tiled roofs) recall local rural architecture and enhance a critical reuse of Portuguese architectural values. The conversion of the 18th-century Convent of Santa Marinha da Costa to a *pousada* (the typical Portuguese inn) allowed Távora to further develop his principles. This project is not a mere restoration of the old walls of the convent but rather a subtle attempt to insert modern structures in an architectural continuity. The conceptual methodology adopted in the restoration of the convent is clearly explained by Távora himself: "The general criterion used was to carry on innovating the already long life of the old building, by preserving its most important areas and creating spaces of quality resulting from the new functional use introduced." The new bedroom section is not a simple addition of forms but rather represents the continuous transformation of the whole building. Popular forms of rural architecture inspired the design of the new parts of the convent: the integration between the old and the new suggests continuity more than rupture. A similar conception was successively adopted for the Refoios do Lima Convent's conversion to the High School for Agriculture (1987). The interior values of the existing structures are unchanged, and the yellow ancient walls are carefully linked with the new buildings.

In summing up Távora's contribution to 20th-century architecture, it is useful to conclude with the words of the critic Manuel Mendes. He asserts that "Távora's architecture is not influenced by any particular architect, by any one particular school or period, it encompasses the whole dimension of memory: his work in its apparent simplicity, is the most original and erudite stylistic research carried out in recent years in Portugal."

STEFANIA ATTI

See *also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France); Mies van der Rohe, Ludwig (Germany)**

Biography

Távora's thinking about modern and traditional values originated with his upbringing and education. Born in Oporto, Portugal, 25 August 1923, to a rich and well-educated family, he attended the Oporto School of Fine Arts, where he graduated in architecture in 1952.

The discovery of new international architects (Le Corbusier, Gropius, and others) and the principles of the Modern movement caused in Távora a deep change of mind and boosts a new reflection on Portuguese architecture.

Granted a scholarship by the Calouste Gulbenkian Foundation and the Institute for Culture in the United States and Japan. Attended the CIAM summer course at the Faculty of Architecture of Venice. Assistant director at the UIA/Oporto Summer School. Architect for Oporto Town Council, consultant to the Commission for the Urban Renovation of the Ribeira/Barredo project, consultant in the Technical Bureau of the Northern Planning Commission, consultant in the local Technical Bureau of Guimarães Town Council. President of the Ad Hoc Committee of the Faculty of Architecture of Oporto, university professor at the Faculty of Architecture of Oporto and professor at the Department of Architecture of the University of Coimbra. Awarded the First Prize for Architecture by the Calouste Gulbenkian Foundation, the Europa Nostra Award, the 1985 Tourism and Heritage Award, the 1987 National Award for Architecture, and the Golden Medal of the city of Oporto. Doctor Honoris Causa at the University of Coimbra. Member of the Association of Portuguese Architects, the International Union of Architects, the Advisory Committee for Training in the Field of Architecture (European Economic Community). Correspondent of the National Academy of Fine Arts.

His works have been hosted in important exhibitions: Washington (United States), Clermont-Ferrand (France), Brussels (Belgium), Lisbon (Portugal), Milan and Venice (Italy).

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Municipal Park of Quinta da Conceiçao, Oporto, 1956–60

Tennis Pavilion of Quinta da Conceiçao, Oporto, 1956–60

Summer House, Ofir, 1957–58

Gondomar Convent, 1961–71

Center and Municipal Building, Aveiro, 1963–67

Covilhã House, Guimarães, 1973–76
Santa Marinha Convent, Guimarães, 1975–84
General Urban Plan of Guimarães, 1980
Renovation of a house in Rua Nova, Guimarães, 1985–87
High School for Agriculture, Refoios do Lima Convent, Ponte de Lima, 1987–93
Urban renovation, Guimarães, 1987
Police Station, Guimarães, 1988–93
8 de Maio Square, Coimbra, 1993

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TAYLOR, ROBERT R. 1868–1942

Architect, United States

Robert R.Taylor, the first professionally trained African American architect, was a designer, teacher, and administrator at Tuskegee Institute (now University) in Alabama.

Taylor was born in Wilmington, North Carolina, to relative privilege for a black southerner. After graduating from the Massachusetts Institute of Technology with a degree in architecture in 1892, he rejected several teaching offers and started an architectural practice in Cleveland, Ohio, which had a black community with long ties to the Wilmington area. Taylor was less immune to the blandishments of Booker T.Washington, who lured him to Tuskegee, which was then a secondary school. Washington had a full understanding of the power of architecture to inspire its inhabitants, instill racial pride, and present the school by photographs in the national press. Washington wanted to showcase black-designed and black-built buildings as well as develop courses in architectural and mechanical drawing. All students in all trades were to draw their projects—stovepipes, wagon wheels, shoes, and carpentry joints—as a precondition to making them. Teachers and ministers as well as those learning

Douglass Hall (1902–04), Tuskegee Institute, Tuskegee, Alabama

Photo by Frances Benjamin Johnson. © Library of Congress

building trades must also be able to draw and then build their own schools, houses, and churches or adapt whatever poor structures they might be assigned in their remote rural destinations. By hiring Taylor, Washington had acquired not only the country's only school-trained black architect but also an able administrator who would soon direct the Boys' Industries Division and manage Tuskegee's building program, serving as its contractor as well as architect.

Taylor's design tracks at Tuskegee remain clear, even with the loss of three major buildings. The Chapel (1898) initially seated 2000 (later 3000) under a hammer-beam roof. Although it burned in 1957, it has lived on as the scene of the hero's epiphany in Ralph Ellison's *Invisible Man*. (Paul Rudolph designed the replacement.) In 1918 a fire took the SlaterArmstrong Memorial Trades Building (1899), and the Huntington Memorial Academic Building (1905) burned recently. Still, enough remains to leave a remarkably attractive campus of gently scaled, white-trimmed brick structures punctuating the green and hilly landscape. Taylor's buildings vary in shape and style, but all have modest detailing that sets off sharp-edged wall surfaces that display Tuskegee's student-made bricks. The trials of getting the school's brickyards started loomed large in Tuskegee's collective memory. Building donors knew that their gifts did triple duty in shelter, student support, and education, as students did most of the construction, learning trades as they earned money.

About two dozen other brick buildings remain that were designed by Taylor and the Architectural Drawing Division. There are many dormitories, a classroom building (now offices), an administration building, Booker T.Washington's house (now a museum), and an unusually elegant Laundry Building (now the George Washington Carver Museum). The exterior of the Girls' Industrial Building still stands, although the interior has been gutted. The Carnegie Library (1902) is fronted by the school's first two-story portico. Critics now interpret southern high classicism as reified white triumphalism based on Jim Crow laws and sanctioned violence. Tuskegee's library portico was built just when a new Alabama constitution denied most black people the vote and just when Booker T.Washington was excoriated throughout the region for taking a meal with Theodore Roosevelt in the White House, thereby seeming to claim social equality. However, even Tuskegee's harshest critics accepted its several classical porticoes and a dome without questioning them for effrontery.

Taylor also designed buildings elsewhere: Carnegie libraries at Livingstone College in Salisbury, North Carolina (1906), and Wiley University in Marshall, Texas (1907); brick school buildings in Cambria, Virginia (1897), and Selma, Alabama (1921); a church in the town of Tuskegee (1907); a Masonic Temple and office building in Birmingham, Alabama (1922); many wooden houses; wooden schools in the countryside; and perhaps a house for C.A. Correa in Mexico City (1908). Taylor did not design all of historic Tuskegee. A white Georgian designed the domed Tompkins Dining Hall (1910), although Taylor did the interiors and supervised construction. Other black architects teaching in the Architectural Drawing Division, such as Walter T.Bailey (trained at the University of Illinois), William S.Pittman (Tuskegee and Drexel Institute), Wallace A.Rayfield (Pratt Institute), Louis H.Persley (Carnegie Institute of Technology), and the office-trained William A.Hazel, also played active design roles. Tuskegee nurtured black architects with teaching jobs and prepared students for architecture schools (Pittman and Charles Brent to Drexel and Vertner W.Tandy to Cornell) or practice (Charles Bowman in Kansas City; Charles T.Russell in Richmond; John A.Lankford in Washington, D.C.; and several others in Puerto Rico and Cuba).

Taylor's life and architecture were, then, closely bound to Tuskegee, which he made into a center of architectural activity for African Americans. Although he left briefly to resume his Cleveland practice, he designed Tuskegee buildings as a part of it. In 1929 the Phelps-Stokes Fund sent him to Liberia to help create the Booker Washington Institute as an "African Tuskegee." The reticent, diplomatic academic administrator observed Liberia's controversial social and economic conditions, proposed a program and staffing, planned the campus, and designed its first buildings. He retired soon after this adventure and spent his remaining years in Wilmington. His son, Robert Rochon Taylor, carried on in some sense, becoming the Chicago Housing Authority administrator for whom the high-rise Robert Taylor Homes were named.

Taylor was too modest or too honest to claim for himself the role of the first black professional, an honor that he might have given his older colleague William A.Hazel (185?-1929). Taylor's architectural reputation was eclipsed during his own lifetime by the stellar Los Angeles career of Paul R.Williams (1894–1980). However, recognition has come recently through the naming of prizes and associations in his honor and by MIT's attention to its first African American graduate.

ELLEN WEISS

Biography

Born in Wilmington, North Carolina, 8 June 1868. Father was a white planter's son who was free before emancipation and had prospered as a coastal trader, merchant, and carpenter/builder. Attended an American Missionary Association school for black children in New England; met Henry and Francis Bacon—the first a future architect, the second a Massachusetts Institute of Technology (MIT) architecture student in 1888; attended MIT, 1888–92; bachelor of science degree in architecture 1892. His thesis was a home for aged Civil War veterans, northern and southern together. Married; son, Robert Rochon Taylor, administrator of the Chicago Housing Administration. In private practice, Cleveland 1892–96; brief private practice, Tuskegee, Alabama. Professor and administrator, Tuskegee Institute (now University), Alabama from 1896; designer and administrator, Booker Washington Institute, Liberia 1929–34. Died in Wilmington, 13 December, 1942.

Selected Works

Grade School, Cambria, Virginia, 1897
Chapel (destroyed), Tuskegee Institute, Alabama, 1898
Slater-Armstrong Memorial Trades Building (destroyed), Tuskegee Institute, 1899
Carnegie Library, Tuskegee Institute, 1902
Huntington Memorial Academic Building (destroyed), Tuskegee Institute, 1905
Carnegie Library, Livingstone College, Salisbury, North Carolina, 1906
Carnegie Library, Wiley University, Marshall, Texas, 1907
Church, Tuskegee, 1907
Grade School, Selma, Alabama, 1921
Masonic Temple, Birmingham, Alabama, 1922

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Philadelphia: Society of Architectural Historians, 1993

TEAM X (NETHERLANDS)

Team X was an architectural group formed in the early 1950s by a number of young European architects. The participants were dissatisfied with the mid-20th-century Modern movement, particularly with the ideals of CIAM (Congrès Internationaux d'Architecture Moderne), with which they had previously been affiliated. Oscar Newman's *CIAM '59 in Otterlo* and Alison Smithson's *The Emergence of Team 10 out of C.I.A.M.* document Team X's official secession from CIAM. Factions that began to appear at the CIAM IX meeting in Aix-en-Provence in 1953 between the old guard and the younger generation anticipated the split. Under that meeting's theme, "Habitat," the younger members contested the simplistic divisions of living, working, leisure, and circulation that had been established in the Athens Charter. Alison Smithson contends in *Team 10 Meetings: 1953–1984* that the first Team X meeting took place during the meeting at Aix-en-Provence. Following the events of CIAM IX, the "youngers" were entrusted with preparing the subject matter for the CIAM X meeting and from then on were known as Team X.Alison and Peter Smithson (England), Aldo van Eyck (Netherlands), Jaap Bakema (Netherlands), Georges Candilis (France), Shadrack Woods (France), John Voelcker (England), and William and Jill Howell (England) were the founding members of Team X. Participants in Team X altered considerably during the group's existence, but in general the group remained small and was defined by its reaction to the inefficiencies of the large CIAM commissions.

Curtis maintains in *Modern Architecture since 1900* that the members of Team X initially advocated the moral convictions of the early Modern movement but were discontented with CIAM's incapacity to respond to growth and change. They felt that culture, climate, and context were not being addressed and opposed the modernist philosophy of "tabula rasa." However, Francis Strauven acknowledges in his article "The Dutch Contribution: Bakema and Van Eyck" that even the method of achieving these mutual goals was not easily agreed on by the members of the group. Bakema and van Eyck, both of whom requested modification of an original draft by the Smithsons of the Doorn Manifesto (January/February 1954), had their suggestions for the document initially ignored. Finally, an appendix to this manifesto, called the "Dutch Supplement," was added.

Few similarities generally existed between Team X members. Individual participants varied in their method of working and in their perception of how a building was produced. Alison Smithson argues in *Team 10 Meetings: 1953–1984 whether* even the group's function as a forum for the development of individual architectural concerns was necessary for each architect's work to have advanced.

The most influential manifesto produced by Team X is the *Team 10 Primer,* published in 1962 and edited by Alison Smithson. It consists of a compilation of quotations from its members at the time. John Voelcker and William and Jill Howell were no longer listed as members in *Team 10 Primer,* being replaced by Giancarlo de Carlo (Italy), José Antonio Coderch y de Sentmenat (Spain), C.Pologni (Hungary), Jerzy Soltan (Poland), and S.Wewerka (Germany). Extracts explore issues initiated by the CIAM commissions, such as mass housing and urbanism through the multilevel city, including the Smithson's proposal for the Golden Lane Housing Competition using the concept of "streets in the air." This proposal was strongly influenced by their relationship with Nigel Henderson, a photographer of London's working-class communities, and their involvement in the art collaborative, the Independent Group.

Van Eyck's elaboration of the doorstep metaphor and his criticism of twin phenomena is another important contribution found in *Team 10 Primer.* In the chapter on Van Eyck in *Modern Architecture: A Critical History,* Kenneth Frampton acknowledges how Van Eyck differed from the other participants of Team X in regard to the severity of his critique of the Modern movement. Before his involvement with Team X, Van Eyck had undertaken extensive studies of anthropological concerns through his personal interest in "primitive" cultures.

Formal meetings of Team X members were generally held annually. In 1962 a well-documented Team X meeting occurred at Abbaye Royaumont. Its importance lay in Team X's acknowledged independence from CIAM concerns. Once again the listed participants had changed. Projects presented included the Waterford School in Swaziland by Pancho Guedes (South Africa/ Portugal), the Tibro housing project by Ralph Erskine, John Voelcker's Council Offices and proposal for Tilbury House in Maidstone, Peter Smithson's studies of metropolitan London, José Antonio Coderch y de Sentmenat's studies of slums in Barcelona, Christopher Alexander's study of Indian villages, Kurokawa's capsules, Aldo van Eyck's interest in the large-house/ little-city image, Jaap Bakema's gallery housing, Giancarlo de Carlo's plans for Milan, Christopher Dean and Brian Richards's studies of Euston Station, Shad Woods's interest in pedestrian avenues, and Georges Candilis's Toulouse-le-Mirail. The records of "Team 10 at Royaumont" differ from those in *Team 10 Primer* in that they chronicle the interactive discourse by participants in the projects presented. The contributions of architects of different nationalities, speaking English to varying degrees, resulted in frustration with this meeting's outcomes.

In 1982 the final Team X family included Alison and Peter Smithson, Aldo van Eyck, Georges Candilis, José Antonio Coderch y de Sentmenat, Giancarlo de Carlo, Jerzy Soltan, Ralph Erskine (Sweden), Manfred Schiedhelm (Germany), Pancho Guedes, and Julian de La Fuente (France). No longer driven to respond to CIAM inadequacies, the group lost effectiveness and was disbanded in 1984.

The contributions made to 20th-century architecture by Team X include the production of important writings such as *Team 10 Primer* and their capacity to reassess the existing canon of the Modern movement. Equally important are the built works and writings of Team X members. In his article "Team 10 after the Sex Pistols," Willem Jan Neutelings acknowledges the impact of Team X on the Dutch architecture that followed, citing a link to Rem Koolhaas's work. Similarly the Smithsons influenced British architecture through Reyner Banham's promotion of them as founders of the Brutalist movement.

S*ee also* **Congres Internationaux d'Architecture Moderne (CIAM)**

IGEA TROIANI

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TECTONICS

The term *tectonics* alludes to the formally expressive capabilities inherent in architectural forms, both as singular components and in relation to the building assembly as a whole. This aspect of architectural form has, therefore, a greater meaning than either the dictionary definition of *tectonic* as merely "pertaining to building or construction in general" or the simple revealing of constructional techniques. Tectonics, in architectural discourse, refers to the poetics of construction in the original Greek sense of poesis as an act of making and revealing.

The term *tectonic* derives from Greek word *tekton,* meaning carpenter or builder, in turn borrowed from the Sanskrit *taksan,* referring to the craft of carpentry and to the use of the ax. Remnants of a similar term can also be found in Vedic, where it again refers to carpentry and to the art of construction in general. This meaning undergoes further evolution as the term passes from being something specific and physical, such as carpentry, to the more generic notion of construction and later to becoming an aspect of poetry.

The history of tectonic form has two major theoretical lines divided roughly between the German lineage of J.J. Winckelmann, Karl Boetticher, Gottfried Semper, and Karl Friedrich Schinkel and the French tradition of Abbé Laugier, Claude Perrault, Jacques-Germain Soufflot, Henri Labrouste, and Eugène-Emmanuel Viollet-le-Duc. Whereas the German architects and writers focused on the post-Enlightenment dilemma of the disjunction between form and spirit as applied to architecture, French thinkers were preoccupied with the expression of statical logic and the rationality of construction procedures insofar as they could be revealed with greater clarity than before using the new materials of iron and concrete informed by the newly developed science of statics.

The first architectural use of the term *tectonics* in German dates from its appearance in Karl Otfried Müller's *Handbuch der Archaologie der Kunst* (1878; Handbook of the Archaeology of Art), wherein he defines *tektonische* as applying to a series of art forms "such as utensils, vases, dwellings and meeting places of men…. We call this string of mixed activities tectonic; their peak is architecture, which mostly through necessity rises high and can be a powerful representation of the deepest feelings." Karl Boetticher, in his *Die Tektonik der Hellenen* (1874; The Tectonic of the Hellenes), elaborated the concept of the tectonic in several ways. At one level he described a process of building made of a series of appropriately interlocking constructional elements. Simultaneously articulated and integrated, this series of joints constituted the body-form, or *Körperbilden,* of the building that enabled construction of the building and made such assemblies symbolic components of an expressive system. At another level Boetticher distinguished between the *Kernform,* or nucleus, and the *Kunstform,* or decorative cladding, the latter having the purpose of representing and symbolizing the status of the work.

The German architect Gottfried Semper was particularly influential in the evolution of tectonics in his work *Die vier Elemente der Baukunst* (1851; The Four Elements of Architecture). Inspired by a Caribbean hut in the Great Exhibition of 1851, Semper evolved the notion of a paradigmatic primitive hut that embodied the four basic tectonic elements of architecture: the earthwork, the hearth, the framework (and roof), and the light-weight enclosing membrane. This model was more anthropological and transcultural than Marc-Antoine Laugier's well-known proposal in his *Essai sur l'architecture* (1755; An Essay in Architecture), which presented a framed pedimented edifice, adopted as an archetype by neoclassical architects. At the same time, Semper divided architectural form into two broader categories: the tectonics of the frame, in which lightweight linear components are in a spatial grid, and the stereotomics of the earthwork, where mass and volume are formed concurrently through the use of heavyweight elements. *Stereotomics* is derived from the Greek terms *stereos,* for solid, and *tomia,* to cut. This distinction between light and heavy is reflected in overall material differences and construction techniques—wood, steel, and other tensile components for the former and brick, stone, reinforced concrete, or their compressive equivalents for the latter. This opposition between iconic construction typologies and their resultant space-forms as a basis for an architectural language is borne out in vernacular building traditions throughout the world. In Semper's *Der Stil in den technischen und tektonischen Künsten, oder praktische Aesthetik* (1879; Style in the Technical and Tectonic Arts, or Practical Aesthetics), he emphasized the joint or the knot, particularly between the stereotomic base of a building and its tectonic frame. Transitions between such elements provided, for Semper, the most extensive opportunities for expression in architecture.

With this focus on the joint or knot, he wrote extensively about the nature of the textile arts as the dominant primordial building element that was often preserved over time stylistically in other, more permanent materials, such as stone or wood.

The tectonic in French architectural thought is traceable to Claude Perrault's *Ordonnance des cinq espèces de dolonnes selon la méthode des anciens (Treatise on the Five Kinds of Columns after the Method of the Ancients,* 1783). Perrault proposed a theory of positive versus arbitrary beauty in place of the prevailing academic theory giving the five classical orders precedence over any other aesthetic ideas. He asserted that such academic styles belonged to the realm of arbitrary beauty, whereas symmetry, richness of materials, and precision of execution were the only means of judging a positive or universal form of beauty, qualities that are tectonic insofar as they are based on material substance and geometric order.

Two Paris masterworks by Henri Labrouste further developed the tectonic with extraordinary grace and clarity: the Bibliothèque Ste.-Geneviève (1850) in Paris and the Bibliothèque Nationale (1875), with the insertion of a prefabricated, fireproof iron framework into an exterior masonry shell, with each element clearly expressed and articulated. The tectonic aspect of this work lay in its attempt to discredit scenographic eclecticism and to establish in its place architecture as an art of construction. Concerned with the economy of structure, he evolved a system of "iron network vaulting" of his own devising—an expressive vocabulary of lightweight iron members and articulated joints that revealed their resistance to gravity in surprising and inventive ways while set within a more traditional heavy outer masonry shell. This syntax was developed further by his pupil Anatole de Baudot in a series of proposals for large-scale, long-span exhibition halls. The last French theorist of the Greco-Gothic ideal was François Auguste Choisy, who, in his *Histoire de l'architecture* (1899; History of Architecture), suggested that great civilizations arrived at their zenith when their essence, subject to geographic and material conditions, became expressed collectively in tectonic form. In part because of the nature of the renowned isometric drawings illustrating this work, Choisy presented the space-form of buildings as inseparable from their mode of construction, thus anticipating the tectonic possibilities of reinforced concrete in the 20th century.

Certain major architects of the 20th century have pursued tectonics as a determinant of architectural form in all or part of their work. The pioneering work of Auguste Perret (1874–1954) was almost exclusively concerned with the expression of the structural frame in opposition to its in-fill. Utilizing the new vocabulary of architectural reinforced concrete, buildings such as the Théâtre des Champs-Elysées (1913) in Paris created a fusion of classical rationalism with the Greco-Gothic ideal. Ludwig Mies van der Rohe (1886–1969) pursued a tectonic form of intense rigor and precision throughout his career, first with brick in a series of houses in Germany and later with steel in such buildings as the Farnsworth House (1950) in Plano, Illinois, and the campus at the Illinois Institute of Technology (1939–57) in Chicago. It is likely that Frank Lloyd Wright (1867–1959) was aware of Semper's writing and developed paradigms in many projects that included Semper's four elements, particularly in the so-called Usonian houses built mainly between 1934 and 1944 and the "textile-block" system of concrete block construction patented in 1923. Louis Kahn (1901–74) gave primacy in his work to understanding the expressive nature of the joint in architecture and emphasized the tectonic element in nearly every project of his career.

In the Kimbell Art Museum (1972) in Fort Worth, Texas, Kahn's manifestation of the Semperian earthwork-and-frame opposition utilized the former as a means of integrating the building into its site and the latter to provide space and reveal light. The work of the Norwegian architect Jørn Utzon has sought to express structure and construction as a major determinant of architectural form in both large- and small-scale projects. These works nearly always seek inspiration from non-European, often vernacular, models and distinguish clearly between the earthwork and roofwork components, the former often accommodating building services within the site and the latter composed of "floating" folded plate or shell-roof structures for the honorific habitable space above the podium. This is clearly manifest in the Sydney Opera House (1973). The tectonic aspect of the work of Carlo Scarpa (1906–78) lies primarily in the extreme emphasis he placed on the constructional joint—its rhetorical amplification and subsequent elaboration—regardless of the building's program or size.

Other architects who have made tectonics an integral part of their work include the Dutch architect H.P. Berlage (1856–1934), who achieved a masterful tectonic synthesis in his Amsterdam Stock Exchange (1903), and the late work of Le Corbusier (1887–1965), where expressive structure began to dominate the character of the work beginning with the Maison Week-End (1935) in St.-Cloud. The Dutch architects Aldo van Eyck and Herman Hertzberger developed the tectonic potential of the reiteration of singular spatial units and highly articulated structural form to create an evolved syntax of architectural form. In England, Foster Associates and the Richard Rogers Partnership have explored the potential of structural efficiency and its expression throughout their respective practices. In Switzerland the work of the Ticino School, as exemplified by Mario Botta and Livio Vacchini, falls easily into this category, as do many late 20th-century Spanish architects, among them Alejandro de la Sota and Bonell and Rius. In Greece the architects Aris Konstantinidis and Dimitris Pikionis worked to successfully unify local regional building and craft traditions with a modern tectonic expression. Finally, the work of Sverre Fehn in Norway as an example of a small practice and that of the Renzo Piano Building Workshop as a large international firm have been producing work that rigorously pursues an architecture rooted in a philosophy of tectonics, work in which the poetics of construction is a primary determinant of form, a determinant that invites adaptation and distortion brought about by exigencies of typological and topographic circumstance.

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S*ee also* **Berlage, Hendrik Petrus (Netherlands); Fehn, Sverre (Norway); Kahn, Louis (United States); Kimbell Art Museum, Fort Worth, Texas; Mies van der Rohe, Ludwig (Germany); Perret, Auguste (France); Piano, Renzo (Italy); Scarpa, Carlo (Italy); Sydney Opera House; Utzon, Jørn (Denmark)**

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TENSILE STRUCTURES

The most common tensile structure is a tent, which is a thin, saddle-shaped tension membrane supported by a compression arch or mast. In a tent the fabric carries all or part of the tensile forces. Small tents, made entirely of fabric, are typically supported by masts (columns) or arches. As the span increases, membrane tension forces increase, and the surface area must be subdivided by cables that carry the principal tensile loads with fabric spanning between cables.

If the edge of a tent is flexible (unattached), it is usually shaped into a concave curve to ensure that it remains in tension. Because the edge is a region of high stress, it is usually reinforced with cable that continues to the anchor point. The anchor point may be connected to a guy cable (which transmits tension forces to the foundation), or it may be supported by a mast or compression strut (which transfers compression loads to the ground).

Perhaps the best way to develop an intuitive understanding of appropriate shapes for tents is to experiment with scale models using a stretchy, lightweight double-knit fabric supported by arches, masts, or strings. At the scale of buildings, however, a minimum of stretch is desired; in fact tent fabrics are selected for their resistance to stretch under load (among other qualities). The three-dimensional form represented in the model by the stretched fabric is constructed at full scale by adjusting the shape and location of the individual panels before assembly. This technique is also used in the design and construction of boat sails to ensure the correct aerodynamic shape. In contemporary tent structures, three-dimensional computer models are used to plan the shape of the tent and its individual panels and to calculate internal tensile stresses. For wind stability (as well as longevity), it is essential that tents be designed as double-curvature structures.

Tents are most easily supported by central masts, but this may be functionally undesirable for nonstructural reasons. Catenary cables can be suspended from side masts to support the membrane peaks at several points. Where center supports are used, fabric stress may be reduced by distributing the load over a larger area through the use of a mushroom-shaped mast capital.

Traditionally, tents were considered to be suitable only for temporary structures because of the deterioration of fabrics due to prolonged exposure to sunlight. The development of improved fabrics (notably fiberglass) and coatings that minimize the deterioration due to sunlight (e.g., Dupont Teflon) have increased the useful life of tent fabrics to over 20 years, making them suitable for use on permanent structures.

Tent Case Studies

Riyadh Stadium

Horst Berger, a pioneer in tension structure technology, was the engineer on this graceful project (1986; Riyadh, Saudi Arabia; Fraser, Roberts, and Partners, architects). The structure consists of 24 identical tent modules repeated around a circle to form a ring canopy covering the grandstands. The open center is over the playing field. Like the Munich Olympic Stadium, the masts are positioned behind the seating to maintain the unobstructed view of the playing field from the grandstands, which seat 60,000. The tent covers a total area of 500,000 square feet (46,500 square meters).

The fabric membrane is stretched between ridge cables, valley cables, and catenary edge cables. The ridge cables are connected to the main mast and are radial in plan. The valley cables between the ridge cables are connected to the bottom anchor and stabilize the structure against wind uplift; they are also radial in plan. The outer edge of the ridge cables and the outer edge of the catenary edge cables are held at a fixed point created by the sloping mast and the two triangulated guy cables. The inner end of the membrane is attached to a ring cable that counterbalances the outward thrust of the sloping mast and guys. To make the structure erectable and to provide redundancy and additional stiffness, an additional cable system was added. This consists of adding a suspension cable, a stabilizing cable, and an upper support cable, all aligned with the ridge cable of each module. These, together with the masts, the rear support cables, and the ring cable, form a stable system not requiring the participation of the fabric.

The structure includes a roof-washing system designed to maintain the fabric's 8 percent daylight transmittance and 75 percent solar reflectance. The high solar reflectance, coupled with the natural convection ventilation induced by the openings at the peak, helps maintain spectator comfort. Rain drains outward to the lower anchor points to spill into a perimeter drainage basin. The center ring cable supports speaker and field lighting systems; uplights reflect off the underside of the tent at night to provide general illumination of the grandstands.

Mound Stands, Lord's Cricket Field

When asked to design the new mound stands for the Lord's Cricket Field (1987; London; Michael Hopkins and Partners, architects; Ove Arup and Partners, structural engineers), Hopkins used fabric roofs to create an elegant tent, recalling the temporary structures of the 17th century erected on the green for a Saturday afternoon's cricket match. In collaboration with the engineers, Hopkins devised a steel superstructure above the existing stadium to house two new tiers of seating, a mezzanine level of services, and the elegant roof that characterizes the structure.

Structurally independent of the existing brick terrace, the tent is supported by six 16-

inch (406-millimeter)-diameter tubular steel columns that also support a spine of steel girders. Cantilevering from the spine are a series of beams that form the floor of the top level and the ceiling above the viewing boxes. At the back of the building, the beams are connected by plate girders that transfer loads to the vertical steel tension rods placed every 59 feet (18 meters) between the arches of the colonnade.

The top tier of seating is covered by the fabric tent, stressed by a framework of steel struts and catenary cables. Originally intended to be Teflon-coated fiberglass fabric, PVC-coated polyester was finally specified because of fire restrictions. The fabric was cut using computer-generated patterns and ultrasonically welded into seven sections that extend between the six masts.

FULLER MOORE

S*ee also* **Hopkins, Michael and Patty (England)**

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TENSIONED MEMBRANE STRUCTURE

Tensioned structures (from the Latin *tendere,* “to stretch”) are ones that resist only tension forces and pull rather than push. A list would include traditional tents, suspension bridges, modern saddle-shaped prestressed membrane and cable roofs, convertible or retractable roofs for temporary covers, air-supported or pneumatic constructions, and combinations of cables and compression struts, referred to as “tensegrity” structures. Some are simply stabilized by their own weight, whereas others resist uplift as well as gravity loadings by being prestressed and having anticlastic surfaces. The majority are either linear or surface structures. A tensioned membrane structure is one in which two dimensions dominate and loads are resisted in a planar manner, such as occurs in tents, membrane, cable-net, and convertible or retractable roofs, and pneumatic constructions.

The origins of tensioned membrane structures arise from three archetypes: tents, suspension bridges, and balloons and airships. Although the tent is the oldest, suspension bridges were more influential. Balloons and airships antedate air-stabilized or pneumatic structures, in which a small pressure differential substitutes for masts or arch supports.

In addition to wire rope and bridge strand for cable or clastic suspended roofs, a number of fabrics are employed, including cotton, canvas, and coated synthetics; of these polyester coated with polyvinyl chloride (PVC) has proven to be the most useful. The experimental introduction of vinyl-coated fiberglass for the shallow cable-reinforced dome of the United States Pavilion at Expo ‘70 in Osaka, Japan, stimulated the search for longer-lasting fabrics. Teflon-coated fiberglass was used for La Verne College (1973), California, and subsequently for many different building types, the most famous being the Pontiac Silverdome (1975) in Pontiac, Michigan, and the giant King Abdul Aziz International Airport (1980) in Jeddah, Saudi Arabia.

For the most part, nonprestressed or simply suspended cable roofs resemble types of bridges: in a cable-suspended roof, the deck is carried directly on cables in the same manner as in a catenary bridge. The Wuppertal Swimming Pool (1957) and an aircraft hangar at Kempen (1957) both in Germany, are examples. The most famous is the Dulles Airport Terminal (1962) in Washington, D.C. Jørn Utzon adopted similar roofs for the National Assembly Building (1983) in Kuwait City, Kuwait.

Tents and ancient Roman theater *vela* are some of the earliest traditional examples. The Raleigh Arena (1952) in Raleigh, North Carolina, is usually given as a seminal instance of a clastic saddle shape whose prestressed cable roof supplied the prototype for many later structures, such as the Ingalls Hockey Rink (1958) at Yale University in New Haven, Connecticut, and the Sidney Myer Music Bowl (1956) in Melbourne, Australia.

Frei Otto’s experimental development of fabric structure marked the 1950s departure from the previous engineering-inspired suspension bridge model and promoted the tent model. Otto was anticipated by a Russian engineer, V.G.Shookhov, who in 1896 designed a series of four steel tents for the Exhibition at Nizhni Novgorod. In his early projects, Otto concentrated his efforts on finding the most efficient minimal surfaces for modest textile pavilions, but when challenged by larger spans in works such as the German Pavilion at Expo ‘67 in Montreal, he developed a system of flexible prestressed wide-rope cable nets on which he hung the fabric-enclosing membrane. A further step was taken with the 1972 Munich Olympic Stadium, which was significant for its material and technological advances that resulted in the application of computer methods of structural analysis for the first time.

Parallel with this, Otto developed miniature cable tractors that travel on the supporting cables and permit the membrane envelope to be fully stretched or retracted or bunched for automatic storage. After the Bad Hersfeld (Hesse) centrally retracting roof, Otto collaborated on constructing convertible roofs with Roger Taillibert over an open-air theater (1965) at Cannes and a swimming pool at Boulevard Carnot (1967) in Paris.

This construction is possible to do without masts and arches entirely in air-supported membranes, which use a small airpressure differential to hold up the structure and resist external loads. The two main types are air-inflated structures, consisting of rib and dual-walled structures, and air-supported structures. To these a third, hybrid type that combines features of both can be added.

An English engineer, Frederick William Lanchester, in a suggestion that he made for a field hospital in 1917, was the first to propose that the balloon principle be applied to building. During World War II in the United States, Herbert Stevens proposed that a pneumatic structure be used for aircraft production. The first actual application had to wait until Walter W. Bird, who enclosed radar dishes in the Distant Early Warning Line inside pneumatic bubbles. The success of these "Radomes" led Bird to establish Birdair Structures Incorporated in 1956. Civilian applications followed, including a theater for the Boston Arts Center (1959) and a Portable Exhibition Pavilion for the U.S. Atomic Energy Commission.

With the Brussels World's Fair, pneumatics, which was almost entirely American, crossed the Atlantic with the Pan-American Airways Pavilion (1958). Around this time Frei Otto began making studies of pneumatic forms and cable-reinforced air-supported membranes. The possible range of applications grew to include sports facilities, roofs for stadiums, warehouses, offices, and pavilions at the New York (1963–64) and Osaka (1970) World's Fairs.

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S*ee also* **Dulles International Airport, Chantilly, Virginia; Expo 1967, Montreal; Expo 1958, Brussels; Jeddah, Saudi Arabia; Otto, Frei (Germany); Utzon, Jørn (Denmark)**

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TENT

Traditional tents come in two categories: noble tents, which are affiliated with urban societies belonging to warriors and kings, and nomad tents, which are the property of nomadic and seminomadic pastoralists. Nomad tents are seen in many varieties, including conical skin-covered tents of northern Eurasia and North America, cylindrical felt-covered trellis tents of central Asia, and the black goats' hair tents of the Near and Middle East and North Africa. There are also species of primitive tents, such as the bone tent of northeastern Siberia and the skin and mat tents that survive in North Africa among the Tuareg and others.

Tents arose gradually, often evolving from existing fixed dwellings and huts that had been simplified and lightened under the pressure of nomadism to give the tent cloth a greater structural role in resisting loads imposed by the wind, snow, and rain and to increase the ease of erecting and transporting them.

Tents belonging to urban peoples existed in the ancient world well before Mohammed and are extremely old. Tents are depicted in an Egyptian encampment at the battle of Kadesh in 1285 B.C., and twin semicupola skin tents are illustrated in Assyrian bas-reliefs from 645 B.C. Images of black tents can be seen in the same Assyrian reliefs, and it is very probable that they existed before the 11th century B.C.

Tents come in two basic plan configurations: circular and rectangular. Structurally, the division is elementary as well: frame tents have a limp, unstressed membrane that is hung on a structural supporting frame that carries the imposed loads and is secured by thongs or straps to prevent the membrane from flying off; frameless tents have a load-bearing and load-distributing cover that is supported at points or linear arrangements of compression members, such as struts or arches. Very few traditional nomad tents have wholly, or true, prestressed membranes. The tent cover of the black goats' hair tent is comparatively heavy, and its weight, especially when it is wet, helps stabilize it. However, the cloth is stretched and deformed by rope around its edges to improve its stability under lateral wind loads. Thus, the tent is partly prestressed and partly weight stabilized. Structurally, traditional tents can be divided into unstressed frame tents; stressed tents without frames supported by poles, arches, and horizontal bars or tensile cords or filaments; and any combination of these.

The conical tent fundamentally is a primitive dwelling used by peoples at the hunting stage. It is a circumpolar trait found in the boreal regions of North America and Eurasia. The tent is retained as a summer dwelling by many nomadic and seminomadic herdsmen and even by some sedentary and agricultural tribes. It consists of a conical frame of radially inclined poles in a circle, with their slim upper ends secured at the peak. The pattern of the pole frame and the material used as a cover (but not the basic form) are remarkably uniform. Two, three, or four poles make up the foundation for the secondary poles, which are laid in the V-fork of the crossing. The conical frame tent belongs to the region of northern taiga forest among the Samoyed, Syran, Mansi, Sel'kupi, Ostayak, Vogul, Northern Evenki Tungus, Yeniseians, Khanti, Nganasani, and Lapps in Keti, Upper Yukaghir. Even the Kalmuck of Astrakhan and the Kirghiz use felt-covered conical tents. The tepee of the Great Plains Indians is a late modification of this circumpolar type and displays such essential features of the Eurasian conical frame tent as the central fire, a smoke hole centering on the crossing of the poles, an eastern entrance, and a place of honor opposite the doorway.

The cylindrical felt-covered trellis tent is a further, highly developed frame tent that is found in the vast region surrounding the Volga River and the Anatolian plateau in the west and the Khingan Mountains in the east. The shape and construction of the trellis tent are surprisingly uniform and have remained unchanged over the past four centuries. The two main types are a felt-covered cylindrical walled trellis tent with a conical ribbed roof, found among the Mongol peoples and some Turkicspeaking tribes of northern central Asia, and a convex domical roofed version, found among Turkic-speaking tribes of western and southern Siberia, such as the Kirghiz, Uzbek, and Turkoman.

The black tent type is a frameless tent with a partially stressed membrane with an anticlastic or flat saddlelike surface supported by ridge, arches, or high points and anchored to the ground by long, extended stays. It most resembles the modern prestressed tent and uses the least amount of wood of any type, with the possible exception of Inuit tents. Black tents are distributed in a nearly continuous narrow belt between 25 and 40 degrees north latitude, extending from Mauritania in northwestern Africa to Afghanistan, with the Tibetan group forming an isolated island. This distribution approximates the region of desert vegetation across North Africa and the Middle East and is related to two animals: the goat, from whose hair the tent cloth is woven, and the dromedary, which is used for the tent's transport.

Notable differences exist between the Arabian black tents and tents on the northern fringes of Arabia and North Africa: the cloth tent of the desert Bedouin, the Sba'a and Rwala, has three longitudinal rows of poles supporting a rectangular cloth, with the central row higher than the remainder, giving its characteristic ridge profile. The tents of North Africa differ significantly in having two rather than three rows of poles: a front row and a central row but no back row. The North African black tent was brought to the region with the Arab expansion in the 11th century B.C. and has a striped awning.

Inuit and Tuareg tents occur in extreme culture-resistance zones and typically are minimal constructions of considerable ingenuity.

Sumptuous tents were introduced into Western Europe in the 12th century A.D. as a result of the Crusades and then spread from France, where their immediate effect was great, and quickly became identified with the tournaments, and warfare that were part of the chivalric tradition in neighboring regions. Tents were symbols for the heavenly city of Jerusalem and the exotic Near East. Tents influenced the design of pavilions and of turret roofs for churches, castles, and palaces (a very fashionable architectural motif) as well as the interior design and decoration of palaces, especially the boudoir. Miniature tents, to symbolize the Old Testament tabernacle, were frequently adopted for reliquaries and monstrances in medieval Christian ritual. Elaborate, fabulously decorated tents were revived in the 15th century, reaching a climax under Francis I and Henry VIII in 1520 at Ardes and later under Emperor Napoleon at the beginning of the 19th century. In the 16th century, the word *pavillon* came to dignify anything likened to a tent—any lightly constructed ornamental building or pleasure house in a garden. Even more widespread was the tent roof that was derived from the conical shape of the parasol-roofed tent or the square pavilion tent with its draped pyramid-shaped canopy.

Tents generally are identified with nomadism, whether a full-blown nomadism; the itinerant nomadism of armies and royal progresses; or that of an individual or groups who are forced by their lifestyle to move often and who, to this end, require a light, portable shelter. The relationship between tents and permanent monumental architecture is a complex two-way one, with exchanges occurring in both directions, reflecting the interdependence between sedentary urban and nomadic pastoral cultures. Because of their symbolic prestige, tent forms have been imitated and preserved in stone buildings and in other durable constructions, resulting in a hybrid class of pseudo-tent buildings, a phenomenon that is very noticeable in France after the Crusades and that spread to Stockholm, Dresden, and Vienna.

PHILIP DREW

Further Reading

Much of the material on tents occurs within ethnographic studies of nomadic life that are not written from an architectural viewpoint but that treat the tent as an expression of culture and weaving technique. The subject of urban tents has received even less attention by comparison, and there are no architectural histories or separate technical accounts of their construction, origin, and development. This selection is biased toward the tents of nomadic peoples and includes some of the more pertinent ethnological reports in addition to popular accounts.

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TERRA-COTTA

Terra-cotta (Italian for "baked earth"), a building material with ancient roots, found its fullest expression in architecture of the first half of the 20th century. Architectural terra-cotta is ceramic or fired clay, most often glazed, used primarily in the 20th century for fireproofing and exterior cladding of buildings. The earliest known use of terra-cotta is in early Mesopotamia, where examples are found from as early as 3200 B.C. Terra-cotta was also used by the ancient Egyptians and the Etruscans as well as the Greeks and the Romans.

Lost with the fall of Rome, the art of terra-cotta was rediscovered in 14th-century Germany and Italy, as exemplified by the work of Luca della Robbia and his family, who introduced polychrome techniques on panels and plaques used as architectural decoration. The techniques for making terra-cotta found their way to England, where unglazed terra-cotta was used as early as the 16th century, mostly as decorative detail on brick and stone buildings. During the 18th century, technological advances resulted in a steady increase in England in the use of terra-cotta, which was noted for its durability and resistance to weathering. Terra-cotta was also admired because of the its ability to mimic the appearance of stone at a fraction of the cost.

By the 19th century, terra-cotta was widely used in England for architectural ornamentation. Its popularity grew because it was available in a range of colors and textures and could be molded with fine detail emulating carved stone. Terra-cotta was also being produced in North America on a limited basis during this period. Factories in New York, Philadelphia, and Chicago produced unglazed terra-cotta for ornamental detail for the facades of buildings, including string courses, capitals, and window surrounds.

Despite its early introduction to the United States, architects and builders tended to be skeptical of the claims for terra-cotta's durability. This began to change after Chicago's Great Fire of 1871. After the devastation of the fire, the emphasis in Chicago and nationwide was to construct buildings that were as fire resistant as possible. Structural terra-cotta provided an extra measure of fireproofing to buildings. At the same time, the last quarter of the 19th century, advances in the terra-cotta manufacture and architectural design that capitalized on the inherent malleability of terra-cotta as a cladding material spurred the growth of the fledgling American industry.

As terra-cotta was receiving acceptance as a building material, dramatic changes were occurring in the technology of building construction. Technological innovations—notably skeleton-frame construction—led to the development of the modern skyscraper. The use of structural metal to form a skeleton on which finish materials could be hung meant that buildings could rise to heights previously unimagined. At the same time, architects were anxious to develop new design motifs to celebrate this new building type. Architectural terra-cotta proved to be the ideal material. Terra-cotta cost 90 percent less than a piece of ornamental stone and was one-third the weight. In addition, because terra-cotta was molded rather than carved, repeating motifs in a complex design was easily achieved. Variations in surface texture and colors were also possible. One of the earliest structures to use terra-cotta as a cladding material was New York's Flatiron Building (built 1901–03, designed by Daniel Burnham). This 22-story building, the tallest building in the city when it was built, has a stone base, with brick and terra-cotta finishing up the floors above.

Louis Sullivan exploited the plasticity of terra-cotta perhaps better than any other practitioner of his time. The intricate interplay of the design motifs on the facades of Sullivan's commercial buildings and skyscrapers exemplifies terra-cotta's ability to be shaped and molded to fit the architect's design. Because of the material's malleability, architects and designers for the terra-cotta manufacturer often cooperated to produce beautiful systems of wall surfaces and ornament. By the 191 0s skyscrapers were soaring to new heights, and terra-cotta was increasingly employed because of its many ornamental and constructional advantages. Both the Woolworth Building in New York, designed by Cass Gilbert and completed in 1913, and Chicago's Wrigley Building of 1924, by Graham, Anderson, Probst, and White, are important examples of buildings fully clad in terra-cotta.

In the early years, the finish color of terra-cotta depended on the color of the clay used. Most terra-cotta manufactured in the United States was gray or buff in color to emulate the stone it was meant to replace. During the early decades of the 20th century, terra-cotta was accepted as a material in its own right, and its success depended less on its ability to imitate other materials. At the same time, architects began to experiment with colored glazes to provide another layer of detail to their designs.

Terra-cotta was adapted as the ideal material for the streamlined Art Deco and Art Moderne styles that became popular after the 1925 Paris Exposition. Improvements in the manufacture of terra-cotta resulted in the introduction of thinner panels that were lighter in weight. Terra-cotta was easily molded into the geometric, stylized, and colorful decorative elements that are found on a variety of small and large buildings from this era. Terra-cotta can be found on myriad commercial structures, small apartment buildings, automobile-related buildings such as garages and showrooms, and movie theaters dating from the early decades of the 20th century.

Terra-cotta was replaced as a structural and as a decorative component by a material that could be produced even less expensively: concrete. Reinforced concrete initially provided the structural fireproofing capabilities of terra-cotta at a reduced price. Eventually, concrete proved to be better suited to the unadorned architecture that became popular at midcentury.

LEAH KONICKI

S*ee also* **Art Deco; Chicago School; Flatiron Building, New York City; Ornament; Woolworth Building, New York City**

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TERRAGNI, GIUSEPPE 1904–43

Architect, Italy

Giuseppe Terragni was among the most talented and esteemed of the Italian modernist architects working in the period between the world wars. His Casa del Fascio (1936) in Como is generally considered the emblematic modernist building to have been built under the Fascist regime, and his Sant'Elia Nursery School (1937), also in Como, ranks as a tour de force of modern European architecture.

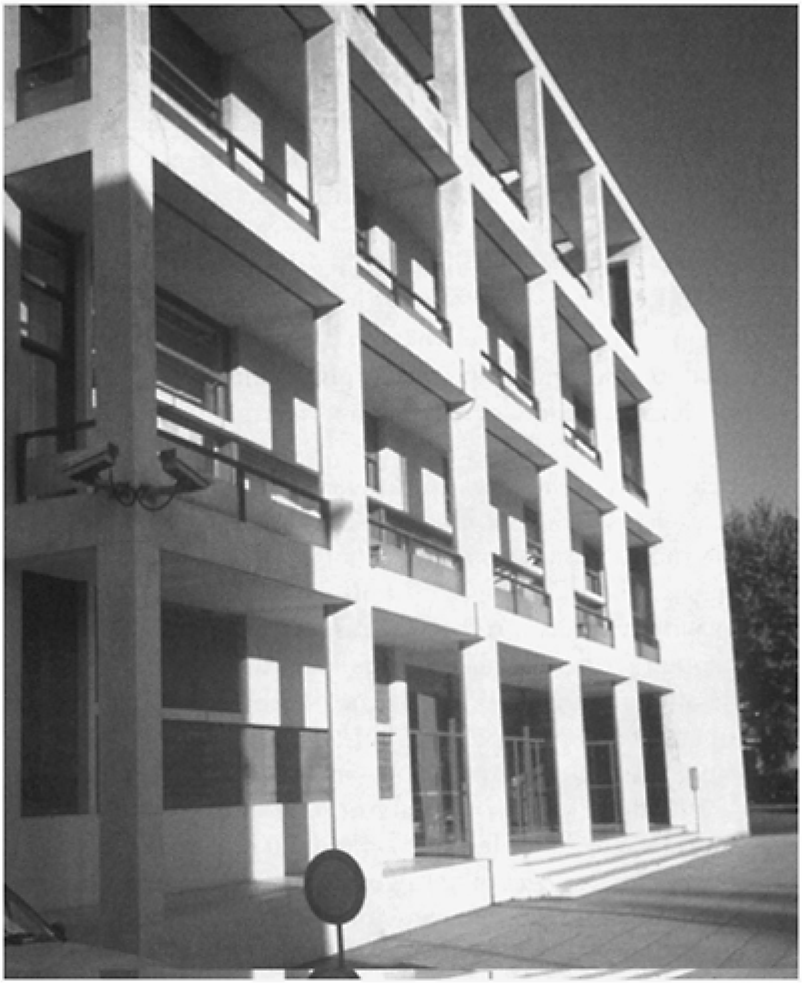
In December 1926 Terragni burst onto the Italian architectural scene with the first of four magazine articles on which he collaborated with six of his contemporaries. These essays, published in the esoteric and unillustrated magazine *La Rassegna Italiana,* later came to be known as the "Rationalist Manifesto." Terragni and his friends of the Gruppo Sette (Group 7) argued in these essays against revivalism in Italian architecture and that rationalism must shape all decisions about form, structure, and function. The avant-garde in Italy were henceforth known as the "rationalists."

Terragni's first major building was the Novocomum Apartment House (1927–29) in Como. A controversial building from the moment of its unveiling, it was hailed as the first rationalist work in Italy. Terragni went on to design a total of 26 built works and numerous unbuilt projects in a 15-year career that was cut short by World War II.

Terragni's undisputed masterpiece—the Casa del Fascio in Como (a local Fascist Party headquarters that the architect named the "Glass House of Fascism")—was begun in 1932 and completed in 1936. The building is a prismatic exercise in modern geometric form and structure, with four different facades that nevertheless together possess compositional coherence and harmony. The building contains a two-story atrium space encased by a system of clerestory windows, one of the first of its kind in Europe and an influence on post-World War II atria. The play of transparency and opacity created by Terragni's use of materials (glass and marble, respectively) results in fascinating visual contradictions. The building was initially condemned by the local Fascist Party chief as being too ordinary for an important state edifice. To appease his critics, Terragni employed an artist and industrial designer, Marcello Nizzoli, to develop a decorative figural design scheme for the building facade. The ensuing panels were never added as envisaged, however.

By 1936 Terragni had built five apartment houses in Milan (in collaboration with Pietro Lingeri) and had gained recognition in the competition for the National Fascist Party Headquarters (1934) in Rome. In 1937–38 he built several significant villas including the Villa Bianca in Seveso and the Sant'Elia Nursery School in Como. Terragni's plan for the nursery school drew on a radical sense of interior transparency, using glass partitions in the design of the flexible free plan derived from Le Corbusier.

In 1938 Terragni and Lingeri designed the Danteum project for Rome. The building was to have been an exercise in the



Giuseppe Terragni, Casa del Fascio, Como, Italy (1936)

relation of architecture to literary and political themes, with its composition derived in part from Dante's *Divine Comedy* and its forms referencing the iconography of the resurrected Roman Empire, which Benito Mussolini had declared after the Ethiopian War (1935–41). With its thick marble walls and processional promenade, the Danteum building previsioned much of the massive architecture of the postwar period.

Terragni's last major work—the Casa Giuliani Frigerio Apartment House (1939–40) in Como—was completed by his assistant, Luigi Zuccoli. It was realized when Terragni (now serving in the Italian army) was on his way to the Russian front. At the battle of Stalingrad, he suffered a nervous collapse, and after being returned to Italy in the winter of 1943, he died in Como six days before the coup that deposed Mussolini.

THOMAS SCHUMACHER

S*ee also* **Fascist Architecture; Rome, Italy**

Biography

Born in Meda, Italy, 18 April 1904; moved to Como as a child. Attended Liceo Scientifico in Como, graduated 1921; attended Politecnico di Milano, Facoltà di Architettura, 1921–26, degree granted 1926. Founding member, Gruppo 7 1926. Hired Luigi Zuccoli as assistant 1927; formed partnership with Pietro Lingeri, 1933; the pair worked together on competitions, five apart ment houses in Milan, and the Danteum Project for Rome. Worked with brother Attilio, an engineer, on buildings in and around Como, 1927–39. Participated in Palazzo Littorio competition, 1934, 1937; won second prize in Palazzo dei Congressi competition, Rome 1939. Founder and editor, *Valori Primordiali* 1937. Inducted into Italian army shortly after the start of World War II, served in the Balkans and the USSR. Died of a brain embolism 19 July 1943. Rumors of suicide have persisted until today, but have not been substantiated.

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TERRAZZO

One of the oldest types of flooring, terrazzo was developed by Venetians in the 16th century and was popularized during the late 19th century. Modern terrazzo flooring is composed of 70 percent marble or granite chips (or a combination of both) and 30 percent white, gray, or pigmented Portland cement. After curing, the surface is ground smooth, giving the stone chips a polished surface. Terrazzo flooring is very durable and can be arranged in decorative patterns. During the 1930s terrazzo was very popular for commercial buildings, fitting in well with the Art Deco design then so popular. Public and commercial buildings such as schools, banks, and hospitals and government buildings such as post offices incorporate terrazzo into main corridors and lobby areas. A special type of terrazzo flooring is used in hospital operating rooms.

Terrazzo flooring developed from the first "composition" floors developed by the ancient Greeks. Over time the rubble and charcoal flooring was held together with cement mortar and then developed into flooring of lava cement and charcoal set with marble pieces in imitation of mosaic flooring. This type of flooring was often laid in service areas and on terraces. The name *terrazzo* comes from the Italian word for "terrace."

In Venice, Italy, during the 1500s, a finely finished terrazzo flooring was developed that consisted of the 70–30 marble-to-mortar binder still in use today. After placing the marble chips in the binder matrix, the surface was polished smooth. This type of terrazzo flooring became very popular for use in Italian villas. During the late 19th century, travelers to Italy were impressed by the beauty and function of this flooring. Wealthy travelers, on returning home from Italian excursions, had terrazzo flooring installed in the entrance halls of their homes. The use of terrazzo in public buildings soon became popular as well.

Because of terrazzo's strength, durability, and potential to create decorative patterns reminiscent of mosaic flooring, it became a popular flooring in public and commercial buildings. In particular the use of a pigmented binding matrix made the flooring popular during the Art Deco movement of the 1930s. It is most often used in the same locations that stone flooring would be. Where appearance and durability are needed in high-traffic areas, it is a cost-effective option. Most train stations, movie theaters, fire stations, city and state offices, and schools built during the first third of the 20th century include terrazzo flooring in high-traffic areas.

The original method for installing terrazzo flooring is cast-in-place. It ranges from 1/4 inch (6 mm) to 3 inches (72 mm) thick placed over a mortar bed or secured to the substrate floor using direct bonding. A layer of sand 1/4 inch (6 mm) is used as a cushion when structural movement is anticipated. The sand is covered with a waterproof paper and wire mesh. A 2–1/8-inch (54 mm) concrete slab is poured over the sand. Divider strips are embedded in the concrete with 5/8 inch (16 mm) left exposed. These divider strips help control shrinkage and cracking and allow color changes. They also serve as a guide for installing the topping. Bonded floors, used in areas where structural movement is unlikely (such as corridors, walks, and swimming pool decks), have a total thickness of 1–1/8 inches (29 mm). The base slab is coated with Portland cement to ensure a good bond. The underbase is poured and divider strips are set before the topping is installed.

The terrazzo topping is installed by first coating the underbed with a layer of grout matching the color of the binding matrix. The topping is placed using the divider strips as guides. The topping is sprinkled with marble chips matching the color percentages of the stone in the topping. Heavy rollers compact the topping until most of the water is removed. The surface is then troweled until the divider strips are exposed. The floor must cure for at least six days before grinding and polishing the surface smooth. After curing and first grinding, a light application of grout cement is used to fill voids. The final grinding levels the floor and exposes the 70 percent stone composition. The floor is then cleaned, sealed, and machine buffed to reveal the color and luster of the marble.

Terrazzo floors can also be installed monolithically with the structural slab. Divider strips are placed when the slab is poured and 5/8 inch (16 mm) is left for the terrazzo topping. Curing, grinding, cleaning, sealing, and buffing follow the same procedure as with bonded and sand-cushioned cast-in-place terrazzo.

Although modern terrazzo floors include a mixture of stones capable of taking a high polish, terrazzo originally stuck to marble and granite chips. The advent of linoleum and other durable flooring made the expense of quarrying stone for use in terrazzo, together with the effect of terrazzo's long curing time on tight construction schedules, less desirable to architects and builders. Cheaper alternatives to both budget and schedule caused terrazzo to fall out of popularity during the decades of the mid-20th century. Other disadvantages included the thickness (and thus weight) necessary for terrazzo flooring, and the efforts necessary to prevent cracking as buildings shift and settle.

Developments Expand Terrazzo's Options

Systems for applying thin-set terrazzo and precast terrazzo tiles and products have reawakened an interest in terrazzo flooring. During the last decades of the 20th century, terrazzo flooring in both commercial and residential settings gained popularity.

Thin-set terrazzo reduces the weight of traditional terrazzo by eliminating the underbed. The topping, ranging from 1/4 to 5/8 inch (6 to 16 mm) thick, is bonded directly to the structural slab. The matrix mix, which includes epoxies, polyesters, or latex instead of Portland cement, adds to the adhesion of the topping and shortens the curing time to as little as 24 hours. Divider strips are not necessary, except for color changes and in locations where movement or stress is likely (such as around columns or over beams).

Precast terrazzo tiles also open up options for terrazzo flooring; thus, its renewed popularity. Precast tiles allow easy color changes and patterning and also include additional uses for terrazzo, such as stair treads, risers, bases, and shower receptors. Nonskid finishes are also available. Precast terrazzo products are bonded to surfaces using epoxies and other adhesives as directed by the specific manufacturer.

Special-Use Terrazzo

Conductive terrazzo is commonly used in hospital operating rooms. Acetylene carbon black in the matrix binder as well as the underbed provides a path for electrical conductivity. Static electricity between people and equipment is absorbed by the acetylene carbon black. This type of terrazzo is also used in some laboratory settings. Acrylic or vinyl emulsions may also be added to the matrix for thin-set terrazzo. These emulsions increase allowable tensile and flexural stresses, allowing the terrazzo topping to be decreased to as little as 1/4 inch (.6 cm). The Portland cement matrix can also be replaced with a plastic matrix, thus expanding use options. Rustic or washed terrazzo provides a pebbly finish rather than a smooth and polished finish. Marble, quartz, onyx, and granite chips are used in a white or colored matrix. After curing, the floor is washed with either water or acid to expose the stone chips, creating the pebble effect.

LISA A.WROBLE

S*ee also* **Art Deco**

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TESSENOW, HEINRICH 1876–1950

Architect, Germany

Heinrich Tessenow was born in Rostock in 1876. He was introduced to the art of building by his father, a successful carpenter with whom he worked before studying at the building schools in Neustadt and Leipzig. In 1900 he enrolled at the Technical University in Munich, where he studied architecture under Friedrich von Thiersch. However, he left the university after three semesters and joined the office of the prominent Jugendstil architect Martin Dülfer. Tessenow also worked for Paul Schultze-Naumburg.

Despite the sporadic nature of his own education, Tessenow was an accomplished teacher. After leaving Dülfer's office in 1902, he accepted a position at the Building School in Sternberg. He taught at the Building School in Lüchow and the School of Applied Arts in Trier before accepting a position at the Technical University in Dresden as Dülfer's assistant. From 1913 until 1919, he was a professor at the School of Applied Arts in Vienna. In 1920 he taught at the Academy of Fine Arts in Dresden. In 1926 he was selected by Bruno Paul to lead a master class at the School of Fine and Applied Arts in Berlin. He held a concurrent professorship at the Technical University in the capital.

As an architect Tessenow was fascinated by the problems of mass housing. In 1903 he had developed a housing type with roughcast walls, tiled roofs, and carefully detailed woodwork that was evocative of traditional rural building. Tessenow's aesthetic preferences were suggestive of the Heimatstil (vernacular style) advocated by his former employer, Schultze-Naumburg. However, Tessenow's residential designs, as exemplified by projects such as his Workers Housing for the Electric Power Station in Trier of 1906, were not merely copies of traditional rural buildings. His workers' houses reflected a pragmatic balance between comfort and affordability. They were carefully designed to encourage efficient lighting and ventilation and typically included sensible built-in furnishings and a garden to provide for a measure of self-sufficiency. For Tessenow the Heimatstil represented a vocabulary of architectural reform. This theme was conveyed in his book *Der Wohnungsbau* (House Building), published in 1909.

In 1910 Tessenow designed his best-known project, the Dalcroze Institute for Rhythmic Dance in the garden city of Hellerau near Dresden. This project, with its severe and attenuated neoclassical forms and simple geometries, represented the translation of the principles of formal abstraction that characterized his houses to a project of substantial scale. The Dalcroze Institute also illustrated the increasing simplicity of Tessenow's projects, a tendency that was also apparent in the houses he designed for Hellerau between 1910 and 1911. These small stucco houses combined his sensitive detailing with creative features, such as the *Patentwand* system for the construction of internally ventilated walls.

In 1916 Tessenow published *Hausbau und Aergleichen* (House Building and Such Things), in which he reiterated his beliefs concerning industry, craft, and the design of modern housing. Although he maintained his dedication to the precedent of vernacular architecture throughout the years of the Weimar Republic, he was an active member of the artistic avantgarde. In 1910 he had joined the Werkbund and in 1921 entered the radical Novembergruppe, whose architectural section was directed by Ludwig Mies van der Rohe. He was also one of the founding members of der Ring. His interest in social progress extended to his own designs, in which he demonstrated an increasing concern for the entire built environment, from furniture through urban planning. In 1925 he designed a school at Klotzsche for the government of the land of Saxony, a regular, symmetrical composition of individual pavilions with pitched tile roofs arranged around expansive courtyards. The plan reflected his theories of urban design, which were also manifested in the residential developments that he composed. The individual building masses at Klotzsche were stark and geometric, with Tessenow's characteristic detailing limited to the door and window surrounds. The same qualities were apparent in his Heinrich-Schütz-Schule in Kassel of 1927. In Kassel, Tessenow dispensed with a pitched roof and designed a loosely symmetrical composition in which the tradition of antique typology was apparent only in the regular disposition of fenestration and the elegant sense of proportion that pervaded the design.

In 1930 Tessenow's design to rebuild Schinkel's Neue Wache in Berlin as a memorial to the fallen of World War I was selected in a competition over submissions by many of Germany's most successful architects, including Peter Behrens, Hans Poelzig, and Mies van der Rohe. His plan was notable for its pervasive simplicity. The interior was a stark, cubic volume lit by a circular oculus placed above a prismatic black stone supporting a bronze wreath in commemoration of the dead. The exquisitely careful detailing of the interior provided a counterpoint to its monumental severity. The drum of the oculus maintained a subtle, elegant compound curve in its profile. A complex molding de-fined the joint between the metal drum and the stucco ceiling. A similar molding elaborated the joint between the ceiling and the stone veneer of the walls. Tessenow used these abstracted classical details only where they were functionally justified by a change of materials or methods of construction. The interface between the stone walls and the stone pavement was a simple mortar joint. Tessenow's new interior for the Neue Wache represented a distillation of the neoclassical tradition to an essential form that existed in a perfect accord with tectonic and functional requirements.

The nationalistic and racist promotion of the Heimatstil by Paul Schultze-Naumburg and its subsequent association with the ideology of the Nazi government have until recently relegated Tessenow to a position of relative insignificance in the standard histories of 20th-century design. However, during his lifetime Tessenow was an influential author and educator, and his theories were familiar throughout Germany. He was one of the progenitors of the Modern movement. Throughout the first half of the 20th century, his successful solutions to the problem of mass housing in Central Europe served as a point of reference for subsequent experiments in the field, and his transformation of the vocabulary of German neoclassicism as an example of the vitality of traditional forms within the context of modern design.

W.OWEN HARROD

S*ee also* **Avant-Garde; Paul, Bruno (Germany); Vernacular Architecture**

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TESTA, CLORINDO 1923-

Architect and painter, Argentina

If one had to identify Le Corbusier's counterpart in 20th-century Latin America, Clorindo Testa, a major figure in Argentinean architecture in this period, would almost certainly be the choice. He is not referred to here as a "disciple" or "follower," but as a similar personality in terms of his constant innovative and creative capacity, his dialectic and changing relationship to the natural and urban surroundings, his passion for painting and drawing, and his interpretation of society and history in his artistic production. He was the son of an Italian immigrant residing in Argentina, who originated from the town of Ceppaloni. He was born in Naples in 1923 and maintained a persistent emotional relationship with Italy (in 1997 he was declared an honorary citizen of Ceppaloni) despite his full identification with the city of Buenos Aires. He pursued a career in engineering, but his artistic vocation (he started drawing at a very early age) led him to the College of Architecture and Urbanism, where he graduated in 1947. He worked for one year in the Master Plan of the City of Buenos Aires (1948), where he met Ernesto N. Rogers, whose criticism of the "rationalist" project for a collection of residences that was being built definitively distanced him from the rigid designs of the Modern movement. With a scholarship from the College of Architecture and Urbanism, he traveled to Europe, extending his tour for almost three years (1949–52). He did not go to Paris, where Le Corbusier was based, nor did he accept Rogers's offer to work in his Milan studio (BBPR). Painting constituted his principal interest during that period, and he held his first exhibition at the Van Riel Gallery on Florida Street, Buenos Aires (1952).

Associated with the architects Dabinovic, Rossi and Gaido, he obtained various prizes in competitions for public and private works, such as the headquarters of the Argentinean Chamber of Building Contractors (1952), a group of health centers in Misiones (1955), and the Civic Center of Santa Rosa in the province of La Pampa (1956). This ensemble of public buildings, which included the Government House, underwent various successive stages in 1972 (Legislature) and in 1981 (Court and Cultural Center) which illustrate the expressive changes in Testa's language, from the Le Corbusier-inspired Brutalist orthodoxy of exposed concrete and the transparent facades of the canopies to the free and unprejudiced planimetric and volumetric composition of the 1980s decade, foreshadowing the aesthetic values of "supermodernism." From then on, he always worked in teams of professionals from different generations, though his dominant presence could still immediately be identified by the originality of the successive artistic languages used. Two works reached international importance, identified as the expression of Latin American creative freedom even by traditionalist critics such as Nikolaus Pevsner: the Bank of London and South America Head Office (1959–66), in collaboration with the SEPRA studio (an Argentinean version of the SOM) and the National Library, a team project also involving Francisco Bullrich and Alicia Gazzaniga (1962–95). Both buildings are configured by gigantic outer structures of reinforced concrete, a Jurassic exoskeleton according to Berkel and Bos. In the first he created an expanded interior space with hanging trays suggesting an interaction between a Roman cathedral and the dynamism of the Carceri de Piranesi. The library, suspended in air by a base that includes a circulation system, substituted Borges's labyrinth for the image of the Tower of Babel, a metaphor for the integration of universal knowledge.

From the 1960s onward, Testa abandoned Brutalist language and the principle of the autonomy of the "monument," which still continues in the marine shapes of the Central Naval Hospital (1970), in order to work with the multisignifying components of the urban context. Both the Cultural Center of the City of Buenos Aires (with Jacques Bedel and Luis Benedit 1979) and the Design Center in the Recoleta area (1990–93), integrate free forms and a strong chromatism within the preexisting historical buildings, rescuing the open and unprejudiced discourse of contemporarieity. Simultaneously he was able to introduce in the shopping center's configuration aesthetic attributes similar to those existing in the neighboring Cultural Center. There emerges a constant assimilation of the particular qualities of the surroundings that generate an architectural response, the undulating coastal landscape of the seaside resort La Perla in Mar del Plata (1985–90) or the mimesis with the neighborhood's anonymity in the exterior treatment of the La Paz Sgiar Auditorium (1995–96) in the city of Buenos Aires, whose artistic and spatial values unfold in the interior areas.

In the 1970s he reflected the dark social climate created in Argentina by the military dictatorship and the increment in the contradictions inherent to modern urban life in a series of paintings entitled "The Plague in the City" and "The Plague in Ceppaloni," dramatized by the obsessive use of black and white. In the 1980s chromatism appears in the free forms that identify his artworks and architectural works. It is worth asserting that, despite the spatial and formal control that Testa exerted on his large-scale works—he also carried out urban projects through his participation in the competitions for Puerto Madero (1992), Retiro (1996), and the Acropolis Museum in Athens (1992)—the enigma, the humor, and the unpredictability of his artistic solutions also appear in his designs for smaller residences. This is where architecture, painting, sculpture, and design are unified in the freshness of an achieved poetic synthesis. The Capotesta houses (1983–85) and the Altera art gallery in Pinamar and La Tumbona in Ostende (1985–87) surface as colorful and geometric objets trouvés amid the marine scenery, characterized by the unexpected volumetric "deconstruction" of the original cubic forms. The antithetical dialogue with history reaches its maximum expression with the Ghirardo House in Martínez, Province of Buenos Aires (1992), a Tudor mansion from the 1920s that is penetrated by colorful metallic structures and internally hollowed out with diagonal sliding walls that greatly modify the traditional structure of compartmentalized spaces. Testa thus shows that individual creativity has no end and that the artist's dialogue with his environment implies a persistent rediscovery of the reality that daily surrounds him.

ROBERTO SEGRE

S*ee also* **Bank of London and South America, Buenos Aires; Brutalism; Buenos Aires, Argentina; Corbusier, Le (Jeanneret, Charles Édouard) (France); Deconstructivism; Supermodernism**

Biography

His father, an Italian immigrant living in Argentina, decided that Clorindo had to be born in Naples, (10 December 1923). Following the sentimental desire of his family, he never became an Argentine citizen. He returned in 1924 to Buenos Aires where he lived all of his life. After attempting to study naval engineering in La Plata and civil engineering in Buenos Aires, he started to study architecture in 1942 at the University of Buenos Aires, becoming an architect in 1947, and began to work in the Master Plan of Buenos Aires. There he met Ernesto N.Rogers, who had a strong influence on his architectural development. With a fellowship from the School of Architecture, he traveled in Europe between 1949 and 1952, devoting himself to painting more than architecture. As soon as he returned to Buenos Aires, he began his professional career associated with Dabinovic, Rossi and Gaido, and obtained the first prize for the Argentine in Chamber of Building Contractors (1952) and the Civic Center (government building) of Santa Rosa, La Pampa Province. Other buildings for this Center were designed in 1972 and 1981. In partnership with the SEPRA office (Sánchez Elia, Peralta Ramos, Agostini), they won the first prize for the construction of the Bank of London and South America Head Office in Buenos Aires (1959–66). Immediately, associated with Bullrich and Gazzaniga, he obtained the first prize in the competition for the National Library (1962), built between 1971 and 1995. In the early 1970s, he built the Central Naval Hospital (1970–83). In this period, he was mostly devoted to painting activities and obtained several prizes: Punta del Este

Bienal, Uruguay (with the Team 5) (1957), Torcuato di Tella International Prize (1961), Second Latin America Kaiser Bienal, Córdoba (1965), Itamaratí Mayor Prize at the XIV São Paulo Bienal (1977), and the Trienal Prize "Architect of America," by FAPA (1987). In the last two decades he designed important buildings: Recoleta Cultural Center of the City of Buenos Aires (1979–80); La Perla beach complex (Mar del Plata, 1985–90), Buenos Aires Design Center (1990–93), and the Soka Gakkai International Auditorium in Buenos Aires (1993–96), nominated in the final selection of the First Mies van der Rohe Latin American Prize (1999). In 1976 he was included in the Buenos Aires Academy of Fine Arts and received a Doctorate Honoris Causa at the University of Buenos Aires (1992), and Honorary Professor at the Faculty of Architecture in Buenos Aires (1996). His paintings were shown in museums and galleries throughout the world, and in 1999 the Museum of Fine Arts in Buenos Aires devoted a complete exhibition to his main design production. In 2000 the Netherlands Institute of Architecture in Rotterdam presented his architectural works in Europe.

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THE ARCHITECTS COLLABORATIVE (TAC) (UNITED STATES)

Formed in December 1945 by Walter Gropius and a number of graduates from the Harvard School of Design, The Architects Collaborative (TAC) was a firm whose output reflected some of the most cherished and derided aspects of postwar architectural design. TAC was a global firm, with offices and projects spanning the globe from Cambridge to Baghdad, and its legacy is predicated primarily on three intertwined elements: the collaborative and democratic principles that guided both the management of the firm and its designs, the prestige associated with Gropius, and the tremendous range (and size) of the firm's work.

In the tradition of the Bauhaus, Gropius and the other architects at TAC worked in collaborative groups headed by "job captains," resisting the postwar trend toward specialization and

Harvard University Graduate Center, designed by Walter Gropius and TAC (1949)

corporatization. Also in the Bauhaus tradition, the architects of TAC sought to align architecture with the disciplines of art, economics, and sociology. This effort, in theory, enabled architects to treat design as a social process, one responsive to the needs of individual patrons and sites. In the firm's later years, however, many critics argued that TAC simply designed the same solution to any number of different architectural problems, falling into a period of modernist repetition. Although TAC was founded on the notion of challenging the professional tradition of highly individualized firms or ateliers led by a single, famous master architect, in fact it was Gropius's name that was most often associated with the firm. If the anonymity behind the name The Architects Collaborative was supposed to deemphasize Gropius's role in the firm, it might have instead helped to keep TAC's other partners from sharing in both the praise and the criticism leveled at the firm. TAC, at various points, included Jean Fletcher, Norman Fletcher, John Harkness, Sarah Harkness, Robert McMillan, Louis McMillan, Benjamin Thompson, Richard Brooker, Alex Cvijanovic, Herbert Gallagher, William Geddis, Roland Kluver, Peter Morton, and H. Morse Payne, Jr., many of whom had attended the Graduate School of Design at Harvard University during Gropius's tenure there from 1937 to 1953. In 1963 TAC legally incorporated, becoming TAC, Inc.

Important works from the firm's early years include the Six Moon Hill development (1948) in Lexington, Massachusetts. Eventually home to more than 30 families (and seven of the eight partners in TAC at the time), Six Moon Hill was planned along the standard (soon to become ubiquitous) suburban cul-de-sac road. However, the effort to leave large spaces open for communal use and its equal division of land prices and lot sizes make it an interesting early deviation from the broader trend of postwar suburban development. Perhaps the most famous project from the first 15 years of its history was TAC's design for the Harvard Graduate Center (1949) in Cambridge, Massachusetts. Located on a wedge-shaped lot near the northern edge of the Harvard University campus, the Graduate Center exemplified Gropius's (and, by extension, TAC's) own ambivalent feelings about the relationship between architecture and history. Although the Graduate Center took on the traditional form of the Harvard Yard or academic quad, the appearance of the individual buildings that made up the center seemed to have little to do with their surroundings. Another relevant project from this period was the U.S. Embassy (1956) in Athens, Greece, whose construction signaled the coming widescale adoption of modernism as the symbol of post-World War II American power and prosperity.

By the late 1950s, TAC had largely abandoned small-scale efforts along the lines of Six Moon Hill. Instead the firm became increasingly involved with large corporate commissions. The capitulation of social concerns to the requirements of the market-place that such a move entailed are strikingly visible in the Pan Am Building (1963) in New York City, designed in collaboration with Emery Roth and Sons and Pietro Belluschi. With a record 2,350,000 square feet of rentable office space, 64 elevators, and 18 escalators, the building's size seemed to obliterate the spaces around it. Responses to the Pan Am Building were largely negative, and today it is for many an example of the worst aspects of an overly programmatic and formal modernist tradition. Critics attacked the building for destroying the historic vistas of Park Avenue and claimed that it destroyed the silhouette of the New York Central Building (Warren and Wetmore, 1929), reducing it to a mere shadow. Gropius seemed baffled by the criticism and responded that he thought that the New York Central Building should be torn down to provide the Pan Am Building with a proper forecourt. The public's refusal to embrace the objective and stylistically neutral design of the Pan Am Building puzzled Gropius, who seemed unable to comprehend the attachment that New Yorkers felt for older urban forms and spaces, an attachment that Gropius considered outdated and archaic.

Significant later commissions undertaken by TAC included the plan for Baghdad University (1958) in Iraq, construction of which was often interrupted because of political instability. The members of TAC had always considered involvement with education one of the defining characteristics of the firm, arguing that sensitive design was an integral element of the learning process. Efforts such as Baghdad University, however, seemed at best a pale effort to incorporate faux regional design elements (in this case Islamic ones) onto a standard steel-framed concrete box. Despite such missteps in 1964 TAC received the Firm Award of the American Institute of Architects (AIA). Eight years later TAC designed the national headquarters of the AIA (Washington, D.C.). TAC also contributed to the massive Boston development known as Government Center with the design for the JFK Federal Officc Building in 1968.

The demise of the firm was precipitated by the death of Gropius in 1969 and the rising influence of Postmodernism in the architectural profession and among the public. Although the reputation of TAC was still quite solid abroad (particularly in the Middle East), in the last two decades of its existence the firm seemed to flounder without the guiding and unifying influence of Gropius. Seemingly unable to adapt or respond to the changing milieu of the architectural world, fewer commissions came to the firm, and for financial reasons the doors finally closed at TAC in 1996.

BENJY FLOWERS

S*ee also* **American Institute of Architects; Gropius, Walter (Germany)**

Biography

Established in Cambridge, Massachusetts 1945 by Walter Gropius, Norman Collings Fletcher, Jean Fletcher, John Cheeseman Harkness, Sarah Pillsbury Harkness, Robert Senseman MacMillan, Louis Albert McMillan, and Benjamin Thompson. The Architects Collaborative International was founded in 1960 and dissolved in 1996.

Selected Works

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Harvard University Graduate Center, Cambridge, Massachusetts, 1949

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University of Baghdad, 1958

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Kennedy Federal Building, Government Center, Boston, 1968

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TIMBER FRAME

Timber framing, although largely outmoded by the beginning of the 20th century, not only persevered in its centuries-old, low-technology form but developed as well into high-technology structural systems. Aside from its universal aesthetic appeal, timber construction—eclipsed by steel, concrete, and lightweight wood framing—maintained interest among architects, owners, and builders because of its economy, durability, and ecology.

In the United States, timber framing refers to traditional post-and-beam construction (known as "heavy timber" at the industrial scale). Internationally, however, descriptions of timber-frame buildings often include lightweight wood-stud construction. This discussion considers only the heavier construction—whose columns are usually at least 8 inches by 8 inches, with beams no less than 6 inches by 10 inches—where significant advances were made throughout the past 100 years.

In regions with ready access to timber, vernacular styles of framing with various in-fill materials had become established over the centuries. In Europe and England, timber frames with brick, rubble, or wattle-and-daub walls were ubiquitous. In North America colonial buildings often were clad in wood as well as brick. In tropical Asia and the Pacific islands, wood or other native materials served as sheathing. Japan and China had long traditions of timber temples, palaces, and houses.

Architects of the 20th century working with timber frequently drew on those vernacular references for their own work. At Hvitträsk (1902) near Helsinki, Finland, a housing-studio compound that Eliel Saarinen (1873–1950), Herman Gesellius (1874–1916), and Armas Lindgren (1874–1929) designed for their own use, the architects adapted their country's rustic tradition to create what became known as the National Romantic style.

The English Arts and Crafts movement of the late 19th century continued to influence architects well into the 20th century. Timber was just one of the natural materials used by proponents of the movement. In the United States, California, with its abundance of timber and increasing affluence, generated several timber styles. In the United States, the brothers Charles Sumner Greene (1868–1957) and Henry Mather Greene (1870–1954) ushered in a golden age of timber design with a widely admired series of houses near Los Angeles. Influenced by Japanese and Swiss vernacular timber craft, their Gamble House (1908) in Pasadena may have been the apotheosis of 20th-century timber houses. This sprawling masterpiece revealed the architects' obsessive attention to finishing each exposed structural timber, articulating every handcrafted joint, and specifying the finest wood finishes.

Many architects who worked mostly in other materials used timber to great effect in combination with those materials. The San Francisco Bay Area's most prominent architect, Bernard Maybeck (1882–1957), accented the interior of the First Church of Christ Scientist (1910) in Berkeley, California, with massive decorative timberwork; in his own studio (1924) in Berkeley, the innovative Maybeck used timber framing but added an experimental concrete finish.

In Europe, Austrian architect Adolf Loos (1870–1933) included exposed timber in his Steiner House (1910) in Vienna and, more heavily, in the rustic Khuner Villa (1930) near Payerback, Austria. The modernist Serge Chermayeff (1900–96) designed his house Bentley Wood (1938) in Sussex, England, in timber and brick, an unusual choice for an English country house at that time, which typically would have been all masonry.

Tree heights determined timber spans, and the largest timbers became scarcer as the oldest trees were harvested. Even while steel and concrete increased in popularity, the economy of wood—plentiful and easy to erect—encouraged technological development of timber for increasingly demanding structural purposes. Maybeck had experimented with a timber arch of smaller pieces of wood strapped together. However, not until engineers applied the technology of plywood—an early 20th-century innovation whereby wood veneers were glued together to form a monolithic panel—to heavy timbers did wood become reestablished as a competitive structural component. Relatively small sections of solid timber were laminated together with special glues into one large structural member called a glu-lam (glued-laminated timber).

The economy of laminated timber widened its appeal during the Great Depression of the 1930s. The shortage of steel for buildings during World War II further encouraged the use of timber in structures such as hangars and other utilitarian buildings.

Assembled for beauty as well as structural predictability, glulam beams, girders, columns, and trusses began to appear prominently in low-rise, long-span structures, such as buildings for worship, auditoriums, exhibition halls, sports arenas, and recreational buildings. The fact that engineered timber could be prebent and custom shaped allowed architects to create dramatic arches, domes, and organic sculptural effects beyond the capabilities of natural timber. Later technologies introduced high-tech connectors to enhance the wood's strength.

In Japan, whose vernacular architecture inspired the Greene brothers and Frank Lloyd Wright, among many others, architects after World War II embraced concrete as their material of choice, yet some evoked natural beauty with occasional spare, timber-frame houses and other small structures. More ambitious was the elegantly spiraling timber-roof structure of the Puppet Theater (1992) in Seiwa, Japan, by Katsuhiro Ishii (b. 1944).

In Finland, a land of ubiquitous timber resources, Heikki Siren (b. 1918) and Kaija Siren (b. 1920) made their mark with the asymmetrical timber trusses at Otaniemi Technical University Chapel (1959, burned 1975) near Helsinki. Other Finnish architects experimented with multistory timber-frame apartment houses during the 1990s. Architects who used the sculptural potential of laminated timber included the Hungarian Imre Makovecz (b. 1935), whose organic buildings included the Farkasret funeral chapel (1977) in Budapest.

Late-century forays with traditional framing into public spaces included Hugh Boyd's 37,000-square-foot Public Market (1998) in Portland, Maine, whose concrete columns carry the largest traditional timber roof in New England. The natural

Sea Ranch Condominium, Sea Ranch, California (1964–65), designed by MLTW (Moore, Lyndon, Turnbull and Whitaker) timber beams span up to 40 feet in length. In contrast, the new Globe Theatre (1998) in London re-created the mortise-and-tenon oak timber craft of Shakespearean England, but this time around the wood cladding was treated for fire resistance.

During the 1990s European researchers pioneered the use of timber for new commercial buildings and multistory apartment houses. The British group Timber Research and Development Associates (TRADA) notably included a six-story timber structure (1997) in a testing facility alongside concrete-and-steel structures. Such experiments promised a future for timber framing in building types where fire or structural limitations typically limited its use.

During the last quarter of the century, producers in the United States of off-the-shelf timber components and designs developed a healthy market for "do-it-yourself" timber-frame house kits and even rustic log homes. The affordable option of a timber-frame house enhanced the awareness of this traditional construction type among the general public.

By century's end the conversion of heavy-timber warehouses and other industrial buildings to new uses had become routine in many cities. The resulting lofts with offices, residential spaces, entertainment venues, and shopping malls popularized a timber-and-masonry aesthetic among urban residents, businesses, and tourists in search of open, flexible spaces with a historic character. These recycled buildings also won favor with proponents of sustainable architecture.

With the focus on sustainable environments and renewable resources, new timber construction qualified as alternative, so-called "green" architecture, as long as the material was harvested from carefully managed forests. While environmental crusades curbed the use of old-growth timber from dwindling ancient forests, ecologically conscious architects and builders turned to timber from managed sources.

By the end of the century, traditional timber was used in combination with efficient new building materials, such as structural insulated panels, and even in composite applications where steel or concrete was integrated with the wood structure.

RANDALL J.VAN VYNCKT

S*ee also* **Arts and Crafts Movement; Greene, Henry M. and Charles S. (United States); Loos, Adolf (Austria); Maybeck, Bernard R. (United States); Saarinen, Eliel (Finland); Steiner House, Vienna; Sustainability and Sustainable Architecture**

TOKYO, JAPAN

In the course of only one century, Tokyo has evolved from a city trying to imitate Western centers to a major metropolis and a center of high-quality architecture. The architectural design work and the theories of contemporary Japanese architects, most of them based in Tokyo, have found interest worldwide. Their projects often reflect the specific architecture and context of Japanese cities, particularly its capital.

Tokyo's urban landscape is characterized by a juxtaposition of high-rise modern business districts and high-density, mixed-function neighborhoods composed mainly of wooden single-family buildings, resembling Asian more than European cities. The nongeometric organization, the multitude of centers, and the cellular addition of neighborhoods have been handed down from Edo, as the city was called before the Meiji Restoration of 1868. The urban layout of the Edo period—its patchwork of extended areas for the warrior class on the *yamanote* highlands and the low-lying *shitamachi* areas, which housed the ordinary people—provided an ideal background for the integration of new functions related to the modernization of the country. The spacious lots and extended green spaces of the daimyo areas permitted the realization of large-scale developments and buildings, such as the government area at Hibiya and the Marunouchi district in the vicinity of the Imperial Palace and Fumihiko Maki's comprehensive design of Hillside Terrace (1969–92).

In contrast to European cities, where buildings often define public places, the liveliest spaces in Tokyo are not given particular architectural form. Infrastructure nodes, such as Shibuya or Ikebukuro on the Yamanote railway ring, are social spaces characterized by a maze of billboards, huge screens, multilevel infrastructure, and a large variety of commercial buildings. Buildings of different scale, height, and age, designed without any concern for aesthetic unity, stand next to one another. The 109 Building (1978) by Minoru Takeyama, with its tall, aluminum-clad tower, exemplifies commercial architecture in Tokyo. A marker in the billboard environment, its facade and layout had to take into account a small wooden restaurant because its owner did not want to sell.

The absence of aesthetic and height control in Tokyo buildings is not a recent development. In 1937, Bruno Taut, in his *Houses and People of Japan,* criticized the chaos of forms and styles, and other westerners have done the same. Recently, this attitude has started to change: Yoshinobu Ashihara and other writers view Tokyo as the urban model for the 21st century, considering the city as the evocation of such recent ideas as chaos theory. Tokyo's architects have made the chaotic urban landscape a central design theme. Maki's Spiral Building (1985), with its collaged and fragmented facade, reflects this, as does Kazuo Shinohara's Centennial Hall (1987) for the Tokyo Institute of Technology.

The reasons for the chaotic appearance of Tokyo are manifold. Tokyo, a wooden city, has been destroyed by fires and earthquakes regularly. In the 20th century alone, the city saw devastation twice in the Great Kanto Earthquake (1923) and the large-scale bombing in World War II. The city has a tradition of rebuilding, and few old constructions remain. Buildings of the Meiji period (1868–1912) are becoming rare, and major works of postwar modern architecture, including Kenzo Tange's Tokyo City Hall (1957) and Kunio Maekawa's Harumi Apartments (1958), have been demolished. Even Toyo Ito's well-published Nomad Restaurant (1986) disappeared as early as 1990. The permanent threat of another major earthquake, the need to meet recently enacted legal requirements, and high land prices that dwarf construction costs further explain the relative freedom of architecture.

Early Meiji Architecture

When Japan opened its gates to the outside world, it did not have a tradition of monumental public architecture, vistas, and high-rise landmarks comparable with that of major European metropolises. The traditional Japanese prints *(ukiyo-e)* show that natural features in the city's vicinity, such as Mount Fuji, gave a feeling of place. Furthermore, the city did not have a monumental public core: the center was and is occupied by the Imperial Palace and its huge gardens, which are closed to the public.

In the early Meiji period, under the influence of the government, Tokyo became the showcase for the rapid transformation of Japan. The Tsukiji Hotel (1868) and the first Mitsui Bank (1872) by Kisuke Shimizu II illustrate early Meiji attempts to adopt Western (European and American) forms. They were crowned by towers (novelties in Japan) but were not part of the cityscape in the same way as their European counterparts. The buildings were separated from public space through gates and walls, as in traditional daimyo residences. It took years until Japanese architects started to use buildings as public monuments. Even now, vertical markers, such as the Tokyo Tower (1958), do not have the same symbolic value as their Western models. The creation of landmark buildings in Tokyo remains an important topic, taken up particularly by Maki.

Foreign architects, surveyors, or amateurs created many of the early Meiji buildings: an Englishman, Thomas Waters, designed the urban outlay and the brick buildings of the Ginza after a fire in 1872. The Berlin office of Böckmann and Ende projected the Ministry of Justice (1895) and Supreme Court (1896) buildings. A central figure among these foreigners was the English architect Josiah Conder (1852–1920). Author of numerous important buildings, including the Rokumeikan (1883), a government guest house, he was also a professor at the newly founded Tokyo Imperial University, predecessor of the University of Tokyo, where he introduced Western educational concepts.

The first generation of Japanese architects in Tokyo, many of whom had studied with Conder, realized a number of eclectic buildings that include Kingo Tatsuno's Bank of Japan (1896) and his Tokyo Station (1914) as well as the Akasaka Detached Palace (1909) by Tokuma Katayama and the Hyokeikan Museum (1909) in Ueno. By the end of the Meiji period, after two victorious wars, Japan had established itself as a powerful modern state, and Tokyo's architecture was exported to the colonies.

The most recent architectural styles were adopted quickly in Tokyo and other Japanese cities, as the country strove for international recognition. In contrast to colonial situations, tra-ditional forms were not suppressed. When the need arose in Nara to integrate new large-scale buildings into a traditional setting, a modern Japanese style developed that combined the new scale and function with traditional forms and an overall Japanese look, particularly in the design of the roof and the entrance space. This modern Japanese style quickly spread to Tokyo. The memorial (1930) for the victims of the 1923 earthquake in the form of a pagoda by Chuta Ito and the New Kabuki Theater (1924) by Shinichiro Okada exemplify the combination of new building techniques and materials with traditional forms. Other examples show the adoption of Western style in the facade and the business spaces and the maintenance of traditional spaces for the living areas. The least Western influence occurred in the field of urban planning, as the strong attachment to the land and the scattered character of land ownership hindered redevelopment.

"Modern Style" Architecture in Japan

The start of modern architecture in Japan largely coincided with the presence of Frank Lloyd Wright and the construction of the Imperial Hotel (1923–69, dismantled) in Tokyo, one of the city's best-known buildings because of its size and the name of its architect. The fact that it withstood the Great Kanto Earthquake on the day of its opening further contributed to its fame, even though the "Marubiru" office building (1923), built by the Fuller Company in the Marunouchi district, and other major constructions also withstood the quake. Modern architecture was still rare in Japan at that time, and some of the earliest works, including the Reinanzaka House (1923–24) in Azabu, were produced by Antonin Raymond, a former collaborator with Wright at the Imperial Hotel.

The rapid reconstruction after the 1923 earthquake reinforced the functionalist trends: street widening and replotting took precedence over urban design, and modernist principles were used for public buildings. Examples are Tetsuro Yoshida's Tokyo Central Post Office (1927–31) and several public schools designed by the architectural department of the Tokyo Municipality, including the Yotsuya Fifth Primary School (1934) and the Takanawadai Primary School (1935). Social housing became another field for rationalist design. A nonprofit government foundation, the Dojunkai, was created in 1924 to provide temporary structures for quake relief. It continued to function afterward and provided the city with 2501 ferroconcrete apartment units in 15 new developments between 1926 and 1933. The Aoyama apartments (1926) and some others remain functional today. Many, including the Daikanyama complex (1926), have been demolished for higher-density reconstruction.

Many Japanese architects of the 1910s and 1920s were influenced by German Expressionism and the Viennese Secession. Kikuji Ishimoto's Secessionist-style Asahi Newspaper Offices (1927) at Sukiyabashi was demolished, but Shozo Uchida's Yasuda Hall (1925) at the Imperial University of Tokyo, Hongo, survives as a good example of the North German Expressionist inspiration. The Secessionist Architectural Society (Bunri Ha Kenchiku Kai; 1920–28), founded by six Japanese architects, was a cradle for modernist architecture. Two of its members, Sutemi Horiguchi and Mamoru Yamada, later became major representatives of the International Style. Horiguchi was acknowledged particularly for the Okada Residence (1934), which elegantly integrates traditional Japanese elements and modern Western concepts. Yamada, author of the Expressionist Central Telegraph Office (1925), was the only Japanese architect to have a building—the Electrical Laboratory (1930)—included in the 1932 International Style exhibition of the Museum of Modern Art in New York, marking the entry of Japanese modern architecture on the global scene. Both returned to more traditional forms later, as shown in Horiguchi's Sukiya-style teahouse (1965) in the Minato ward and Yamada's Nippon Budokan (1964), a hall for judo competition with an octagonal pyramidal roof that reinterprets traditional Japanese forms.

Tokyo's architects had intimate contacts with leading modernist designers abroad. Kikuji Ishimoto, a student of Walter Gropius, produced the Shirokiya Department Store (1931) and the Tokyo Airport Office (1932), which reflect his knowledge of works by Erich Mendelsohn and the Bauhaus. Bunzo Yamaguchi worked with Gropius between

1930 and 1932 and, after his Expressionist phase, produced several modernist works in the Tokyo area, such as the Yamada House (1934) in KitaKamakura, the Nihon Dental College Hospital (1934), and the Bancho Siedlung (1933), which recalls the Weissenhofsiedlung (1927). Junzo Sakakura and Kunio Maekawa, who studied with Le Corbusier, also realized major works in Tokyo.

In the mid-1930s, the so-called Imperial Crown style *(teikan yoshiki)* became the symbol of Japanese nationalism. The term was developed in the context of the competition for the Imperial Diet Building (1917–19). Although the prize-winning entry was not realized, the term relates to buildings that feature huge Japanese-style roofs, such as Ryoichi Kawamoto's Soldiers' Hall (1934) and Hitoshi (Jin) Watanabe's Imperial Museum (1937) in Ueno and Dai-ichi Seimei Building (1938), used as general headquarters of the American command after World War II.

Architecture in Tokyo after World War II

Tokyo suffered major destruction in the Allied bombings, particularly through fire: 92,778 persons were killed, 129,300 were injured, and 850,000 lost their homes. The reconstruction of the capital symbolized Japan's renewal and revival and was expressed in modernist architecture. Raymond's Reader's Digest Building (1951, demolished 1964) and Sakakura's Prefectural Museum of Modern Art (1951, addition 1966) in Kamakura are major examples. However, the main figures of postwar reconstruction were Tange and Maekawa.

Tange, who had won international recognition with his Hiroshima Peace Center, designed major buildings in Tokyo, including the Tokyo City Hall (1957) and the Tokyo Metropolitan Government Building (1991) in Shinjuku. His Olympic Stadiums (1964), with their suspended roofs, have landmark character and symbolize the major urban transformations of that period.

Maekawa authored several buildings in Tokyo's Ueno Park, including the Metropolitan Festival Hall (1961), a huge cultural center with a powerful protruding roof of exposed concrete; the Tokyo Municipal Museum of Art (1975); and the addition to Le Corbusier's Museum of Western Art (1979). Other architects of roughly the same generation who were influential and revered designers and teachers in Tokyo are Isoya Yoshida, Yoshiro Tani-

Tokyo City Hall (1957) Shinjuku district, by Kenzo Tange

guchi, Hiroshi Oe, and Togo Murano. Their works drew on a larger range of historical and modern forms and have still to be fully acknowledged in the West.

The economic boom of the 1960s provoked rapid urbanization and overcrowding in Tokyo and other Japanese cities. Confronted with the scarcity of land and carried by their belief in continuing technical and economic development, several visionary projects for

Tokyo were developed that suggested extension onto the sea and into the air. Tange's project for a city axis (1960) extending over Tokyo Bay reflected visionary ideas sketched by Kiyonori Kikutake as early as 1958. Several young designers, some of whom had been working on the Tange project, took up these ideas, designing megastructures such as Arata Isozaki's Sky Cities (1961 and 1962), Kisho Kurokawa's Helix City Plan (1961), and Kikutake's Ocean City (1961) and Marine City (1963). These projects were often presented as suggestions for Tokyo, thereby further promoting the capital. Its name was already connected to the emergence of the Metabolist movement at the World Design Conference of 1960.

Several buildings reflecting Metabolist ideas were realized in Tokyo, including the Shizuoka Press and Broadcasting Center (1966–67) by Tange, the Nakagin Capsule Building (1972) by Kurokawa, and later, Kikutake's Edo-Tokyo Museum (1992). No visionary cities were realized, but they prefigured and paralleled major transformations of the city at that time: the construction of huge highways and high-speed trains, land reclamation and the extension of the city on artificial islands, and the construction of huge underground passageways and structures, particularly around the stations, are the real megastructures of the city. However, the design of these developments was in the hands mainly of the major construction companies rather than the visionary architects.

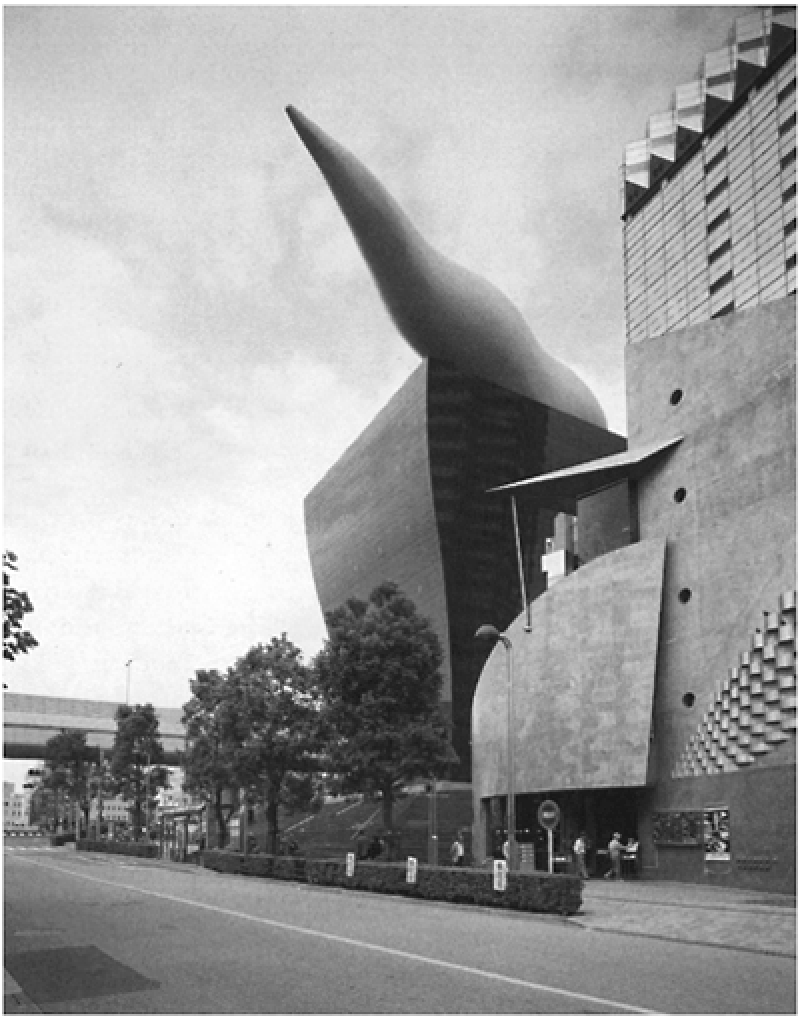
The concentration of people and economy in the large centers was reinforced when the traditional height limitation of 31 meters was replaced by a system of floor ratio in the 1961 Building Standards Law. The first skyscraper, the 36-floor Kasumigaseki Building by Yamashita architects and engineers, was completed in 1968. Further skyscrapers rose in the Shinjuku subcenter on the site of a former water purification plant to the west of the station on the Yamanote railway. Based on a development plan from 1960, a skyscraper district came into existence, starting with the Keio Plaza Hotel (1971). Major buildings are the NSBuilding (1982) by Nikken Sekkei and the Postmodern Tokyo Metropolitan Government Building (1991) by Tange, which displays two cathedral-like towers and a huge public plaza embraced by wing buildings and the assembly hall.

The most pressing issue for the steadily growing city remained housing. Various policies for decentralization were instigated that led to the creation of new towns, such as the research and university city of Tsukuba outside Tokyo, known for its Center Building (1983) designed by Arata Isozaki. The creation of Tama New Town to the west of Tokyo included the relocation of the Tokyo Metropolitan University, which features several Postmodernist buildings (1991) by Teiichi Takahashi and DaiichiKobo.

The negative effects of economic development, including the chaotic landscape of Japanese cities, became obvious in the 1970s, and contemporary architecture responded to this environment in various ways. Toyo Ito's U-shaped House (1976) in Nakano Honcho and Kikoo Mozuna's Mirror Image Hall (1980) mark an introverted attitude, concentrating on the interior space and turning nearly closed facades to the outside. Kazuhiro Ishii's House of 54 Windows (1975) and Takefumi Aida's Toy Bloc Houses of the early 1980s show a more playful response.

High real estate prices and limited sites made it increasingly difficult for people to live in the city. Takamitsu Azuma's Tower House (1967) expresses the difficulties of inner-city private housing: on a basic floor space of 10 square meters, it offers an overall living space of 60 square meters. The lack of buildable land brought about inspiring projects for housing several generations of one family on the same site. Tadao Ando's Kidosaki House (1986) and Riken Yamamoto's Hamlet (1988) demonstrate the possibility of housing three generations in one building complex. Kazuo Shinohara's House under High Voltage Lines (1981) expresses the necessity to use every single site in densely built Tokyo, and Kunihiko Hayakawa's Yoga-A-Flat (1993) addresses the growing diversity of housing needs. Recent smallscale projects, such as Shigeru Ban's Curtain Wall House (1995) and Itsuko Hasegawa's Sumida Culture Factory (1995), illustrate the growing understanding of Tokyo's neighborhoods as a positive life environment.

The land boom of the 1980s paved the ground for expensive and eccentric structures. Shin Takamatsu's machinelike Ima-



Asahi Beer Hall and Brewery (1989), designed by Philippe Starck nishi Motoakasaka Building (1992) and his mainly subterranean Earthtecture (1990), Atsushi Kitagawara's theatrical Rise Cinema Complex (1986), Makoto Sei Watanabe's Aoyama Technical College (1990), Itsuko Hasegawa's futuristic and vernacular design of the Shonandai Cultural Center (1991), and the commercial Collezione (1990) of the Osaka-based architect Tadao Ando became possible during this period. Young emerging architects of the 1990s were given chances to prove themselves in small-scale structures, such as Kazuyo Sejima's Chofu police station (1994). Simultaneously, international architects, including Mario Bellini, Mario Botta, Branson Coates, Peter Eisenman, Norman Foster, Steven Holl, Richard Rogers, and Aldo Rossi, were called on to create landmark buildings, with Philippe Starck's Asahi Beer Hall (1989) being the most visible. The list of Tokyo's grand projects is crowned by Rafael Viñoly's Tokyo International Forum (1996), one of the unique designs in Japan to result from an international competition.

When the economic boom ended, the construction of many large-scale projects was postponed or abandoned. The 1996 Tokyo Frontier World Cities Expo, which was supposed to explore possibilities for the city of the 21st century, was ultimately canceled. In the same waterfront area, the smaller-scale Tokyo Teleport Town, initiated in 1987 as a new subcenter, is taking shape in reduced form. Tange's Fuji Television Building (1997) is one of its most visible markers. The Tokyo waterfront project faces competition from two other major developments on the waterfront of Tokyo Bay: Yokohama started to build Minato Mirai 21 in 1985, and Chiba is developing Makuhari New Town, which features a housing development characterized by strict planning legislation, a rarity in Japan.

Some large-scale interventions have been carried out despite the recession, such as the Tokyo University Komaba Campus redevelopment (1999) by Hiroshi Hara. Further development proposals and futuristic plans are projected for Tokyo, such as sky cities and developments in Tokyo Bay, by Kisho Kurokawa, Shin Takamatsu, and the Shimizu and Takenaka corporations. At the dawn of the 21st century, discussion about relocating the capital city continues.

CAROLA HEIN

S*ee also* **Ando, Tadao (Japan); Hasegawa Itsuko (Japan); Kurokawa, Kisho (Japan); Maki, Fumihiko (Japan); Metabolists; Shinohara, Kazuo (Japan); Tange, Kenzo (Japan); Taniguchi, Yoshio (Japan)**

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TORONTO CITY HALL

Designed by Viljo Revell, completed 1965 Toronto, Ontario

In November 1961 sod was first turned to construct a new city hall, the design of Viljo Revell (1910–64) and the result of the most significant architectural competition in Canadian history. Revell did not live to see his design completed, but its impact continues to shape the evolving character of the city of Toronto to this day. In its evocative fusion of the unfettered reexamination of function and material characteristic of the International Style, with a poised expressionism capable of imparting symbolic presence, New City Hall dramatically broadened the resonant potential of modern architecture to its citizenry. Even more, the design for its accompanying civic square provided Torontonians with a new paradigm for both inhabiting and imagining their unfolding city.

The apparent origin of this fortuitous event lay in a proposal submitted to the city in 1911. John Lyle, a local architect who had trained at the École des Beaux-Arts, envisioned a City Beautiful scheme that included a civic square adjacent to E.J.Lennox’s Richardsonian Romanesque city hall (1899). Subsequent proposals for this site followed regularly, but it was not until

New City Hall, Nathan Phillips Square, Toronto

Photo © Mary Ann Sullivan

1946, with the anticipation of a postwar development boom, that public acquisition of the land was approved by a plebiscite. It was another five years before the city council agreed to build a new city hall, giving the commission to a triumvirate of well-connected and stylistically conservative firms. The subsequent design was met with criticism from members of the city's arts community, who saw in the design a symbol of an "old guard" that had resisted for decades the influence of modernism on painting and sculpture as well as on architecture. Once local papers gave voice to these arguments, public opinion went against the proposal, and it was defeated in a second plebiscite, although yet another vote subsequently reinstated the public's desire for a new building.

Facing possible lawsuits if a fourth architect were hired, Mayor Nathan Philips instead opted for a plan put forward by Eric Arthur, an activist on the faculty of the University of Toronto's School of Architecture. Arthur organized an international competition, with a jury that included Ernesto Rogers, William Holford, and Eero Saarinen. The response saw more than 500 entries, complete with models, from 42 countries. Finnish architect Viljo Revell's winning proposal featured a pair of slender, concave towers, each visibly accommodating one of two tiers of local government. These wings in turn cradled a saucerlike council chamber, all atop a broad, two-story podium.

Revell opened a Toronto office in April 1959 in association with John B.Parkin Partnership. Parkin was a committed modernist who would soon join with Mies van der Rohe in realizing Mies' final, and arguably finest, tower complex, the Toronto-Dominion Centre (1969). Revell and Parkin spent the next two years refining the design and experimenting with details that would accommodate Revell's vision within a North American constructional idiom. The results reveal one of the most thoroughly crafted buildings in Canada from the latter half of the century. The concave surfaces of the single-loaded towers are veiled in an elegantly proportioned stainless-steel curtain wall. The convex sides are clad with windowless precast-concrete panels inlaid with strips of rough-faced Pentelic marble whose fluted surface recalls that of a Doric column. These same marble strips are repeated in the floors of the lobby, embedded in a smooth matrix of black terrazzo. The portly main doors are composed of staggered, laminated strips of oak, with oversize, sculpted door handles of laminated wood.

Approaching the building along the curved front face of the podium, the visitor is enfolded by a double-height colonnade from which the second-floor offices of the mayor and city councillors are clearly visible through floor-to-ceiling glass. Moving inside, the lobby opens up into a clerestory-lit public forum around which an ample circumference of counters allows for contact with municipal services. Graceful curved stairs lead to second-floor offices and committee rooms. At the center of this circular assemblage lies a stepped ceremonial pit, an *umbilicus urbis,* out of which thrusts the massive, flaring column supporting the council chamber, which nonetheless seems to float serenely above the clerestory. Revell intended the chamber to recall a classical theater in which rising tiers of public seating surround concentric rings of council desks. The mayoral dais is framed by a slightly concave, freestanding *scena frons,* itself framed by the gently domed ceiling. Set within the trussed perimeter supporting this dome, a continuous arc of glazing provides a panoramic view of Nathan Philips Square and the downtown core beyond.

The status of Toronto City Hall as the symbolic center of the city is dramatically reinforced by the success of this square. Bordered by an elevated promenade that extends the frontal colonnade, the square's dominant feature transforms seasonally, from fountain pool to a perennially popular ice-skating rink. Henry Moore's *Three-Way Piece No. 2* and a leafy outcropping known as the "Peace Garden" complete the perimeter of a central space occupied by a succession of public concerts, rallies, and demonstrations in addition to art shows and market days. In stark contrast to the common criticism of modernist public space as sterile, Nathan Philips Square is enlivened by a constantly shifting inhabitation both day and night, even during the deepest of Canadian winters. As Dendy and Kilbourn noted in their book *Toronto Observed* (1986), “It is to Viljo Revell and his humanistic concept of ancient and modern city forms, and of urban life itself, that Toronto owes the success of its civic square. Without it the building would have been forever incomplete.”

JEFFREY BALMER

S*ee also* **City Beautiful Movement; City Hall; Mies van der Rohe, Ludwig (Germany); Revell, Viljo (Finland)**

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TORONTO, ONTARIO

If any one building in Toronto may mark the transition from the 19th century to the next, that building is Old City Hall (1899, E.J.Lennox). Lennox’s masterwork marks the culmination in the city of Romanesque Revival, a style influenced by the works of McKim, Mead, and White, and H.H.Richardson, particularly his Allegheny County Courthouse (1884). Other local examples of this genre include the Gooderham House (1892), designed by David Roberts, and the Ontario Legislative Building (1892, known also as “Queen’s Park”), by R.A.Waite. These buildings share the robust Richardsonian complement of rusticated stonework, massive rounded arches, steep gabled roofs, and richly ornamented interior woodwork. More generally, Old City Hall marks the culmination of High Victorian Toronto, which, in addition to the Romanesque style, looked toward an eclectic array of Renaissance Revival, Second Empire, Italianate, and Queen Anne. These templates were modified by a web of influences, including a constructional idiom founded on the versatile red and yellow brick produced from local clay pits and the ever-present specter of winter. The most enduring legacy of this period is the near ubiquitous semidetached housing type known as Toronto Bay-n-Gable, variations of which continued to be built throughout the 20th century.

Into the new century, Lennox would continue to match the ambitions of his patrons with the flamboyance of his designs. A case in point is Casa Loma (1911), commissioned by Sir Henry Pellatt, a pioneer in the development of hydroelectric power from Niagara Falls. Here, Lennox forged an elaborate confection composed of French Medieval and early Renaissance that may well have found favor with King Ludwig of Bavaria. Such extravagance was the exception to the rule in Edwardian Toronto, for although the explosive accretion of wealth and population continued along its Victorian trajectory, the opulence of Richardsonian Romanesque gave way to more subtle shades of English domestic architecture. The dominant model for the first two decades of the century was neo-Georgian, all red brick and white trim, although it is in the Cottage style that we recognize two of the city's most significant neighborhood models: Wychwood Park and Riverdale Courts.

Wychwood Park was founded by Marmaduke Matthews, an English-born landscape painter who envisioned an artists' idyll set amid ten acres of ravine land west of Casa Loma. Most of the development dates from after 1907, when the architect Eden Smith, in addition to building his own residence, designed a further half dozen houses in the park. All were executed in the Lutyens-inspired Cottage style, comprising deceptively simple assemblages of sweeping rooflines, stucco walls, and timber de-tailing. Smith employed this combination throughout other affluent neighborhoods that were then taking shape in the city, but it is to his credit that he was able to apply the fruit of this experience to an altogether different challenge. Riverdale Courts (1914) was the inaugural project of the Toronto Housing Company, a coalition of political and philanthropic organizations concerned with the lack of affordable housing. Set among a solidly middle-class area east of the city (and soon to be connected across the Don valley by the Prince Edward Viaduct, 1918), Smith's picturesque Cottage vocabulary provided a palatable image to both residents and neighbors. The original phase included 208 units, varying in size from one to four bedrooms, in three-story blocks arranged around quadrangles. These courts had the double advantage of providing every unit with a veranda-level entrance while maximizing the amount of land set aside for lawn and play space. The careful articulation of common and private spaces enabled a balanced sense of community and provided a role model for many of the successful publicly assisted in-fill projects built subsequently: the Garden Court Apartments (1942, Forsey Page and Steele), Sherbourne Lanes (1976, Diamond and Myers), and the much larger St. Lawrence Neighborhood (1983, various architects).

The prosperity of Toronto in the early decades of the century was perhaps most clearly embodied in the head offices of the banks that grew in importance as both domestic and foreign investment fueled the development of railways and manufacturing and the exploitation of natural resources. An early example of this is the Traders' Bank Building (1905), designed by the New York firm of Carrère and Hastings, which was later known for the design of the New York Public Library (1911), designed in association with John M.Lyle. The bank building is composed of a series of layers. A ground level of polished granite supports a double-height banking hall encased in a Doric colonnade. Above that, eight floors of office space are clad in smooth stone and punched windows and crowned by a broad cornice. The Dominion Bank Building (1914), designed by the Toronto firm of Darling and Pearson, is noteworthy for its pair of banking halls, the upper hall featuring double-height arcuated piers suggestive of an Albertian basilica and combined with a richly coffered timber ceiling. Commissioned by Edmund Walker and soaring to 34 stories, the Canadian Bank of Commerce Building (1931) remained the tallest building in the British Empire for more than 30 years. York and Sawyer, on the heels of its headquarters for the Royal Bank in Montreal (1928), designed a subtly tapering office shaft clad in piers of buff limestone. The tower is wrapped by a banking hall, its gilded coffered vault modeled on the Baths of Caracalla. Across King Street, the construction site of John Lyle's Bank of Nova Scotia (begun 1929, redesigned by Mathers and Haldenby, 1951) was mothballed, as the crash of 1929 abruptly halted the upward urge of Canadian banks for a quarter century.

Edmund Walker the banker was also a founding patron of the Royal Ontario Museum, and for that institution the firm of Darling and Pearson chose an equally exuberant modern Romanesque style in which to garb its original wing (1914). The facade features a rich brick and terra-cotta matrix, enlivened by an articulated profusion of fretwork, corbeling, and friezes, offset by projecting bays and recessed three-story arched windows. More typical of public buildings in the first half of the century was Beaux-Arts classicism, as witnessed by the Toronto Public Reference Library (1909, with significant additions, 1929), by A.H. Chapman with Wickson and Gregg, and Union Station (1927). Although planning for the new station began in 1905, technical complexities, combined with financial and legal entanglements, delayed the opening of the station for a total of 22 years. John Lyle, in collaboration with Ross and McDonald, architects of Union Station in Ottawa (1912), and Hugh G. Jones, created one of the most imposing yet urbane public buildings in Canada. As with the Bank of Commerce Building, a grand vaulted hall is modeled on the Roman imperial baths, replete with Tennessee marble and Missouri Zumbro. Light floods this space both through north and south clerestory openings and at the short ends of the hall through four-story arched windows, their filigree of rippled-glass-and-steel trusswork doing double duty as glazed corridors bridging office wings flanking the hall to the east and west.

The most intriguing public building in the city, without reservation, is the R.C.Harris water filtration plant (1937), named for the public works czar responsible for its construction (he was a kindred spirit of Robert Moses and William Mulholland). Designed by English architect Thomas Pomphrey and constructed during the leanest years of the Depression, its hydrological panoply of pumps, impellers, Venturi tunnels, and filter pools is housed in a sumptuous neo-Byzantine fortress. Calling it "the Palace of Purification," the building is memorialized by Michael Ondaatje's *In the Skin of a Lion:* "Harris had dreamed the marble walls, the copper banded roofs. He pulled down Victoria Park Forest and the essential temple swept up in its place, built on the slopes towards the lake." The building still functions with its original equipment, capable of delivering a billion liters of clean water a day. Its audacity was the exception to the rule of the middle third of the century, when the city appeared to have entered a state of suspended animation, its energies sidetracked by the Depression and the global war.

The arrival of the International Style, that hallmark of postwar economic recovery, was slow to make its mark in Toronto. A few worthy examples include the Anglo Canada Insurance Building (1954, James Murray) and the Shell Oil Tower (1955, George Robb), both since grievously demolished. Peter Dickinson's Benvenuto Place (1955) established a paradigm for modern apartment dwellings, as the planned community of Don Mills (begun 1953) did for suburban development. However, it was not until the onset of the 1960s that a critical mass of influences and projects decisively marked the second great wave of expansion and experimentation in the city. Beneifiting from a massive buildup in postsecondary education, a new generation of architects sought to advance and adapt modernism in an academic setting. A supreme example of this synthesis is embodied in Massey College (1962), a graduate residence of the University of Toronto. Ron Thom combined the tradition of Collegiate Gothic (a nearby example, Sproatt and Rolph's elegantly functional Hart House, 1919, was endowed by the same Massey Foundation that sponsored Thom's design) with modernist influences from the Netherlands into a superbly crafted environment of total design, right down to the silverware, that is reminiscent of Wright's Prairie period. Scarborough College (1965, John Andrews Architects and Page and Steele), a satellite of the University of Toronto, challenged existing notions of what constituted a campus. Arranged along the northern brow of a forested ravine, the college is essentially a single building extend-ing along the contours of the valley and interconnected along an internal, temperature-controlled pedestrian spine. The heroic scale of the Brutalist in situ concrete forms, conceived of at the scale of the landscape, is balanced by skillfully modulated spaces of public gathering arranged in succession along the central "street."

At the center of the city, sustained immigration, particularly from southern and Eastern Europe, progressively enriched the realm of public space. The Colonnade (1964, Gerald Robinson) cast in a modernist idiom the often antimodernist concept of mixed use, reflecting in a single complex the more incremental transformations taking shape in neighborhoods such as Yorkville and Kensington Market. The symbolic apotheosis of Toronto's cosmopolitan metamorphosis was the arrival of New City Hall (1965), which saw Finnish architect Viljo Revell's design emerge from a competition field of 520 entries. Unremittingly modern yet sinuously sculptural, the building was matched in impact by its accompanying urban square, which continues to provide a sustained and lively focus to civic events and public gatherings. Equally significant was the Toronto-Dominion Centre (1969, Mies van der Rohe, with John B.Parkin Associates, and Bregman and Hamann), Mies's final, and perhaps finest, corporate tower complex. Set on a gray granite podium, two characteristically prismatic towers offset the supremely elegant banking pavilion, a 150-square-foot clear-span essay in Miesian refinement. Their dramatic effect on the skyline was equaled by an initially more subtle intervention: that of the commercial services buried beneath the podium. Joined with similar underground adjuncts to a cluster of subsequent towers (including Commerce Court, 1972, I.M.Pei, with Page and Steele, and the Royal Bank Plaza, 1976, WZMH Partnership), this concourse grew to encompass most of the subterranean area of the downtown core, including a half dozen subway stations. Along with a similar development in Montreal, it represents a uniquely Canadian response to the nexus of metropolitan life and the forces of nature.

Increasingly identified as the "livable city," Toronto took steps to forestall the blight plaguing American urban centers. Curtailment of the Spadina Expressway saved several historic neighborhoods while simultaneously privileging public over private transportation. Similarly, government-sponsored initiatives favored in-fill and renovation rather than the tabula rasa of "urban renewal" that local transplant Jane Jacobs had castigated in her seminal *Death and Life of Great American Cities.* Situated on artificial landfill, Ontario Place (1971, Craig, Zeidler, and Strong) was a publicly sponsored amusement park inspired by the success of Expo '67 in Montreal. Designed as a showcase for the burgeoning province, Eberhard Zeidler created a broad array of high-tech follies set amid a picturesque landscape of linked islands and lagoons: giant white pods cantilevered on slender pylons several hundred feet above water, a hyperbolic paraboloid "tent" for outdoor concerts (ignobly demolished), and a geodesic sphere containing the first-ever IMAX cinema. It was also instrumental in focusing public attention on the city's shoreline and led to the establishment of Harbourfront (begun 1972)—a 100-acre strip of abandoned piers and warehouses that became Canada's first urban national park. Here, Zeidler's renovation of Queen's Quay Terminal (1983) followed on the heels of the immensely influential Eaton Center (1979, Bregman and Hamann, with the Zeidler Partnership). Connected at both ends to the main subway line running beneath Yonge Street (and to the subterranean concourse begun by Mies), this urban mall offers a parallel climate-controlled "street," a 900-foot-long glazed vault enclosing five levels of retail from street level down, as many office and parking levels above, and 20 million visitors annually. Like the now ubiquitous profile of the CN Tower (1976, John Andrews, with WZMH Partnership, and E.R. Baldwin), this "street" has served as a lightning rod for critics and boosters alike, joining Revell's City Hall in the pantheon of postcard symbols of the city.

A severe recession in the early 1980s, followed by a lengthy economic downturn through much of the final decade of the 20th century, brought to an end the dynamic experimentation of the postwar period. As elsewhere, although the relative merits of Postmodernism were discussed in academic circles, historicist pastiche began to dominate the sprawl of subdivisions and shopping malls engulfing the exurban hinterland. Notable exceptions buoyed the hopes of conscientious objectors: A.J.Diamond's Central YMCA (1984), a taut assemblage of Platonic volumes with nuanced references to Roman *thermae,* among others, and Mississauga City Hall (1987, Jones and Kirkland Architects), which drew on both vernacular and modernist influences. Financially squeezed local governments lost influence over powerful developers, resulting in projects that ran counter to the spirit of consultation and compromise that had been the cornerstone of the "livable city" formula. The practice of architecture itself increasingly fell to the sway of bottom-line economics of design-build management, eroding the traditional role of the architect. Despite all of this, the city continued to be an enviable place to live, with rich cultural deposits, vibrant neighborhoods, an invigorating waterfront, and an economy poised to meet the challenges of the coming decades. A new generation of architects waits in the wings.

JEFFREY BALMER

S*ee also* **Brutalism; Carrère, John Mervin, and Thomas Hastings (United States); Lutyens, Edwin (England); Pei, I.M. (United States); Revell, Viljo (Finland); Toronto City Hall**

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TORRE, SUSANA 1944

Architect, theorist, and urban designer, United States

Susana Torre is theorist, educator, practicing architect, urban and interior designer, social activist, and architectural critic.

Fire Station Five, Columbus, Indiana (1987)

Photo © Mary Ann Sullivan

Torre has demonstrated her talents in several design competitions and prestigious awards since graduating with an architecture degree from the Universidad de Buenos Aires in 1967. Torre's ability to incorporate allegory and metaphor into complex, plastic forms is nowhere more evident than in her design for the restoration and adaptive reuse of Ellis Island in New York Harbor (1981). She transformed this abandoned relic of immigration into a delightful park of memorable symbols and enjoyable relaxation. Torre's Ellis Island project has been displayed in architectural exhibitions at more than 40 universities and, through numerous publications, educated the general public about architecture's ability to express a culture's narrative histories.

Among her earlier projects, Torre's 1977 design for the offices of Manhattan lawyer Harry Torcyner suggests a pristine orchestration of the relationship between art and architecture. (The space was also designed to house Torcyner's art collection.) Torre subtly used color to amplify the structural grid and employed texture and color to contrast the permanent exterior walls with the flexible interior partitions. Vivid surrealist paintings and primitive objects of art are showcased by sensitively configured architectural spaces.

Two of her commissions—Fire Station Five (1987) at Tipton Lake, Columbus, Indiana, and the Garvey House (1988) in Amagansett, Long Island—embody recognizable yet thoroughly abstracted references to site and context. Fire Station Five's plan is generated by the square. One of the interlocking squares shelters the functional and technical apparatus of the station, whereas another square houses the "human" facilities (sleeping and living areas, kitchen, and offices.) The shape and form of the building echo its suburban and bucolic environment. The exposed steel frame alludes to a barnlike structure meant to house fire trucks. References to silos (the cylindrical stair with a fireman pole and the tower for fire hoses) tie the two functions of the building together formally and physically while making clear reference to Midwest agricultural building traditions. Elegant details and balanced colors augment the architectonic integrity of this admired landmark.

The semicircular two-story Garvey residence gracefully balances vernacular and intellectual traditions. Clad in local cedar, it also pays tribute to the American classicism in architecture through its symmetrical street facade with a central stair tower. The stunning oceanview site ensures direct sunlight all day long.

Torre has integrated her aesthetic concerns with those of education and social reform. In her 1980 studio at Syracuse University's School of Architecture, Torre focused the curriculum on the housing needs of two-income families, asking the students to reexamine the contemporary roles of parents and children. As director of the Architecture Program (1982–85) at Barnard College, Columbia University, she shaped the educational experiences of many young women. While chairing the Environmental Design Department of the Parsons School of Design (1991–94), she implemented curricula that emphasized social needs of the late 20th century. In collaboration with government agencies and professional offices, she offered a hands-on housing design program for low-income and mentally ill families. The students created plans and models for three sites in Manhattan's Lower East Side and participated in subsequent implementation.

Torre has curated several traveling exhibitions of architecture, including the innovative and acclaimed "Women in American Architecture: A Historic and Contemporary

Perspective," displayed at the Brooklyn Museum of Art, New York (1977). The same year Torre organized the traveling exhibition "Childbirth Centers," installed at the New Jersey Institute of Technology, where she was an associate professor (1977–78). A decade later Torre arranged a symposium and traveling exhibition, "Hispanic Traditions in American Architecture and Urbanism," at Columbia University in New York. After touring the United States, this exhibition was shown in Argentina and Spain.

MILKA BLIZNAKOV

S*ee also* **Contextualism; Columbus, Indiana; Feminist Theory**

Biography

Born in Puan, Argentina, 2 November 1944; attended the Universidad de la Plata, 1961–63; studied at Universidad de Buenos Aires; Edgar Kauffman Foundation Scholar, 1967; earned degree in architecture, 1967; postgraduate studies at Columbia University, New York, 1968–69; Noble Foundation Fellow, 1971–72; J.Clawson Mills Grant, Architectural League of New York 1973. Principal, Architectural Studio, New York, 1978–85; member, editorial board, *Journal of Architectural Education* 1983–85; partner, Wank Adams Slavin Associates, New York, 1985–87; established her firm Susana Torre and Associates, New York, 1988. Cochairperson, assistant professor, and director of design concentration, State University of New York, College of Old Westbury, 1972–76; adjunct professor of architecture at Columbia University, Yale University, Cooper Union for the Advancement of Science and Art, Carnegie Mellon University, and Syracuse University, 1973–80; visiting associate professor, New Jersey Institute of Technology School of Architecture, 1977–78; associate professor of architecture, Columbia Graduate School of Architecture, Planning and Preservation, 1981–89; director, Architecture Program, Barnard College, Columbia University, 1982–85; Sam Gibbons Eminent Scholar in Architecture, FAMU Graduate School of Architecture and Urban Planning, Florida 1990; visiting university professor, University of Sydney, 1990; chairperson, Parsons School of Design, Architecture and Environmental Design Department, New York from 1991. Member, board of directors, Architects, Designers and Planners for Social Responsibility from 1988; vice president of architecture, Architectural League of New York 1989–93; member, board of directors, Architectural League of New York from 1989.

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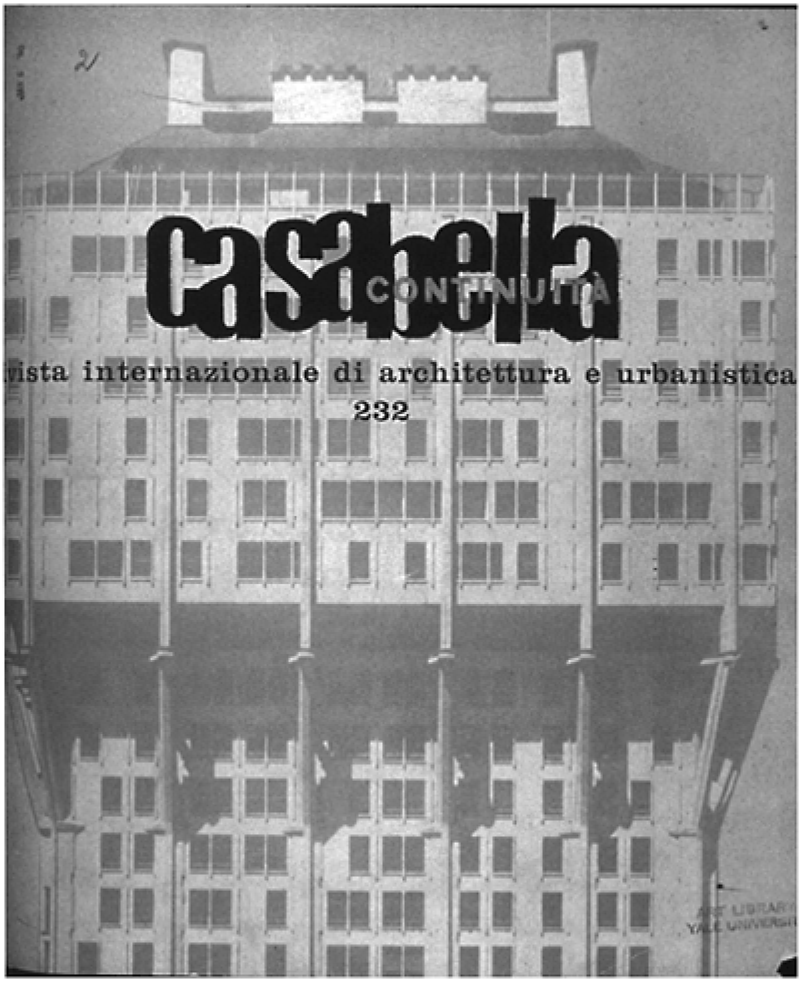
TORRE VELASCA (VELASCA TOWER)

Designed by Lodovico, B.di Belgiojoso; completed 1958; Milan, Italy

Completed in 1958, the 26-story Torre Velasca (Velasca Tower) was built by architects Lodovico B.di Belgiojoso (1909–), Enrico Peressutti (1908–76), and Ernesto N.Rogers (1909–69) of the Studio Architetti BBPR in collaboration with structural engineer Arturo Danusso. Only the second skyscraper to be built in Italy, it followed the Pirelli Tower, designed by Gio Ponti with structural engineer Pier Luigi Nervi, by two years. Milan's two highrise towers redefined the skyline of the most industrial city in Italy at precisely the moment when modern life began to eclipse the traditional agrarian economy and bleak wartime conditions were giving way to new prosperity. Unlike the Pirelli Tower, located in the vicinity of Milan's Stazione Centrale, and thus somewhat removed from the historic center of the city, the Velasca Tower was situated at the intersection of Corso di Porta Romana and Via Velasca, in the ambit of the unique Gothic Duomo and Giuseppe Mengoni's Galleria Vittorio Emmanuele.

The tower was named after the street, Via Velasca, which in turn had been named for Fernando Velasca, Spanish governor of Milan 1592–1600 and 1610–12. Conceived as a tripartite structure, the building comprises a two-story canopied entrance pavilion at ground level, which houses retail shops; a robust rectangular shaft with central elevator core accommodating commercial office space; and a slightly larger rectangular crown overhanging the central shaft, occupied by private residences and topped by a copper-clad hipped roof. To accommodate the broad base of the structure, war-damaged residential buildings on the site were demolished to expand Via Velasca into the large, open Piazza Velasca that surrounds the tower. In a gesture that echoes Mies van der Rohe's solution for the Seagram Building's (1954–58) plaza in New York, a place of repose was created in



Photograph of Velasca Tower on the cover of *Casabella-Continuitá* (December 1953/January 1954)

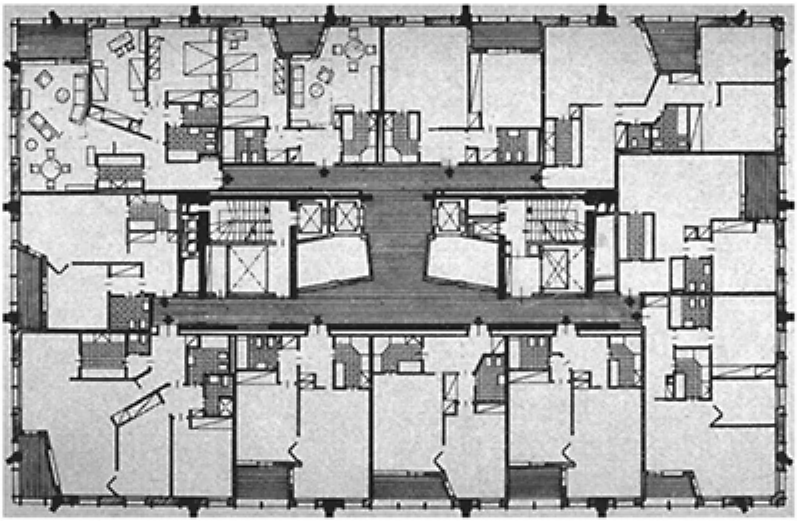
Photo courtesy Michelangelo Sabatino

the dense urban fabric of Milan. Together, the shaft of the tower and its overhanging crown—which critics have likened to a medieval fortified palace—are visually unified by steel-reinforced concrete ribs that span the height of the building, recalling August Perret's Raynouard Street apartment building in Paris (1932) and his Notre Dame du Raincy (1922). The structure of the Velasca Tower also recalls Pier Luigi Nervi's Palazzetto dello Sport (1957). However, in contrast to the lightness of Nervi's work, the sheer mass of the Velasca Tower asserted a striking monumentality that was mediated by the void of the surrounding piazza.

Designed for the Milan offices of the Società Generale Immobiliare (Real Estate Association), the monumentality of the building suggests longevity and permanence. The reinforced-concrete in-fill panels and vertical ribs evoke the stone architecture of Italy's past at much grander scale, rather than employing the curtain wall introduced in slightly earlier American skyscrapers, including Skidmore, Owings and Merrill's Lever House (New York City, 1951–52) and Mies' Seagram Building. The with ornamental details that recall both the nearby Duomo and roof of the overhanging crown is clad with copper and trimmed medieval fortifications. Even when glass was employed for the tower's fenestration, vast planes of glass that made visible the building's viscera were avoided, and windows were moderately scaled.

Provoking heated debate in local and international architecture circles at a time when skyscrapers were still new to European cities, the distinctive Velasca Tower contradicted the tenets of International Style modern architecture; it appeared antimodern. The effect of lead architect Ernesto Rogers's rejection of the ethical and aesthetic mandate of modern architecture was no doubt exacerbated by BBPR's decision to present the tower together with the work of Giancarlo de Carlo (Housing in Matera, 1956–57), Ignazio Gardella (Olivetti Cafeteria in Ivrea, 1953–59), and Vico Magistretti (Villa in Arenzano, 1959) at the Otterlo Congrès Internationaux d'Architecture Moderne (CIAM) meeting of 1959. Controversy generated at this meeting concerning the future of Modern architecture ultimately led to the collapse of the organization, and thus the loss of one of the most prominent forums for debate on Modern architecture and urban planning.

Consciously attempting to evoke the ambience of Milan, austere yet sophisticated, urban yet introverted, historic fabric punctuated by gaps and contemporary interventions, BBPR's design for the Velasca Tower sought to make manifest the concept of continuity *(continuità)* that Rogers had adumbrated in his editorial in the December 1953/January 1954 issue of the journal *Casabella,* which he renamed *Casabella-Continuità.* For Rogers continuity referred to historical context in the broad sense, what he termed architecture's "pre-existing environment" *(preesistenze ambientali).* From its founding in 1932, amid heated debate over rationalist architecture and its ties to the Italian Fascist regime, Studio Architetti BBPR took both the classical tradition and the vernacular heritage of the Italian peninsula to be vital sources for modern Italian designers. This position was also pervasive—albeit articulated in different ways—among architects of the postwar period, despite the attempts of the critic and historian Bruno Zevi to promote "organic" architecture. Consideration of context was a necessity for Italian architects operating in war-torn Italy under conditions that forced them to rebuild damaged buildings wherever possible; where older structures



Velasca Tower plan (1958)

Photo courtesy Michelangelo Sabatino

were damaged beyond repair, architects were called on to insert new residential, institutional, or industrial structures into the dense historic urban fabric.

The Velasca Tower was conceived as the remedy for a wartorn site, and no doubt symbolized rebirth in this city that had suffered great losses of its historic building stock during the war. It became a symbol of a revitalized Italy, liberated from the ideological excesses of the Fascist regime and inspired by the hope of rebuilding the country without negating its built heritage.

The Velasca Tower could be compared with late 19th- and early 20th-century tall buildings in New York (e.g., Cass Gilbert's Woolworth Building, 1913), in that it borrowed from historical models such as the medieval fortified castle and tower. The reliance on "traditional" historical types was rejected by modernists in favor of formal innovation. Yet the decision to radically expand the tower's scale and proportions is reminiscent of the striking modernity that one sees, for example, in Adolf Loos's Chicago Tribune Tower Competition entry of 1922.

Departing from the reductive language of international modernism, Studio Architetti BBPR looked to the local context, adapting the built forms of Milan and northern Italy to advanced building technologies to demonstrate that Modern architecture could be representative of the individual as well as the collective, the local, national, and international. The appropriation of the medieval past was not merely an archaeological exercise. Rogers and his associates sought to reinvent the past in light of the contemporary needs, both spiritual and functional. The fundamental contribution of the Velasca Tower to the history of 20th-century modern architecture lies in its ability to convey the prescient message—against the grain of international modernism—that

Modern architecture need not necessarily break with the past but, rather, should aspire to engage in a creative dialogue with it.

MICHELANGELO SABATINO

S*ee also* **Lever House, New York; Seagram Building, New York; Woolworth Building, New York**

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TRANSPORTATION PLANNING

Transportation planning in the 20th century grew up with the automobile. Only for the first few years of the century were streetcars able to compete with interest in the automobile. Comprehensive plans that included rail transit, such as those for Llewellyn Park, New Jersey, and Forest Hills Gardens, New York, quickly proved to be the exception. Transportation planning soon became the handmaiden of the automobile, taking it where it wanted to go, often regardless of the consequences.

By the early 1920s, the popularity of the automobile had largely displaced interest in planning for public transportation, which faced declining ridership and loss of profits. Nationwide, voters turned their backs on public transit investments in referenda, sometimes influenced by huge contributions by automobile and parts manufacturers. The automobile quickly became the emblem of the future and national progress. The number of electric streetcars peaked for the century in 1917 at 72,911, and total ridership was greatest in 1923, when 15.7 billion transit trips were taken. The planners' preference was certified at the 1924 National Conference on City Planning when the way of the "horizontal city of the future" was declared—by the automobile.

The sudden tidal wave of automobility swept over cities throughout the 1920s. Suddenly, suburbs began to grow at a much faster rate than cities. As early as 1923, some cities were debating the banning of cars downtown because of congestion. Commuters by automobile quickly outnumbered those by transit. In the early years of the meteoric ascendance of the automobile, transportation planners raced to facilitate its needs. The single answer for congestion was to build more roads, usually in straight radial lines from the center of the city into territories of developable land at the city's edge.

The "good roads" movement gained in popularity. Taking advantage of Progressive Era sentiment against the monopolistic practices of railroads and toll-road operators, the good-roads movement advocated for public ownership and construction of roads. The concept of a continuous national system of highways was instituted in the Federal Aid Highway Act of 1921 with the adoption of a numbered U.S. highway system composed of routes extending across the nation. By the early 1930s, the objective of constructing a system of two-lane roads connecting the centers of population had been largely completed, making it possible to travel across the country on an all-weather highway system.

No one was more aggressive at road building than Robert Moses, who, from 1924, amassed unprecedented power in New York to steamroll thousands of miles of highway building projects. Moses's first parkways were designed for the recreational driver, but by the early 1930s the wide thoroughfares became conduits for commuters. Moses's massive transportation projects, which combined urban expressways, bridges, and tunnels, had an immediate effect of pumping up suburban migration in New York's suburbs, particularly to Westchester and Nassau Counties.

Moses was many things, but he was only figuratively a planner, as he concentrated on building a bureaucratic empire. Many of his massive transportation building projects found their source in the landmark 1929 Regional Plan of New York, a privately funded transportation and development plan for the New York metropolitan region. The plan was a mix of proposals for decentralizing and "decongesting" New York, calling for the expansion of highways and rail links and at the same time recognizing, in Clarence Perry's classic section on neighborhood units, that the automobile was inevitably creating the cellular city.

As Moses drew from the Regional Plan of New York, other large-scale plans attempted to envision and shape the future of automobile transportation. The Regional Plan Association of America (RPAA), composed of the era's most reform-minded planners, including Lewis Mumford, Clarence Stein, and Henry Wright, proposed the idea of the "townless highway," thoroughfares that would "encourage the building of real communities at definite and favorable points off the main road." However, without Moses to take up the idea, the RPAA's plan languished as the Great Depression set in.

With the Federal Aid Highway Act of 1934, Congress authorized funds to state governments for surveys, plans, engineering, and economic analyses for future highway construction projects. By 1940, all states were participating in this program. Transportation planning moved into another realm of influence in 1940 with the opening of the Arroyo Seco Parkway (later the Pasadena Freeway) in Los Angeles (the term "freeway" had been coined initially in 1928 in a *New York Times* article by Edward M. Bassett, a New York planner). Los Angeles' first freeway plan, by Lloyd Aldrich, was not developed until 1939, and by World War II Los Angeles had only 11 miles of freeway. However, Los Angeles soon became the world model of up-to-the-minute modernity in its enthusiastic embrace of transportation planning for the automobile.

The most shining vision of the future of 20th-century transportation, however, was exhibited at the 1939 World's Fair in New York. Rarely has a plan of the future city shown such prescience. The most popular exhibit at the fair was General Motors' Futurama, which attracted long lines of visitors who wanted to visit a future envisioned by America's most successful automobile manufacturer and that resembled nothing so much as the southern California landscape, circa 1955. When Secretary of Defense

Charles Wilson asserted that what was good for General Motors "was also good for the country," no voices were heard in dissent. Eventually, more than five million visitors came to the Futurama exhibit to wonder at the expanse of miniature elevated freeways that designer Norman Bel Geddes had created to show the prospects of "modern and efficient city planning—breath-taking architecture—each city block a complete unit in itself [with] broad, one-way thoroughfares—space, sunshine, light and air."

Although the arrival of World War II brought a halt to the rise in automobile ownership and slowed the momentum of transportation planning, significant efforts were made that contributed to the huge surge in highway construction afterward. Congress passed the Federal Aid Highway Act of 1944, financing an interurban system of 32,000 miles that bypassed urban areas. The act immediately created a debate: transportation planners, such as Harold Bartholomew, and power broker Robert Moses wanted to use new roads to attack "urban blight," charting expressways through urban residential areas to entirely redevelop them. However, initially at least, federal aid focused on intercity connections.

The increased interest of the federal government in transportation planning and highway development soon aroused the in-terest of lobbyists, the most significant of which, the American Road Builders Association, established one of the most effective campaigns in the history of pressure-group politics to advance the cause of federally supported highway building. Members of the group further set out to systematically dismantle municipal streetcar systems in large portions of the country. General Motors, Firestone Tire, Standard Oil of California, and Phillips Petroleum were eventually convicted of antitrust violations for setting up an illegal transportation company, National City Lines Inc., whose purpose was to obtain control of transit companies throughout the Midwest and West and to dismantle streetcars in favor of buses, which were financed by the same manufacturers and suppliers.

In 1953, when the highway lobby sponsored a nationwide essay contest on the need for more highways, the winner was, aptly enough, Robert Moses, who received a $25,000 prize for his essay "How to Plan and Pay for Better Highways." The essay proved to be a preliminary script for more federal funding of highway construction. Although the Eisenhower administration initially had kept highways separate from its 1954 Urban Renewal Act, as had Truman in the original 1949 act, Eisenhower soon became enamored of the prospects for a large-scale highway transportation project.

Eisenhower, whose military success during World War II came on the German autobahns, listened carefully to arguments that a massive federal highway-building project would benefit national defense and stimulate an economic boom. Once again, the debate over "roads fight blight" came to center stage, with many planners insisting that the new highways must penetrate to the center of urban areas to remove slums and improve the connection between outlying suburbs and downtown offices and retail areas.

In June 1956, the Interstate Highway Act was passed with only a single vote in opposition. The $41 billion bill became the largest public works program in the history of the world, setting in place a gigantic imbalance that favored the private automobile over public transit. With an effect befitting its size and cost, the Interstate Highway Act did not by itself create the massive suburbanization that defined the evolution of cities in the second half of century, but it abetted it in an extremely consequential fashion.

By the early 1960s, the automobile was essentially putting other forms of transportation out of business. Between 1950 and 1972, transit patronage declined by 62 percent. Outside of urban areas, it was virtually nonexistent, with only 5 percent of the nation's transit patronage available in rural areas and cities with a population less than 50,000. During the same period, the volume of automobile traffic more than tripled.

It soon became apparent to transportation planners that an undue reliance on the automobile was creating as many problems as it was eliminating. As each new interstate was completed, fresh new problems of displacement, pollution, and congestion arose. Although an entrenched group of planners continued to argue for more highway building, other voices began to be heard in support of the idea of "balanced transportation." In 1962, for example, the San Francisco Bay Area passed a voters' referendum for a 71-mile rail transit system after a prolonged "freeway revolt" had voiced popular dissatisfaction with more and more highway building. The year 1962 also saw the passage of the Federal Aid Highway Act, which mandated local transportation planning.

The Urban Mass Transportation Act of 1964 (UMTA) was the first significant effort of the century to recognize the need to improve and expand public transit. Expenditures increased from approximately $100 million in 1964–65 to approximately $1.3 billion at the end of the 1970s. Under the program, a type of balance was anticipated against the huge federal subsidy for highway building by offering matching funds for capital acquisitions of local transit, and the principal aim was to attain congestion relief by making public transit faster and more comfortable.

The immediate effect of the act was to provide new equipment for public transit buses. However, the act also promoted plans for new rail transit, such as the Bay Area Rapid Transit (BART) in the San Francisco Bay Area. Extensions were funded in New York, Boston, Cleveland, Philadelphia, and Chicago. New rail systems were built in Washington, D.C., Baltimore, Miami, and Atlanta, and planning was begun in Los Angeles and Honolulu.

The ironic consequence of most of these public transit efforts, however, was to spread decentralization of urban downtowns and frequently contribute to the deterioration of central city neighborhoods, often increasing racial segregation. Many of the public transit improvements only facilitated suburban commuting in place of intracity transportation. BART, for example, became a high-speed conduit for financial district office workers from the East Bay suburbs of Contra Costa and Alameda. San Francisco residents were seldom to be found on the bright futuristic cars that sped beneath the city streets. In city after city, the main beneficiaries of the new systems or extensions were suburban commuters, not residents of central cities.

The initial presumption of UMTA was that increased expenditures on capital improvements would relieve traffic congestion. However, by the mid-1970s, planners began to realize the need for a more complex approach. Other influences brought about experiments in vanpooling, dial-a-ride arrangements, and carpool lanes. The principal impetus to these revised approaches was the establishment of the Environmental Protection Agency (EPA). After 1970, pollution in urban areas became a major federal concern, and the EPA sought to develop plans that would diminish traffic in urban areas to reduce pollution, although planners generally continued to ignore the automobile's contribution to urban sprawl. The shift in focus from reducing congestion to reducing pollution brought about certain restrictions on automobiles in central areas, converted downtown streets into pedestrian malls, and reduced downtown speed limits.

Although critics continued to argue that the federal role in transportation planning was only codifying the decentralization of urban areas or providing Band-Aids to the problems of automobile pollution, the notion of balanced transportation continued to be advanced. In 1975, UMTA and the Federal Highway Administration began to require transportation system management plans that had to account for an overall balanced reckoning of transportation needs as a requirement for federal funding. In 1978, requirements were added that focused on the needs of disabled transit riders and residents of densely populated urban areas. During the 1970s, transit planners experimented with a number of varied alternatives to the automobile. In addition to the expansion of bus services and train services, two new modes of transportation came into consideration. The first of these was personal rapid transit, which attempted to answer the mobility of the automobile with small independent conveyances. Systems were tried in Tampa, in Philadelphia, and at Duke University. The second new mode of transportation was not really new at all: light rail vehicles, as they were newly christened, were really a spiffed-up reinstitution of the old inner-city streetcar systems that had been systematically removed from most urban areas.

Increasingly, the federal role in transportation planning grew more inconsistent during the 1980s. Public transit advocates complained that the government was not doing enough, local jurisdictions complained that it was requiring too much, and congressional representatives increased their opposition to what they termed "big-government intrusion into local affairs." A kind of stalemate ensued throughout the 1980s, with mounting opposition to freeway building by quality-of-life advocates and suburban home owners on the one hand and by public transit advocates faced with reduced federal subsidies for public transit development on the other. Although there were some notable successes of locally funded transit programs, such as in San Diego, California, and a number of other cities that cobbled together funding for new light rail vehicle systems, congestion and sprawl continued to increase as a new phenomenon of "edge cities" grew into the planners' purview with the most farreaching requirements for automobile commuting yet.

The 1990s saw the influence of numerous state growth-management plans that for the first time addressed the comprehensive relationship of urban growth to balanced transportation principles. States such as Oregon, Florida, Maine, and New Jersey sought to link transportation planning with the wider implications of urban sprawl, loss of open space, and cost of municipal services. Oregon's growth-management plan, the oldest and most far-reaching, called for the establishment of urban growth boundaries to stave off urban sprawl while at the same time increasing the use of public transportation within areas of increased density.

As state growth-management plans began to extend the idea of what balanced transportation meant, federal transportation planning was also influenced. Passage of the Intermodal Surface Transportation Act attempted to put the highway-only approach to transportation planning to rest forever. For the first time, federal transportation planning included significant provisions to balance local land use planning, the environment, historic preservation, and mobility for children, the elderly, and the disabled. Light rail and subway systems, even bicycle and pedestrian travel, were featured as important components of an overall transportation planning approach.

The notion of what transportation planning is or should be has unequivocally grown more complex, increasingly attentive to a wide complex of consequences that flow from the simple act of traveling from one point to another. The pessimist would point to the stranglehold of the automobile on everything from the shape of cities to the air we breathe and conclude that transportation planning has only contributed to the problem. Citing the increased congestion in urban areas, the growing number of gas-guzzling vehicles, and the rampant path of sprawl, the doubter would have ample evidence.

The optimist, however, might point to the incremental progress that is apparent in transportation planning over time, including the increasing interest in what is often called “smart growth” legislation that attempts to address the relationship of transportation planning and land use, and the increased use of public transportation. As the century ended, public transportation ridership was again on the rise, with an equivalent of a million new trips of public transportation ridership, increasing by percentages greater than any other travel modes, including motor vehicle travel. Significantly, these gains were evident in central cities, suburbs, and even rural areas, and the idea of a comprehensive approach to transportation planning shows evidence of spreading with increased levels of influence and acceptance.

RICK ADAMS

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TRIBUNE TOWER INTERNATIONAL COMPETITION (1922), CHICAGO

On 10 June 1922—the occasion of the newspaper's diamond (75th) anniversary—the *Chicago Tribune* announced a competition for the building of a new headquarters. Given the title "The Tribune Tower Competition," the competition was conceived of as a vehicle for commemorating the substantial growth and achievements of both the newspaper and the city of Chicago. In statements accompanying the program, site, and submission requirements, the Tribune Building Corporation—the stated "Owner" in the competition documents—hoped for something even grander: an architectural representation of a new time and place befitting the postwar era of limitless and boundless opportunity. Viewing the submissions for the competition, Louis I. Sullivan, the well-known member of the so-called Chicago School of Architecture, registered his own messianic hopes for the future of architecture in an issue of *Architectural Record.* Equating architecture with humanity's redemption, Sullivan gave voice to the highly romanticized, Nietzschean spirit of the time:

> The craving for beauty thus set forth by The Tribune is imbued with romance; both that high Romance which is the essence, the vital impulse, that inheres in all the great works of man in all places and all times, that vibrates in his loftiest thoughts, his heroic deeds, his otherwise inexplicable sacrifices, and which forms the halo of his great compassions, and of the tragedy within the depths of his sorrows. So deeply seated, so persistent, so perennial in the heart of humanity is this ineffable presence, that, suppressed in us, we decay and die. For man is not born to trouble, as the sparks fly upward; he is born to hope and to achieve.

Prominently featured in both trade journals and traditional newspapers, the Tribune Tower Competition engendered extensive debate among national and international architects and advocates of architecture. Perhaps exceeding the Tribune Building Corporation's expectations, notice of the competition provided a touchstone for a vital discussion of contemporary architecture, resulting in debates that considered not only matters of style and taste but social, intellectual, and technological ideals as well. The competition's brief was notable for its conscious attempt to elicit an iconic model for the future both of architecture and of mankind's aspirations for the New World, and all this was to be represented by the skyscraper. In addition, prominent citizens of the city of Chicago—always conscious of their competition with cities on the eastern seaboard—proposed the competition as a challenge to both the city and the world. Appearing with great fanfare in the foremost national and international newspapers, the prominence of the Tribune Building Corporation's flagship newspaper ensured the competition's visibility across the Americas and Europe.

The Tribune Tower Competition brief noted the phenomenal growth of the *Tribune* by chronicling the humble beginnings of the newspaper, growing from a small daily that began with the printing of 400 copies to a circulation of over four million copies per week at the time. Mirroring language used by the *Tribune's* contemporaries—a list that included major corporations and civic-minded cultural and educational institutions—the primary reason for the competition was said to be "the creation of a building that would enhance civic beauty and pride while at the same time augmenting the profile and visibility of the newspaper." As if to downplay the more practical aspects of the competition, the actual building program was outlined in rather mundane if relatively sparse terms: the building was to be "erected on North Michigan Avenue property to house its executive and business departments," with the consideration that the enlarged (and growing) departments in the plant (production) building would also be accommodated. In addition, the building as designed was to provide for the future adaptation and expansion of all departments.

A more significant component of the competition brief was the Tribune Building Corporation's choice of the building site. Underlining the importance of the site—located between numbers 431 and 439 Michigan Avenue just north of the famous downtown Loop—the visibility of the building was stated clearly from the outset: It was to be "situated at the heart of the business and shopping district of Chicago," thus ensuring that the newspaper would be a prominent aspect of the cityscape. By providing an anchor for the development of this particular part of the city, the building was to be thought of as a prominent node in the current and future development of the city and was therefore seen as simultaneously benefiting both the corporate institution and the general population, a joining of two constituencies in the shared goal of great civic achievement. Accordingly, the site appeared to many civic officials and urban planners to be ideal, if not tinged with an air of inevitability, as the boulevard on which the property fronted (Michigan Avenue) had been substantially improved by the city of Chicago to enable the area's increased visibility relative to other vital areas of the city. Becoming a central component of Chicago's urban fabric, the site was proposed as both the real and the imaginary central node for the financial, social, and political workings of Chicago, a city that many people at the time perceived to be the capital city of the industrialized upper Midwest, the fabled "City of Broad Shoulders." The design and construction of a new office tower to house the region's most important newspaper would seal Chicago's fate as a center of visionary, albeit practical, significance.

In the language of its time, the final aim of the Tribune Tower Competition was stated in vague aesthetic terms. Accordingly, the successful entrant architect was challenged to "erect the most beautiful and distinctive office building in the world." In formulating the mission of the competition, the board of the *Tribune* had sought professional advice, asserting that "this competition has been instituted [with the guidance of] the American Institute of Architects." In recognition of the better-regarded architects of the time and to ensure the highest profile among members of the architectural profession, the competition issued a special invitation to ten architects of national renown, with the rest of the submissions garnered from those responding to a published "general invitation." The winner of the competition was also given the guarantee of being "engaged by the Owner [the Tribune Building Corporation]" for the commission of the winning entry. Although quite specific, the actual submission requirements were relatively minimal: a sketch floor plan at the Michigan Avenue level, showing main entrance lobby, stair and elevator distribution, and the connection of the new building with the plant at one-eighth-inch scale; a typical office floor on a 24-by-36-inch sheet of paper; the Michigan Avenue (west) elevation; the Austin Avenue (south) elevation; a longitudinal section from west to east; and a perspective showing the entire building from the southwest.

The cumulative prize awards for the competition were set at $100,000, an enormous sum of money at the time. The closing of the competition would occur on 1 November 1922, with a one-month grace allowed for drawings arriving from foreign "distant points." By the time of the "absolute closing date" for competition submissions on 1 December 1922 (the date the winners of the competition would be announced), 204 designs had been received by the initial due date, with 49 more designs received "after the competition was closed." In the *Tribune's* publication of the competition entries, 260 submissions were eventually included.

On 23 November 1922, exactly eight days prior to the 1 December closing date, the competition jury, made up of selected architects, city officials, several members of the newspaper's board of directors, and other interested parties (a group collectively referred to as the competition's "advisory committee") met to whittle the large number of entrants to a small group of 12 semifinalists, apparently leaving open the option of considering any late (foreign) entries. With an obvious seriousness of purpose, the same advisory committee announced that

Tribune Tower, Chicago, Illinois, Hood and Howells, 1925

it had reached a tentative decision on the final order of prizes on 29 November, when, in what was recorded retrospectively in rather dramatic fashion, "entry number 187 was cleared through customs from Finland" and reassembled for submission. The committee's final decision was finally posted on 3 December 1922. Deemed a unanimous decision, the prize winners were the firms of John Mead Howells and Raymond M.Hood Associates of New York City (first prize, with an award of $50,000); entry number 187 from Finland, the architect Eliel Saarinen (second prize, with an award of $20,000); and the Chicago firm of Holabird and Roche, who were awarded third prize with a cash award of $10,000. The remainder of the prize money was then distributed in $2,000 increments to the ten American architects invited to enter the competition at the outset, invitees that included, among others, firms headed by Bertram Goodhue and James Gamble Rogers; the New York firm Hood and Howells Associates; and two prominent Chicago firms, Holabird and Roche and D.H.Burnham and Company.

At the close of the competition, 23 countries were represented. Announcements of the winners of the competition and further details regarding the entrants and the nature of their work were published in metropolitan newspapers throughout the United States. Newspapers in Europe, including the *Tribune's* European edition, highlighted the outcome of the competition; it also received prominent attention in domestic and international architectural trade journals of the time. The publication of the competition results only contributed to the debates surrounding the future of architecture in Europe and the Americas.

Further recognition of the importance of the Tribune Tower Competition continued for some time after the announcement of the competition winners. Multiple requests for the exhibition of the drawings were fielded by the newspaper's offices, including requests from numerous art institutes, associations, and schools; many chapters of the American Institute of Architects; and large universities and educational institutions throughout the United States. In recognition of these requests for a publication or exhibition of the entries, the Tribune Building Corporation agreed to a traveling exhibition featuring drawings by the competition's entrants. The exhibition, accompanied by a publication of record, specifically addressed the competition's educational and cultural potential. In announcing its response to the flurry of requests from across the country, the Tribune Building Corporation issued the following statement on 1 January 1923: "The importance of such an exhibit to furthering the advance of architecture, especially in the study of the skyscraper, cannot well be exaggerated. The designs in some instances have cost the architects competing from 1000 to 10,000 dollars each. With 23 countries represented, the exhibition will show the ideas of the great architects from all parts of the world."

The exhibition consisted of 135 perspective drawings, each drawn on a board measuring 36 by 66 inches in accordance with the original, standard competition requirement. The first exhibit of the competition took place at the University of Illinois, both because of its proximity to the city of Chicago and because it happened to have the largest enrollment of any school of architecture in the country at the time. The program for the exhibition was stated to be primarily educational, with the stated benefit of allowing for the study of the drawings by students and architects. Both the publicity and the expense of the exhibition were borne by the *Tribune*.

The *Tribune's* accompanying statement about the importance of the original competition and the reason for the traveling exhibit speaks directly to the perception that the Tribune Competition was a signal event—sentiments reflected in Louis Sullivan's observations in *Architectural Record:*

> There never has been such a contest and it is very doubtful that there ever will be another…. The greatest architectural contest of history will result not only in achievement of what the Tribune announced as its desire, the most beautiful and distinctive office building in the world, but it will produce many other beautiful buildings. It will give Chicago an architecture gem of the first water and it will add permanently to the resources of the modern architect a mine of new ideas and suggestions. This was the hope of the Tribune and it has been fully realized.

With these words, the Tribune Building Corporation reflected the general optimism of the new century, an optimism that was reflected in the promotion of the "genius" of architecture and its makers. Both Louis Sullivan's and Frank Lloyd Wright's views on architecture, published in popular journal articles and in numerous books, suggest a similar point of view promulgated by advocates of the Chicago style, a school of architecture that viewed architecture as the direct manifestation of the genius of an unfettered and un-self-conscious spirit. The city of Chicago, emblematic of the burgeoning faith in the American Experiment, comprised a time and place in which social, technological, and cultural progress were greeted not only optimistically but also as above reproach. It was in this sense that architecture and urban planning were almost universally—that is, until the spectacular failures of the socially progressive architectural ideals of the post-World War II era—regarded as the material revelation of the destiny and greatness of a new age.

ELIZABETH BURNS GAMARD

S*ee also* **Burnham, Daniel H. (United States); Chicago, Illinois; Holabird, William, and Martin Roche (United States); Holabird, William, and John Wellborn Root (United States); Office Building; Skyscraper; Sullivan, Louis (United States); Wright, Frank Lloyd (United States)**

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TRUSS SYSTEMS

Trusses are triangulated frameworks used as spanning or bracing elements in buildings, bridges, transmission towers, and other structures. What distinguishes the truss from other structural forms is precisely its triangulation, from which two benefits accrue: first, the triangular geometry is inherently stable; second, all internal stresses—at least in "ideal" trusses whose bars are pinned together at the vertices of each triangular panel and whose loads are applied only at these pinned joints—are axial, that is, limited to pure tension and pure compression.

Aside from its web of triangular panels, the truss has no intrinsic formal identity. Put another way, it is the specific pattern of internal diagonal, vertical, or horizontal bars (patterns that in many cases bear the names of their 19th-century inventors: Pratt, Howe, Town, Warren, etc.) that makes the structure a truss, not its overall shape. One may design an arch as a truss, a beam or column as a truss, or any number of tower forms—essentially beams cantilevered from the ground plane—as trusses. Advantages of truss construction include the following: (1) large trusses can be assembled from small members pinned together, facilitating production, transportation, and erection; (2) because all internal stresses are axial, with no bending stresses present, the truss is an extremely efficient structural form; (3) because trusses are typically assembled from individual elements bolted, welded, or nailed together, it is relatively easy to customize the overall shape of the truss in relation to external loads and spans, and to adjust the cross-sectional area of each member in relation to anticipated internal stresses.

Trusses have been used for many centuries; Andrea Palladio illustrated truss bridges in his *Four Books of Architecture* as early as 1570. However, it was in the 19th century that industrial expansion—in particular the need for long-span exhibition and market halls, railroad terminals, and bridges—together with the development of engineering theory and improvements in the production of cast and wrought iron, and later steel, provided the motive and means for most of the advances in truss design that were exploited within early 20th-century architecture. For example, the influence of 19th-century iron trusswork in Henri Labrouste's Biblioteque Nationale Reading Room in Paris (1875) can be seen in the vaulted ceiling above the main concourse in McKim, Mead and White's Pennsylvania Station in New York City (1910); and the tradition of long-span three-hinged arched trusses, epitomized in such 19th-century masterpieces as Contamin and Dutert's Galerie des Machines in Paris (1889), continues in 20th-century structures like Peter Behrens's AEG Turbine Factory in Berlin (1909) and Tony Garnier's Municipal Slaughterhouse in Lyons, France (1913).

Trusses are seldom found as expressive elements within the canon of mainstream early 20th-century modernism. Like Gothic buttresses, trusses are directly constrained by the geometrical logic of their structural form and, unlike prismatically pure columns and slabs, or expressively cast concrete elements, cannot easily be subsumed within modernism's abstract, formal systems. It is only with Russian Constructivist and derivative projects from the 1920s and 1930s that trusses were first exploited as expressive elements within an explicitly modernist context. Prominent examples include Alexander and Viktor Vesnin's Pravda Building project in Moscow (1923), in which trusses are used as wind-bracing elements within a composition that includes bold text, angled planes, and glazed elevator towers; and Johannes M.Brinkman and L.C.van der Vlugt's Van Nelle Factory in Rotterdam (1930) featuring dynamic horizontal and sloping trussed connecting bridges.

Early 20th-century trusses are also important as infrastructure (bridges) and as industrial (long-span factory roofs), vernacular (ordinary wooden gable roofs), or pragmatic (hidden bracing or support) building elements. Gustav Lindenthal's arched Hell's Gate Bridge in New York City (1916) and Albert Kahn's Glenn Martin Aircraft Plant in Middle River, Maryland (1937), both utilize steel trusses that were the longest spans of their type when constructed. Steel trusswork is commonly employed (and hidden) within the central service "cores" of 20th-century commercial buildings to provide bracing against horizontal wind and earthquake forces. Steel trusses are used to transfer loads over large spans—allowing hotel rooms to be placed on top of lower-floor ballrooms, or office buildings over railroad tracks—without themselves being expressed as part of the architectural form. William LeMessurier's development in the 1960s of a "staggered truss" system is another example of an entirely pragmatic invention utilizing trusses to minimize floor-to-floor dimensions in multistory steel-framed housing or hotel blocks. Pre-engineered, factory-produced triangular wooden trusses made from common lumber connected with toothed metal plates are widely used in 20th-century wood-framed residential roof construction. Open-web steel joists, essentially off-the-shelf trusses first manufactured in the early 1920s, routinely achieved spans of up to 144 feet (44 meters) by the end of the century and are ubiquitous in one-story commercial and industrial buildings. Even precastconcrete trusses, consisting of thin prismatic bars of reinforced concrete joined by steel gusset plates, were proposed for ordinary roof spans in England during World War II, as an expedient response to the short supply of steel.

Where trusses are used deliberately as expressive elements within later 20th-century architecture, it is most often by appropriating and reinterpreting the industrial, off-the-shelf, or pragmatic applications described above. Thus, ordinary steel openweb joists were used in California by architect Raphael Soriano as early as 1938, by Ray and Charles Eames in the influential house they built for themselves in Pacific Palisades, California (1949), and in various industrialized building system designs such as Ezra Ehrenkrantz's School Construction Systems Development (SCSD, 1961). Alvar Aalto's fan-shaped bolted timber trusses supporting the double-skin roof of the Säynätsalo town hall council chamber in Finland (1952) recall, in their detailing, vernacular heavy-timber roof trusses of 19th-century mill buildings. Mies van der Rohe's project for a Chicago Convention Hall (1953) visually integrates the diagonal members of its horizontal trusswork within the orthogonal pattern of its exterior curtain wall. Vertical wind-bracing trusses, typically hidden within the framework of tall buildings, are given similar architectural expression on the exterior of Skidmore, Owings and Merrill's Hancock Building in Chicago (1970).

Trusses are commonly featured in so-called High Tech architecture of the late 20th-century. Buildings within this genre reprise to some extent the Constructivists' interest in industrial production, but differ from Constructivist projects in at least two respects: High Tech buildings tend to be less influenced by abstract compositional formulas and often evidence a more theoretically grounded appreciation of structural systems as potential sources of architectural expression. In Renzo Piano and Richard Rogers's Pompidou Center in Paris (1977), virtually the entire architectural concept relies on exposed trusswork. Long-span roof trusses are used as dramatic and expressive elements in innumerable High Tech buildings; examples include Norman Foster's Sainsbury Visual Arts Center near Norwich, England (1978), Michael Hopkins's Research Laboratories for Schlumberger in Cambridge, England (1984), and Nicholas Grimshaw's Waterloo International Rail Terminal (1994) in London, to name but a few.

JONATHAN OCHSHORN

S*ee also* **AEG Turbine Factory, Berlin; Pennsylvania Station, New York; Pompidou Center, Paris; Schlumberger Cambridge Research Centre, England; Space Frame; Van Nelle Factory, Rotterdam; Vesnin, Alexander, Leonid, and Viktor (Russia)**

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TSCHUMI, BERNARD 1944

Architect, Switzerland and France

Bernard Tschumi's architectural projects are probably best understood in relation to his theoretical writings and ideas, many of which reflect his interest in surrealism and poststructuralism. His sources range from Georges Bataille's writings on philosophy and eroticism to Jacques Derrida's deconstruction as a methodology. A review of a few specific adaptations of these ideas for architecture will help us understand the significantly different way in which Tschumi conceived of the nature and purpose of architecture. Three important theoretical concepts include the pleasures of architecture, strategies of disjunction, and "cross-programming."

The pleasures of architecture, according to Tschumi, are based on the relationships between the physical (body) and the conceptual (mind) rather than the complete absorption of one mode or experience by the other. Two written works, published to accompany the exhibition of his work at the Museum of Modern Art in New York (*Event-Cities,* 21 April–5 July 1994), demonstrate this proposition: one text is a collection of his theoretical essays and the other a book of projects (works from his architecture practice). *Event-Cities* establishes the duality of theory and practice that allows for dialectical movement between the physical and the conceptual.

The experience of duality (or "in-between") applies to his architecture as well as his writings. Tschumi relies on the principle of disjunction (a strategy he developed in the 1970s) to reveal the contradictions that exist in architecture between form and function, as well as other oppositions and contradictions. Tschumi argued that habits and conventional assumptions about architecture had to be interrupted or "displaced" in order to make other experiences possible. He employed strategies of shock and defamiliarization to radically shift design paradigms and challenge the viewer.

The theory of disjunction is evident in his critique of the modernist precept that form must follow function. In his explanation of the design for the Parc de la Villette (Paris, 1987–91), for example, Tschumi argued that form and function could ignore or even conflict, and he proceeded to explore this disjunction or rupture by breaking up the space as described in the competition program into volumes placed at the intersections of a superimposed, non-site-specific grid. The volumes were designed as "folies," a play on the double meaning of the French *word folie* (madness or mental imbalance) and *follies,* small pleasure pavilions or ruins popular in 19th-century landscape design. More important, the shape and form of Tschumi's folies were not determined by specific functions; but rather were ingeniously designed as formal exercises and then modified subsequent to their construction to accommodate specific functions, a process that demonstrated that function could follow form.

Tschumi's later work continued to explore other strategies of disjunction through dis- or cross-programming. The opportunities for new architectural experiences made possible by these concepts ranged from the "unclassifiable" or "unprogrammed" spaces of his later projects such as Kansai Airport (Japan, 1988) and Le Fresnoy National Center for the Contemporary Arts (Tourcoing, France, 1992–98) to those heterogeneous projects that encompass multiple uses or functions, such as the Rouen Concert Hall and Exhibition Center in France and the Columbia University Student Center (Alfred Lerner Hall, New York City, 1994–99). He defined "in-between spaces" as inherently ambiguous; they were not dedicated to a single or specific function. This ambiguity provoked the uncanny, the strange, and the unfamiliar in architecture. Heterogeneous spaces contained several normally unrelated functions simultaneously, such as those he illustrated in *The Manhattan Transcripts* (1981): "the quarter-back tangoes on the skating rink; the battalion skates on the tightrope." Heterogeneous spaces are not solely determined by function because life exceeds architecture, according to Tschumi. These spaces invited the multiplicity and diversity of a contemporary fragmented culture.

With the Alfred Lerner Hall at Columbia University, Tschumi attempted to demonstrate these spatial and design principles by containing a series of ramps for circulation between

Parc de la Villette, Paris, 1987–91

floors, student mailboxes, and several other sitting, standing, and viewing conditions that set up multiple possibilities for social contact.

Shock and disjunction made it possible for subjects to experience and recognize the connections that subjects make between fragments that are artificial and yet habituated in experience and thought. When habits are displaced, new experiences are possible. Tschumi's goal was to redefine the experience of architecture itself.

JEAN LA MARCHE

S*ee also* **Deconstructivism; Koolhaas, Rem (Netherlands)**

Biography

Bernard Tschumi was born in Lausanne, Switzerland, 25 January 1944; father was architect Jean Tschumi (1904–62). Graduated with architecture degree from Eidgenöissische Technische Hochschule (Federal Institute of Technology) in Zurich, 1969. Taught at Architectural Association in London (1970–79), the Institute for Architecture and Urban Studies in New York (1976), Princeton University (1976, 1980), and the Cooper Union for the Advancement of Science and Art, New York City (1980–83). Dean, Graduate School of Architecture, Planning and Preservation, Columbia University, New York City, 1988–2003. Won international competition for the planning of the Parc de la Villette (Paris, 1983), an award that would propel him into international architectural fame. Appointed chairman, Flushing Meadows Task Force in New York (1987–89); member, Collège International de Philosophie; a chevalier in the Legion d'Honneur; officer, Ordre des Arts et Lettres in France. Received the Grand Prix National d'Architecture of France (1996) and England's Royal Victoria Medal.

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TUGENDHAT HOUSE, BRNO, CZECH REPUBLIC

Designed by Ludwig Mies van der Rohe; completed 1930

Among the most significant private houses of the 20th century, Ludwig Mies van der Rohe's Tugendhat House represents a material unity of steel, stone, and glass. Situated on a slope to provide ample views, the Tugendhat House echoed Mies' use of continuous space first realized in the German Pavilion in Barcelona (1929).

The owners, Grete Weiss Löw-Beer and Fritz Tugendhat, met Mies in Berlin in 1927 before their marriage. They shared a preference for a modern style and an aversion to traditional interiors. After viewing several of Mies' buildings, including the Wolff house in Guben, they commissioned the Berlin architect to design their new house.

In September 1928 Mies went to Brno to view the lot on which the house was to be built, and on the evening of 31 December 1928, the first sketches were discussed. The final design of the house was decided on around July 1929, when work on the foundations was begun. Several changes were made during construction.

The house is built on an incline, with the living area on the southern side with a view of the garden and the Brno cityscape. On the street, or northern side, the house looks unremarkable, presenting a low and closed facade with a wide, covered entry area. The garage and chauffeur's quarters are on the right. On the left are the bedrooms and bathrooms and a terrace with a view of the garden. These private rooms are separated from the entryway by a vestibule that also contains the stairway to the lower floor. The lower floor contains the servants' quarters, kitchen, and pantry on the eastern side, but most of the space is taken up with the living room. That living space, which is not visible from the street, forms the center of the house and functions as dining room, workroom, library, and sitting room. The living area gives access to another terrace on the same level, from which a staircase leads into the garden. The cellars, which can be reached from the kitchen by means of a circular staircase, contains spaces for the furnace, machines to operate the windows, a laundry room, and so on. Originally it also contained a darkroom because Fritz Tugendhat was an amateur filmmaker.

The most remarkable section of the house is the living area, spreading over an area of 223 square meters (about 2400 square feet). Instead of designing a series of closed spaces, Mies chose to build a single continuous space. This freedom in spatial division was made possible by the use of a steel frame, which dispensed with the need for internal supporting walls. Mies had already experimented with this principle in his houses for the Weissenhofsiedlung in Stuttgart of 1927. In Brno his use of steel permitted a different layout for each level, thus providing an exceptional openness of the living space. This openness was reinforced by floor-to-ceiling windows on the southern and western sides. The windows open up the interior space to the outside, much like the German Pavilion.

In the living area, the separate functions are structured and suggested by spatial means and beautiful, pristine materials. A freestanding onyx wall separates the living room from the workroom. A semicircular wooden wall with a Macassar veneer defines the dining area. The arrangement of the furniture also structures the space, marking places for various living functions. Moving it would undermine the "zoning" of the space. In the living space, most of the furniture was metal, including Mies' tube chair from Stuttgart (1927) and his Barcelona armchair (1929). He also designed the sheet-metal "Brno armchair" and the "Brno dining room chair."

The technical facilities of the house were exceptional for the time. Central heating was supplemented in the living area with a forced-hot-air system in the winter that also served as airconditioning in the summer. In addition the house had built-in humidifiers and air purifiers, a hydraulic system that lowered the living-area windows into the ground, and a light sensor that automatically locked the front door at night.

The house's high cost and the luxurious interior gave rise to criticism. Modernist architects of Brno and Prague objected to the project on the basis of their social convictions. Mies' German origins and the fact that he had succeeded Hannes Meyer at the Bauhaus also played a role in the disapproval from his Czech colleagues. As a consequence Czech architectural circles ignored the house. A different controversy arose in Germany, where *Die Form* asked whether the architectural ideas of Mies determined the lifestyle of the inhabitants to too great a degree. Fritz and Grete Tugendhat denied this in their response, also published in *Die Form,* but admitted that it was not possible to change anything in the interior without disturbing the architect's design.

The inhabitants did not have much time to try out Mies' living concepts. In 1938 the family decided to emigrate to Venezuela as a result of the threatened expansion of the Nazi regime in Germany. The house stood empty for a year before being appropriated by the German occupier. After 1945 the house first became a ballet school and then, in 1950, part of the Brno children's hospital, which used the space for physical therapy. In 1970 the City of Brno took over the house, but renovation on the house did not start until the period 1983–86. The building was freed of additions and adaptations, but the original furniture and equipment were largely lost. In 1995 the restoration of the interior was undertaken, with remakes of the original furnishings. Since 1996 the house has been open to visitors as part of the Brno City Museum.

OTAKAR MÁCEL

S*ee also* **German Pavilion, Barcelona (1929); Mies van der Rohe, Ludwig (Germany); Weissenhofsiedlung, Deutscher Werkbund, Stuttgart (1927)**

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TURKEY

As with other areas of cultural production, in Turkey the prevailing theme in both the practice and the discourse of architecture in the 20th century was the tension between a desire to assert a uniquely national character and the quest to become modern by keeping up with international trends in the profession and by responding to the demands of an ever-changing global context. The balance between the two tendencies shifted frequently, remaining a constant source of debate throughout the century. On the basis of overarching similarities in the organization of professional practice and education, the dominant discourses in architecture, the types of buildings commissioned, and the identity of the clients, as well as broader issues concerning national and international politics, economic policies, and ideological orientations, we may divide the time line between the 1890s and the present into four periods. Longer surveys offer further subperiodizations on the basis of the identity of the architects and stylistic preferences. The early Republican years have been divided into First Nationalist (1890s–1927), First International (1927–late 1930s), and Second Nationalist (late 1930s–late 1940s).

1890s to Mid-1920s

The decades preceding the post-World War I collapse and subsequent partition of the Ottoman Empire were defined by turbulent wars followed by waves of mass migration, the encroachment of European imperialism, and formidable economic problems. To remedy these, the Ottoman government implemented various measures designed to modernize the state and its institutions after European models. Similarly, in an effort to raise the standards in professional education, in 1882 the School of Fine Arts (Senayii Nefise), based loosely on the Beaux-Arts model, was founded, followed in 1884 by the School of Engineering (Hendese-i Mülkiye Mektebi), for which faculty were recruited mainly from Germany and Austria. Foreign faculty from both schools were also commissioned for various projects, many of which were novel building types that housed some new function of the modernizing Ottoman capital. The Ottoman Public Debt Administration (1899), the Imperial College of Medicine (1903), and the Museum of Archaeology (1891–1907) were designed by Alexandre Vallaury of the Fine Arts School, and the Deutsche Bank and the Sirkeci Railroad Terminal (1890) were the work of Professor Jachmund. Among other foreign professionals in Istanbul at the time, Raimondo D’Aronco designed several pavilions at the Yildiz Palace, and Otto Ritter and

Helmut Cuno were commissioned to build the Haydarpasa Railroad Terminal (1908). The professional sensibilities of Istanbul's foreign builders differed, depending on their backgrounds. However, when confronted with the challenge of building in a densely packed city with a complex history, a diverse population, and enduring architectural traditions, they typically resorted to incorporating some Ottoman decorative elements into the mainly neoclassical decorative scheme of the interior and exterior surfaces of their buildings while adhering to spatial layouts with the recognizable symmetry and axiality of the Beaux-Arts tradition. Young Ottoman architects trained in the new schools or Europe also experimented with these ideas. Generally known as Ottoman Revivalism, these efforts to incorporate historical references into distinctively modern building programs were comparable to contemporary trends in Europe in terms of discourse and practice. This was evident, for example, in the similarity of the functional layout, volumetric composition, and handling of historical references in Kemalettin Bey's Dördüncü Vakif Hani (1912–26) business complex and Harikzedegan Apartments to their European contemporaries and in Vedad (Tek) Bey's Sirkeci Post Office (1909), which bears a striking resemblance to Otto Wagner's Postal Savings Bank (1904–06) in Vienna.

The conceptual breakdown between the spatial organization and the decorative schemes (in Ottoman Revivalism) also dovetailed conveniently with the tenets of the rising Turkish nationalism, which, albeit artificially, drew a distinction between civilization and culture. The nationalists deemed *civilization* to be a system of objectively formulated universal truths and rules pertaining to practical matters that could be borrowed from the West, but defined *culture* as a subjective system of beliefs and mores that had to be jealously guarded as the core of a distinctively Turko-Islamic identity. Despite its dubious grounding, the analogy was extended into architecture, where new construction technologies and building types were imported as products of Western civilization, whereas the formal repertoire of Ottoman architecture was retained as a vestige of the national culture. Eventually, when the protonationalist Young Turks seized power in 1908, their ambitious initiative to construct administrative and institutional buildings throughout the empire effectively converted Ottoman Revivalism into the official architecture and, more important, replaced its imperial associations with nationalist ones.

After the proclamation of the republic (1923), which marked Turkey's transition to nation-statehood, their credentials as the creators of the nationalist architecture helped Kemal and Vedat Bey and their cohorts secure important commissions for some of the first official buildings of the country's new capital, Ankara. Kemalettin Bey's Gazi School of Education (1926–30) and Vakif Apartments (1928); Vedat Bey's Parliament Building (1926) and the Ankara Palas Hotel (1924–27); Arif Hikmet's (Koyunoglu) Ministry of Foreign Affairs (1927), Turkish Hearths (1927–30), and Museum of Ethnography (1927–30); and Giulio Mongeri's Agriculture Bank (1926–29) and Labor Bank (1928) stand among the most prominent buildings of the new republic's early years.

Mid-1920s to Late 1940s

Beyond introducing a new political entity, by founding a new republic, Turkey's leaders tried to inaugurate a modern national identity for the country and its people through extensive legal, institutional, and administrative reforms. During this formative period, Turkey's collaboration with longtime ally Germany brought German experts and capital, shaping the principles and direction of the modernization process. Turkey's leaders regarded architecture and urbanism as crucial instruments for rendering their reforms tangible. Thus, building a new capital in Ankara, for which they commissioned a plan from Hermann Jansen (1928–32), was one of their most ambitious undertakings. As the first plan introducing modern planning principles—such as land use zoning and a greenbelt system—on the scale of an entire city, Jansen's plan was regarded as a model for the subsequent development of all Turkish cities.

In architecture, incoming foreign professionals sidelined their Turkish counterparts in obtaining government commissions, as the omission of historicist references in their projects favored them to Turkey's leaders, who by then had moved away from a particularist nationalism with strong Turko-Islamic associations toward a universalist position, seeking to integrate Turkey with Europe. In actuality, the stripped-down Central European Neoclassicism of Theodor Post's Ministry of Health, Ankara (1926–27) or Clemens Holzmeister's ministerial buildings (1929–36) in the new government quarter, to name a few, shared the same Beaux-Arts-inspired compositional principles with nationalist architecture. However, it was more appealing to Turkey's leaders because its restrained unornamented appearance imparted a desirable sense of stately dignity and also because it was less labor intensive and required cheaper materials.

As evidenced by the recruitment of artists, architects, and intellectuals fleeing Nazi persecution alongside those with ties to the German government, the Turkish government was interested more in the expertise and skills of its foreign specialists than in their political associations. Although they rarely found a platform for expressing their political views, émigré architects injected a different strain of modernist sensibilities into Turkey's professional and intellectual discourses both through their involvement in the massive overhaul of higher education and through projects that displayed the trademark traits of German modernism, such as broken masses, interlocking volumes, open plans, and a move away from symmetry and axiality. Bruno Taut's Faculty of Language, History, and Geography (1937) and Trabzon High School (1937–38) and Martin Elsaesser's Sumerbank Headquarters (1937) figure among the prominent examples of the work of German émigrés in Turkey. Moreover,

Turkish Historical Society, central court atrium, designed by Turgut Cansever (1966)

Martin Wagner's consultancy for the Istanbul Municipality and Ernst Reuter's tenure in the School of Political Science in Ankara served as a foundation for modern town-planning education in Turkey.

Meanwhile, local architects denounced their exclusion from most major government projects in *Arkitekt,* the first Turkish-language professional journal, which provided information about the latest trends and debates in the profession. *Arkitekt* also promoted the work of Turkish architects, who, as evidenced by Sekip Akalin's Ankara Railroad Terminal (1937), Seyfi Arkan's Palace of Exhibitions (1933), and Harbi Holtan's Istanbul University Observatory (1936), were experimenting with both modernist and neoclassical repertoires. In the late 1930s, Sedad Hakki Eldem, one of the most prolific Turkish architects of the century, spearheaded the Second Nationalist movement, calling for a return to national precedents for inspiration. However, as in the examples of Atatürk's Mausoleum (1942–53, by Emin Onat and Orhan Arda) and the Colleges of Sciences of the Istanbul (1944) and Ankara (1945) universities (by S.H. Eldem and Emin Onat), rather than introducing new spatial ideas, the second wave of nationalists retained their connection to the Beaux-Arts tradition, adhering to the organizational principles of the Central European Neoclassicism of Clemens Holzmeister and Paul Bonatz. Their references to local traditions took the form of stylized Ottoman decorative elements with a heightened awareness of precedents in civic and domestic architecture in the articulation of masses and plans.

More ubiquitous although less studied in this period are the numerous urban plans and institutional structures (schools, railroad stations, and community centers) that constituted the recurring and recognizable elements of a standardized national landscape. Designed and built by central state agencies, these structures were integral to the nation-building and modernization strategies. Among others, Turkey's first female architects, Leman Tomsu and Munewer Belen, built their careers on these commissions.

Late 1940s to Mid-1980s

In the aftermath of World War II, the onset of the Cold War and the polarization of the international arena into rival blocs brought Turkey closer to the United States politically, economically, and culturally. American experts, capital, and models of modernization replaced those of Germany. The single-party rule ended in 1950, and more liberal economic policies were gradually adopted.

Significant changes also occurred in the architectural profession and education. With more architects graduating and venturing into private practice, the Chamber of Architects was formed in 1950 to protect the interests of the profession and to promote fair practices, especially in government commissions. In 1956, the Middle East Technical University Faculty of Architecture was opened in Ankara, adding American models of professional education to French and German models adopted earlier by the two schools in Istanbul.

During this period, the state continued to be the primary source of projects and jobs, but a growing clientele of private entrepreneurs also began to commission projects, such as factories, hotels, and office buildings. Nevzat Erol's Istanbul City Hall (1953); Skidmore, Owings and Merrill's Istanbul Hilton Hotel (1952, with S.H. Eldem); Bozkurt, Bolak, and Beken's Ulus Business Complex (1954); and Behruz and Altug Cinici's Middle East Technical University campus (starting in 1955) stand out as early examples of the expanding repertoire of architectural practice.

The diversification of projects, the increasing numbers of architects, and changes in education multiplied the stylistic, theoretical, and ethical discourses, especially after the 1960s. The various strains of postwar internationalism with which Turkish architects experimented may be observed in Günay Cilingiroglu's Istanbul Reklam (1969) and Tercuman Press Facilities (1974), Sevki Vanli's M.S.-B. Dormitories (1967–68), Sisa and Tekeli's Lassa Tire Factory (1975–77), and Sargin an Böke's Is Bank Headquarters. Meanwhile, as early as 1962, architects and scholars began to debate questions of contextualism and cultural heritage. Eldem's Zeyrek Social Security Complex (1963–70), Turgut Cansever's Turkish Historical Society (1966), and Cengiz Bektas's Turkish Language Society (1972–78) are examples of projects addressing issues of heritage, context, and regional character. In the 1960s, population increase and waves of internal migration resulted not only in the densification of major metropolitan areas, with speculative apartment buildings emerg-

Dogan Media (Printing) Center, designed by Hayati and Murat Tabanlioglu (1997)

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ing as the dominant type of urban housing, but also in the growth of squatter settlements around them. Although the academic and professional discourse became highly politicized in response to these problems, little could be implemented to resolve them.

1980s to the Present

Starting in 1980, the introduction of liberal economic measures, designed to integrate Turkey into the globalization process, followed by a military coup that facilitated their implementation, triggered profound changes in society, culture, and politics and widened the gap between the rich and the poor.

The state's role in initiating new projects diminished, but with their newfound autonomy, local governments organized competitions for various projects, such as Davran Eskinat's Ankara Bus Terminal (1995) and Hasan Ozbay and Tamer Basburg's Gaziantep City Hall (1987), among others. Meanwhile, the private sector clearly became the major source of commissions. International partnerships and the influx of foreign capital transformed existing patterns of work and consumption. Like their contemporary counterparts that were mushrooming around the world, the new building types, which were designed to accommodate emerging uses, were not particularly distinctive by design, yet they stood as a remarkable novelty within the Turkish landscape. Exclusive resort hotels, such as the Sheraton Voyager (1990, by S.Basatemür) and Falez (1990, by Y. and S.Erdemir and S.Akkaya) in Antalya, and holiday villages, such as Pamfilya (by Tuncay Çavdar), burgeoned in coastal regions. Luxury corporate hotels (the Sheraton and Hilton in Ankara and the Swissotel, and Conrad Istanbul), business centers (Dogan Media Center by Aydin Boysan and Hayati and Murat Tabanlioglu and Sabanci Center by Haluk Tümay and Ayhan Böke), and downtown shopping centers (Akmerkez by Han Karabey and Atakule by Ragip Buluç) were built in major cities, which at the same time were challenged by rampant unemployment and massive internal migration. Although squatter settlements encircled many a Turkish metropolis, large housing developments accelerated suburbanization. Such developments include both upscale (MESA Korusitesi and Elvankent) and medium-range (Eryaman and Batikent) ones, gated communities (Mercansaray Evleri and Kemer Country), malls (Galleria Ataköy, 1989, by Hayati Tabanlioglu and Capitol Shopping Center, 1990–93, by Adnan Kazmaoglu and Murat Çilingiroglu), and megastores catering primarily to the upper-middle and upper classes.

In the 1990s, the conversion of Çiragan Palace and Sultanahmet Prison into luxury hotels, the gradual gentrification of older urban neighborhoods, and the random formalist replication of traditional motifs in new buildings, as well as a growing interest in miscellaneous traditional artifacts, indicated the increasing commodification of "heritage" in Turkey. As exemplified by the eclectic remix of historical precedents in Kemer Country designed by Elizabeth Plater-Zyberk and Andres Duany, local tradition had become one among many choices available to a select segment of Turkish society with access to the benefits of globalization. Given the relative scarcity of debate about the displacement of meanings in these examples and the rather indiscriminate importation of global trends, such approaches to historical context can hardly be considered critical or regionalist.

ZEYNEP KEZER

See also **Duany and Plater-Zyberk (United States); Eldem, Sedad Hakki (Turkey); Gürel Family Summer Residence, Çanakkale, Turkey; Istanbul, Turkey; Mosque of the Grand National Assembly, Ankara, Turkey**

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TWA AIRPORT TERMINAL

Designed by Eero Saarinen; completed 1962 New York City, New York

Initially known as the Trans World Flight Center, the TWA Airport Terminal rose as one of several stand-alone terminals that made up the original Idlewild Airport (now JFK International) in Queens, a borough of New York City. The TWA Terminal, by Eero Saarinen and Associates, became the culminating work in Saarinen's search for dynamic sculptural expression in reinforced-concrete construction. The architect died during emergency neurosurgery in 1961, the year before the terminal building opened.

The commission from the Trans World Airlines Company was made in 1956, just as Saarinen came to worldwide prominence with the completion of the General Motors Technical Center (1955) in Warren, Michigan—a Mies-inspired scheme of a corporate-scale campus begun with his father, architect Eliel Saarinen, in the 1940s. The airline company wanted something much bolder from the younger Saarinen for its New York terminal, expecting that its masterpiece would likewise represent the airline's status as the industry leader.

Eero Saarinen had already made clear his self-stated "urge to soar" in architecture, starting with his 1948 competition winner for the Jefferson National Expansion Memorial, colloquially known as the St. Louis Gateway Arch (1964). His quest continued with the thin-shelled triangular concrete roof of the Kresge Auditorium (1955) at the Massachusetts Institute of Technology in Cambridge and at Yale University's Ingalls Hockey Rink (1959) in New Haven, Connecticut. The rink, with its cablestrung roof suspended from a humpbacked central concrete spine, was the forerunner of Saarinen's Dulles International Airport (1962) in Chantilly, Virginia, and of Kenzo Tange's Tokyo Olympic Swim Hall (1964) as much as its formal considerations affected the TWA design.

Saarinen took his cue from its site, positioned at the far corner of the Idlewild property, opposite the airport entry. The building was angled to sweep gently across at sidewalk level to align itself with the curvature of its corner frontage roadway. Inside, behind the encircling arms of the ticket lobby, Saarinen envisioned a shallow rise to a spacious waiting hall from which matched winding staircases would lead passengers to the departure level with its finger ramp out to waiting planes. (A second finger ramp was added by the inheritors of the firm, Kevin Roche and John Dinkeloo.) Passenger movement through the terminal building was to be channeled, gradually but with absolute clarity, by the curved forms of the interior—a circulation process seen by Saarinen as akin in spirit to the science of aerodynamics.

After a year spent working on trial models for the terminal, the chief obstacle for Saarinen and his firm lay in sorting out the best way to put a roof on the building. Along with matters of site and function, structural integrity was the third guiding principle for Saarinen's architectural practice. As a rule he worked closely with the firm's associated engineers. This was particularly the case with Ammann and Whitney, collaborators on the TWA design as well as that for the Dulles Airport. In addition Saarinen was well schooled in the works of Pier Luigi Nervi in Italy and was friends with Minoru Yamasaki, a principal in the firm of Yamasaki, Hellmuth and Leinweber, architects for the St. Louis Air Terminal (1954), with its domed interior spaces.

Saarinen jettisoned earlier TWA roof schemes in favor of a more complex arrangement of four interlocking vaulted segments, set on a perimeter of concrete edge beams. As with Jørn Utzon's counterbalanced roof sails in the Sydney Opera House (the entry that Saarinen supported in that city's commission), a support system had yet to be devised for the terminal roof. The firm and the engineers jointly solved the problem with the introduction of a four-poster arrangement of irregular Y-shaped piers, the front two serving as markers for the terminal entry. Model photographs document how the piers were molded, as if carved from a bar of soap, in keeping with Saarinen's aesthetic vision for the building as a whole, without any loss of structural integrity. A rudimentary version of the various new roof and support elements was recorded as a set of thumbnail sketches preserved as part of the Eero Saarinen Papers at his alma mater, Yale University. Also hearkening back to the Saarinens' Finnish background, Kevin Roche among others has noted how the shape of the terminal echoes that of an old Norseman's helmet, with its split shell and upturned edge.

Saarinen saw the final composition for the building as somewhat baroque in terms of its fluid, sequential layout, "creating a [comparable] dynamic space…but using different play blocks" to create "a total environment" where each part of the design "belonged to the same form-world" (1968). Some architecture critics, notably Vincent Scully, Jr., were initially dismissive of the building but later determined that it had its merits. Art historian Henry-Russell Hitchcock similarly dismissed the building in the *Zodiac* (1962). The flying public had no such reservations.

In a tribute to Saarinen, published by *Architectural Forum* in October 1961, editor Douglas Haskell made fond reference to "Eero's 'big bird' in concrete." Through his final days, even as the terminal roofs were being finished, Saarinen downplayed any zoomorphic interpretations of the building, preferring instead that it be seen and experienced as a visual analogy of flight. Unfortunately, for the terminal building and Saarinen's hopes for it, the nature of air travel has altered dramatically over intervening decades, prompting a host of changes to airport infrastructure. Nearly all the changes have wreaked havoc with the layout of Saarinen's once-expansive interiors. Thirty-three years after Saarinen's last sight of the unfinished building, with both TWA and its flagship terminal reeling in the wake of postReagan airline deregulation, architecture critic Herbert Muschamp did find one silver lining for the beleaguered masterwork. In his column of 6 November 1994 for the *New York Times,* "Stay of Execution for a Dazzling Airline Terminal," Muschamp reported that the New York City Council had voted to uphold the air terminal's designation as a municipal landmark.

DAVID NAYLOR

S*ee also* **Airport and Aviation Building; Dulles International Airport, Chantilly, Virginia; Gateway Arch, St. Louis, Missouri; Nervi, Pier Luigi (Italy); Saarinen, Eero (Finland); Utzon, Jørn (Denmark)**

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TYPOLOGY

Typology, the study of types or classes of objects, has long served to catalyze debates about both representation and invention. In architecture the types in question may be defined by form (such as central plan churches), by their presumed originary role (such as the "primitive hut"), by program or function (schools and museums), or by a historical sedimentation of characteristics (for example, English terrace housing). "Types" are objects of study, and "typology" is the study of them.

Typology must be exhaustive concerning its chosen class of objects, and thus its limits are as important as its particular content, as when Nikolaus Pevsner opened his *Outline of European Architecture* (1943) by excluding the utilitarian "bicycle shed." Any typology aims to reduce the potentially infinite variety of objects considered. In the most explicitly typological studies of architecture and urban morphology, this gives rise to arrays of diagrams depicting variations in plan, section, and elevation, of which a thorough German tradition is a useful example (Geist, 1983). Related networks of researchers in France, Italy, and the United States continue to work explicitly in a methodological vein known as "typomorphology" (see Vernez Moudon, 1994).

Interest in type among architects and theorists can be understood as the search for a middle ground between the poles of pure invention and blind determinism. Since the beginnings of architectural modernity in the 18th and 19th centuries, advocates of type as a guide or foundation of design have tended to define it by exclusion of these extremes; hence A.C. Quatremère de Quincy's (1755–1849) classic distinction, made in 1829, between the "type" and the "model." The type, for this influential French theoretician, is an ideal schema that is reproduced without copying, whereas the model is to be imitated "as it is." Quatremerè's type is above all not a model and cannot be fully incarnated in any single instance; moreover, its various instances might not even resemble one another. Leaving as it does a wide terrain open for formal invention, this notion allies architecture with fine arts such as painting and sculpture, in which such latitude is important. Quatremerè's definition has remained a touchstone for many of the succeeding reflections on type.

However, architectural practice, responding to the modern pressure for standardization of all sorts, has made other demands on the idea of type. In particular, the pedagogical approach traced to J.N.L.Durand (1760–1834), who taught architecture to engineering students at the turn of the 19th century, proposes to view the design of a building as a combination of preexisting elements—rooms, colonnades, courtyards, and the like—that could be cataloged, selected, and distributed in a modular, axial plan arrangement. This so-called rationalist approach finds strong echoes in the literature of professional manuals up to the present day.

At the same time, the structure of architectural commissions has changed under industrialization and the modern state. Where once a single patron, at least symbolically, would have given the order, clients since the 19th century have been increasingly collective—mainly governments and commercial consortia—and have formulated new and complex needs for spaces of production and administration, recorded in the form of detailed written programs. As professional attention has concentrated around considerations of function, they have come to dominate in many contexts over form as a basis for classifying what are now called "building types."

The functional or programmatic type provides a partial answer to Quatremère de Quincy's mysterious contention that works stemming from a common type might not resemble one another. For although the operation of a type must somehow involve a direct shaping of matter to produce a family of similar instances, Quatremerè's argument signals a growing distrust of simple resemblance. Such an attitude, surprisingly enough, is not incompatible with Durand's impulse to demote the pictorial (and thereby the aesthetic) from among architecture's first principles. Thus, it is easy enough to find examples of train stations, hospitals, and town halls that belong to the same functional type and yet are dissimilar in plan, elevation, massing, size, or style. If architecture is considered to be determined by criteria that can be written and calculated in programs, then questions of mimesis—literally, what a building looks like—are of secondary importance. On the other hand, the figural characters of the architectural plan and facade remain critical to evaluating designs. In this sense the functional type and its representational or iconic aspects remain intertwined (see Holl, 1980).

Twentieth-century modernism's abstraction is fertile terrain for typological thinking. What unites disparate creations is a negative quality, the exclusion of some aspects in order to leave others visible. Canonically, this is seen in the removal of ornament, which allows the imagination to bracket the building's material specificity and to see it as an actual type instead of merely an instance of one. Such a straightforward reduction is quite close to the basic typological operation of reducing complexity to find the essential traits of a group. Yet what Anthony Vidler (1998) refers to as questions of ontology (essential being), first raised among 18th- and 19th-century theorists, remains heavily implicit in the modernist context as a tension between an "explanation of origins" and a "principle of form."

Hermann Muthesius (1861–1927) argued in the early years of the century that architecture strives toward the typical. As if in direct response to this remark, the facade of Adolph Loos's (1870–1933) Steiner House (1910), with its bare punched windows, eliminates much of the evidence that would allow it to be read in stylistic dialogue with preceding works. This choice to eliminate historically specific ornament—counterbalanced by sensitivity toward materials—is followed through, albeit in otherwise diverse ways, in the work of such later architects as Ludwig Mies van der Rohe (1886–1969) and Louis Kahn (1901–74). All three develop what might be called an essentialist or archetypal dimension, placing particular emphasis on elements that can be argued as present in any work of architecture and can be recognized in all its manifestations: the column, the wall and its openings, the roof, and the ground plane. Such an attitude, tied to history but opposed to historicism, can be contrasted with the lively interest in prototypes displayed by other modern architects.

Proposing industrial repetition as a substitute for cultural sedimentation, the Modern movement abounds in prototypes intended to launch a kind of typological revolution. These projects are perhaps closer to Quatremerè's "model" than to his "type," except insofar as they embrace the idea of variants and adaptation. Le Corbusier's (1887–1965) Dom-ino Houses (1915) seek to define a skeletal substructure on which variation can happen. In fact a great number of Le Corbusier's projects, from the Ville Contemporaine (1922) to the Unite d'Habitation (Marseilles, 1947–52), employ typological reasoning, proposing a typical solution across widely varying circumstances. The strategy is pursued with even greater rigor and persistence by early contemporaries, such as Ludwig Hilbersheimer (1885–1967), who seek to modernize society through architecture of repeated, industrially manufactured housing.

Although these projects rarely continue beyond the level of projects and prototypes, a great deal of post-World War II construction, both in the United States and in Europe, is based on the quasi-industrial repetition of basic types. Issues or considerations of construction and financing have enforced homogeneity in the service of political and financial rather than aesthetic goals. To cite only two well-known cases, the single-family suburban house (see Wright, 1981) and the "typical-plan" office building (see Koolhaas and Mau, 1995) have achieved an ambiguous hegemony, seemingly omnipresent even though widely criticized. This situation in turn has created larger and larger markets such that, even if whole buildings are only rarely mass-produced (see Herbert, 1984), their components certainly are.

Indeed, it is in part this galloping homogeneity and the reliance on top-down or market-driven solutions that elicited a growing critical reaction among architects becoming active in the 1950s and 1960s. The reaction is particularly visible in the group known as Team X, who organized the last of the Congrès Internationaux d'Architecture Moderne (CIAM) in 1956: Aldo Van Eyck (1918–99), Alison and Peter Smithson (1928–93, 1923–), Shadrach Woods (1923–73), Giancarlo de Carlo (1919–), and others. These architects view the imposition of a uniform culture of functional planning and faceless public and banal private housing as a result, among other things, of modernist architecture's abdication of its proper cultural role. They invoke, another kind of typological reasoning whereby, instead of a refined industrial model to be repeated by the thousands, the type could be understood as a collective product issuing from local or regional culture. These architects, practicing what Manfredo Tafuri has referred to as typological criticism, propose an anti-subjective aesthetic, seeing the long collective refinement of cultural artifacts as superior to the work of the individual intellect or the technocratic planner.

However, the debate concerning typology that will be freshest in most English-speaking readers' minds is the one that crystallized around a group of Italian architects who, beginning in the 1960s, promoted a critical reevaluation of traditional architectural and urban form. The group, called La Tendenza (neorationalism), is diverse but has in common an attachment to the idea that correctly conceived buildings and urban spaces would show more affinity with history than with the functional reason-ing of the moment and might also outlast their current uses to house very different, indeed unforeseeable, ones in the future.

Neorationalism carries the ambiguous charge that already accrues to the different forms of rationalism discernible in architecture: it could be seen as anchored in the rational, that is, what could be explained or considered reasonable. However, it could also be concerned with the exercise of a pure reason, to a point that could in fact be seen as irrational. It is indeed this flip side of the rational that the best-known neorationalist, Aldo Rossi (1931–96), exploited most heavily, especially the ironic, antihumanist projects of the 1970s.

As a representation of the weight of the past on architectural invention, the notion of type has been central through two centuries of debate in architecture. Its lack of precision, while yet purporting to guide practice, has allowed richly differing uses and has kept the notion from becoming the intellectual property of any single group. In architectural and urban history and theory, the study of building types helps to counter the tendency to concentrate on a single building or author. In design practice, type has proven useful both as a workaday professional category and as a point of departure for debates over continuity and innovation. Some sort of typological reasoning is practically indispensable to architecture as an intellectual enterprise.

DAVID VANDERBURGH

S*ee also* **Loos, Adolf (Austria); Mies van der Rohe, Ludwig (Germany); Muthesius, Hermann (Germany); Rationalism; Rossi, Aldo (Italy); Steiner House, Vienna; Team X (Netherlands); Unite d'Habitation, Marseilles**

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U

UNGERS, OSWALD MATHIAS 1926

Architect, Germany

Born on 12 July 1926 in Kaiseresch (Eifel), Oswald Mathias Ungers helped shape the international architectural scene of the second half of the 20th century. He studied at the Karlsruhe Technical University from 1947 to 1950 under Egon Eiermann, beginning a private practice in Cologne in 1950 and in Berlin in 1964. His work can be divided into three broad categories. His early career saw construction primarily of residences in a Modern style, up to the 1960s. This was followed by a theoretical and conceptual phase, from approximately 1963 to 1980, focusing on major competitions. The last decades of the 20th century provided Ungers with the opportunity for a full elaboration of his architectural ideas and ethos, based on intellectual and spiritual responsibility and the definition of architecture as an autonomous discipline. This commitment, together with his daring use of the cube form, situated him firmly as a leading figure in Postmodernism.

Ungers constructed his early works primarily in the Cologne area, where he opened his first office in 1950. The influence of Eiermann is unmistakable. The elegant lines of his single-family house on Oderweg (1951) in Cologne-Dünnwald or his apartment building on Hültzstrasse (1951) in Cologne-Braunsfeld underline a sleek and sober modernism as regards design and materials. Ungers's residences from a few years later show an influence by the Brutalism movement, inspired by Le Corbusier, including experimentation with new approaches to space as well as material. The multiple-family residence on Brambachstrasse (1955–57) in Cologne-Dellbrück employed his material of choice, rough brick, and represented a departure from the earlier, simple box form typical of modernism. The design of the roof and eaves, situated behind the facade, is a technical feat that he would return to often in later works.

Ungers's move toward new architectural forms and representations is clearest in his apartment building on Belvederstrasse (1958–59) in Cologne-Müngersdorf, where the stacked cubes form the basis of a new exploration of space and volume. Although the house's materials and form reference the neighboring buildings, it stands out as a defiant, new construction. Its expressiveness has caused more than one critic to describe it as part of the German Expressionist movement, a development that plunged Ungers into an analysis of Expressionist architecture. His essay from this period, presented in 1964 in Florence at a symposium on Expressionism, declared his now famous motto "Construction is not utopia, but rather battle." The library "cube house" addition (1989) strengthened the interplay of constructed and free spaces within and between the two buildings, lending the constellation an association of an urban setting and earning it the description of a city in miniature, or a house-city.

The early 1960s provided Ungers with a few larger projects, including the competitions for an art museum (1960) in Düsseldorf and a Roman-Germanic museum (1960) in Cologne. One of his biggest critical failures stems from this period as well, the residential construction of the Märkisches Viertel (1962–67) in Berlin-Wittenau. Initially designed as stacked buildings of 3 to 6 stories, the buildings were actually constructed with 8 to 16 stories, compromising the original statement of the design. This period represented a rupture in Ungers's career, coinciding with an appointment at the Technical University in Berlin, where he taught from 1963 to 1969.

Partly because of a lack of commissions and partly the result of Ungers's desire to reflect on his work, the next years were filled with a "theoretical" construction phase. In 1965 and 1967, he served as a visiting critic at Cornell University. Three projects from these years reflect the new conceptual forms that he had found for his architectural ideals: the design for the Dutch student dormitory (1964) in Enschede, the design for the Berlin museum complex (1965), and the design for the German embassy (1965) in Rome. Using the geometric forms of the circle, square, and triangle, Ungers proceeded to create variations on these basic themes. The result was a harmonious constellation of contrasts and progressions that would influence his work even decades later.

Although Ungers was unable to build most of the projects he designed during this period, usually competition designs, they helped define the possibilities and limits of his architectural thought and practice. Until the late 1970s, he produced numerous plans for major construction projects, including his design for the Berlin-Tegel airport (1966), with its flexible plan for updating the construction according to new airplane models and its emphasis on steel and aluminum. Ungers also entered the competition for Cologne's Wallraf-Richartz Museum (1975), a design that foresaw the building as an extension of the cathedral area and connected the pedestrian zone with Breslauer Platz. He also began a time of much professional and academic international movement. In 1969 he became chair of the Department of Architecture at Cornell, and he opened an office in New York in 1970 after receiving his license there. In 1973 and 1978, he went to Harvard University as a visiting professor and was also a visiting professor at the University of California, Los Angeles, in 1974–75. In 1976 he opened an office in Frankfurt/Main. He went to the University for Applied Arts in Vienna from 1978 to 1980 and opened another office in Karlsruhe in 1983. He began to work at the university in Düsseldorf in 1986.

The late 1970s heralded a new era of large building projects, including the German Architectural Museum (1979–84) in Frankfurt and the residential complex on Lützowplatz (1979–83) in Berlin, with its bands of vertical window lines topped by triangular gables eliciting the impression of massive, moving arrows punctuating the long wall. Ungers's practice was then inundated with commissions, establishing his signature OMU as an established but dynamic architectural firm. In this new period of construction, Ungers's commitment to the cube form became the basis of almost all his future work. However, despite the reaffirmations of his theoretical plans, Ungers was forced to recognize that the translation of his designs into reality often resulted in compromises that weakened the strength of his structures. In this sense his architectural plans have been in some ways more important than the buildings themselves in elevating him to international status.

The last two decades of the 20th century offered Ungers the opportunity to realize many of his ideas in new forms. In 1990 he exhibited “Kubus,” five three-meter-high cubes in a Cologne gallery, demonstrating his mastery of dividing space between concrete forms and emptiness. Numerous publications date from these years as well, including his thoughtful anthology, *Rectangular Houses* (1986). His constructions reflect the near half century of attempts to infuse his designs with uncompromising boldness through imposing geometric forms, such as the Alfred Wegener Institute for Polar Research (1980–84) in Bremerhaven.

Ungers ended the 20th century with a personally satisfying commission: the design of the new Wallraf-Richartz Museum (1996–99) in Cologne. He thereby completed a project for which he had not been selected nearly two decades earlier. Opened in the first month of 2001, the building allowed Ungers to display the many successful techniques he developed during his career, in the city where he had first begun to build. The museum’s design alludes to its historic location between the Gürzenichstrasse and the city hall. Here, as in other designs, his building is a massive cube, but it is less imposing than in his other constructions, is less rigorous in its dimensions, and has an almost flowing, elegant quality. Now the newest home to Germany’s oldest private art collection, the Wallraf-Richartz Museum is a fitting testimony to Ungers’s determination to address the practical challenges of construction and tradition while insisting on architecture’s right to self-determination and a building’s responsibility to fulfill the individual spiritually and intellectually.

BENITA CAROL BLESSING

S*ee also* **Brutalism; Cubism; Expressionism**

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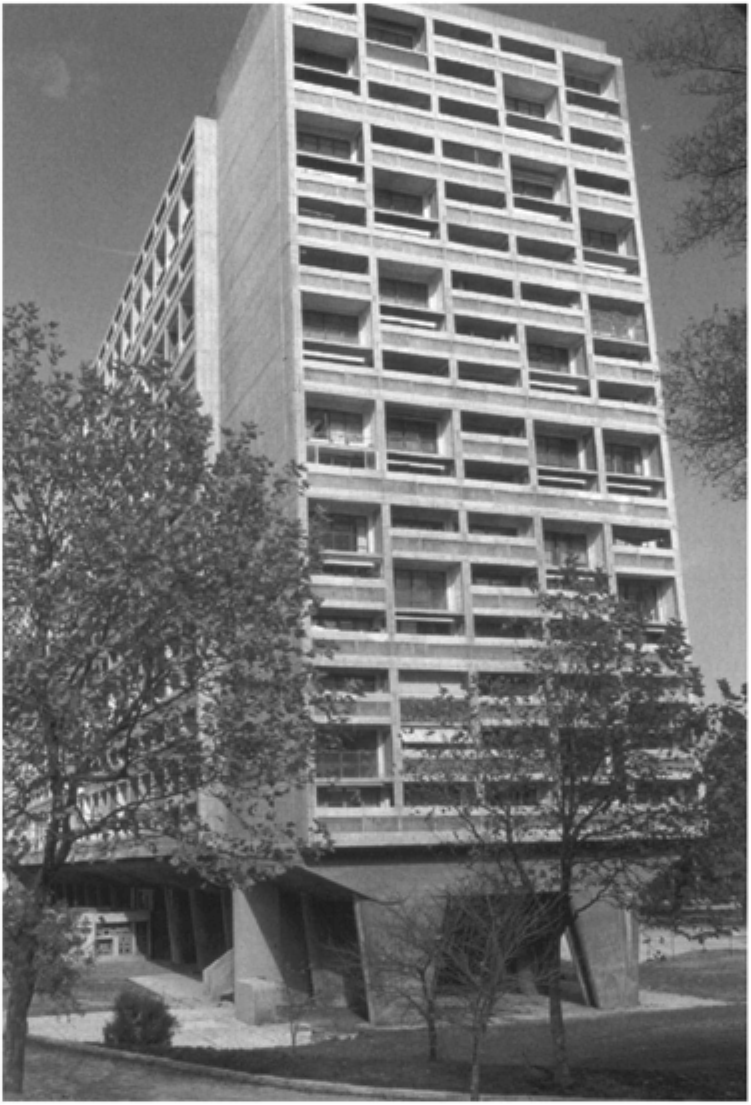
UNITÉ D'HABITATION, MARSEILLES

Designed by Le Corbusier, completed 1952 Marseilles, France

Although it never quite fulfilled its higher social purpose in its short life as public housing, the Unite d'Habitation at Marseilles today is occupied by families who clearly appreciate the building's history and architectural lineage. The first of Le Corbusier's *Unite d'habitation à grandeur conforme* to be realized, the giant, multipurpose complex containing 337 flats was meant to house 1600 people in 23 variants of the typical apartment. The two-story units range in size from small apartments for childless couples to multibedroom small houses for families of eight or more. Based loosely on the horizontal housing blocks on *pilotis* examined in the architect's 1930 book *Cité radieuse* (Radiant City), the Unite d'Habitation at Marseilles, like much of Le Corbusier's domestic architecture, was originally conceived as only part of a larger urban scheme. However, envisioning the need for postwar reconstruction in France, many of his subsequent town plans employed the principles laid out in the *Radiant City* and the Athens Charter of 1943 and contained plans for ultimately unrealized but similar garden cities. After the war, Raoul Dautry, a friend of Le Corbusier's, was appointed the first minister of reconstruction and urbanism and handed Le Corbusier the task of designing new housing in the poverty-stricken port city of Marseilles. Not quite the extensive town-planning project that Le Corbusier was hoping for (French architect and planner Auguste Perret had been drawing up the new urban plan for Le Havre in the meantime), he nonetheless garnered the support of seven subsequent ministers of reconstruction and overcame political instability in the still-Communist Marseilles, countless delays, huge cost overruns, misunderstandings at the site, and harsh criticisms from politicians, doctors, and architects alike. Ultimately, Le Corbusier managed to get an "experimental" tag placed on his plans and thus avoided the constricting zoning ordinances that would have made the building, as it was envisioned, impossible to build.

The self-contained "city" that the architect envisioned for Marseilles relinquished tradition for the convenience of the residents. The garden was on the roof, easily accessible to the nursery school and swimming pool; the "streets" were placed on floors 2, 5, 7, 8, 10, 13, and 16; and shops were placed on parts of the seventh and eighth floors instead of being intertwined with the commercial life of the city outside.

The basic apartment was laid out over two floors with a double-height living room, a kitchen, two bathrooms, two bedrooms for children separated by a movable screen to make for a larger playroom, and a third bedroom for parents. All living rooms faced onto a *bris-soleil-style* balcony that allowed sunlight to enter the apartment in winter and blocked it during the hot summer months. The kitchen is the single, unchanging element throughout the 23 different unit types. The kitchens gave a nod to the materials and beliefs employed by Americans Charles and Ray Eames and George Nelson, utilizing wood and laminated metal for countertops, tables, and cabinets and furthering the relation of the kitchen to the living room by opening the rooms to each other. There were openings from the hallways directly into the refrigerators for the delivery of ice and food, further advancing the ideas of convenience and self-containment.



Unité d'Habitation, by Le Corbusier, at Marseilles, France (1946–52)

The building was constructed after the war, a time when building materials were in short supply. Le Corbusier experimented widely with materials in Marseilles and the chapel at Ronchamp, which was being constructed simultaneously. Between these two projects, he fully developed the almost sculptural use of untreated concrete (*béton brut,* literally "raw concrete") as an acceptable building material. The project at Marseilles combined prefabricated-concrete slabs with poured- in-place forms playfully decorated with the patterns of seashells or locally fired tiles. Each apartment is fronted with a woodframed glass plate inserted behind the concrete facade. The beehive-like structure, as it was once referred to, successfully translates Le Corbusier's original metaphor of the apartment block as bottle rack, in which each apartment was inserted like a bottle into the structure. He even envisioned in future housing units that the apartment units would be constructed off-site and hoisted into place, into the rack. The ground that the "rack" sits on is a table or platform supported by hollow *pilotis* or stilts that provide an area for services beneath the great monolithic structure.

The Unité d'Habitation at Marseilles was Le Corbusier's great experimental site where he applied to the entire structure his Modular measuring scheme. Everywhere, the more rational qualities of Le Corbusier's rambling half-scientific, half-mystical system of measure are employed and illustrated down to the inscribed "modular man" on the side of the building. There is one exception to the Modular rule, and it occurred by mistake; the *bris-soleil* frames on the outside of the building were mismeasured and misproportioned in the construction phase. Le Corbusier decided to have the frames brightly painted in his trademark palette, acknowledging the moment of inspiration that one could find through error.

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S*ee also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France)**

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UNITED KINGDOM

When the 20th century opened, the United Kingdom was at the height of its political power and influence and moreover was valued in Europe as a source of ideas in architecture. In terms of modern art, Charles Rennie Mackintosh was seen to be an originator of the Art Nouveau style and became a positive influence on the Secessionist style as it developed in Vienna. During 1898, Adolf Loos wrote many polemical articles in Vienna's *Neue freie Presse* praising English fashion and products. With Hermann

Muthesius's publication of *Das englischer Haus* in 1904, Britain seemed to be ahead of continental Europe in providing more flexible models of houses and housing, one of the main strands of modernism in architecture.

However, the development was not confined to matters of taste. In terms of economics, the social structure of Britain had been changing since the onset of the industrial revolution in the later 18th century and had now created the conditions pertaining to a mass culture. Britain had pioneered the development of new industrial products from the time of the Great Exhibition of 1851. The rapid growth of London, following the explosion of the middle class and the concurrent expansion of metropolitan railways, had ensured that Britain was ahead both in achieving urban growth and thereby in being forced to begin dealing with typical 20th-century problems.

The speed with which agricultural land on the outer rim was being consumed by new housing led to anxieties about the loss of food production, and with the publication in 1902 of Ebenezer Howard's *Garden Cities of Tomorrow,* urban growth was for the first time subjected to theory, the theory of limiting it by means of new towns located within a "green belt" of protected countryside. First Letchworth in 1903 and later Welwyn in 1920 confirmed local government acceptance of Howard's thesis as the basis of urban expansion. However, this context also explains why home building in Britain took on a "rural" character because it was conceived as the opposite to city living. No doubt, a love of medieval models and the enormous success of the Arts and Crafts movement promoted by William Morris in the tradition of John Ruskin contributed to this attitude. Vernacular architecture was thought proper for suburban housing and was also adopted by architects working individually for more affluent clients: architects such as C.R.Ashbee, C.F.A.Voysey, Richard Norman Shaw, and Edwin Landseer Lutyens.

However, British culture remained strangely parochial. The French scandal of the new century turned on the Dreyfus case, a question of social identity, but the corresponding British scandal turned on Oscar Wilde, a question of personal identity. Fleeing from social ostracism, Wilde took refuge in France, and France remained the cultural center of Europe. During the years of the Entente Cordiale, French influence became paramount. At a time when even well-to-do people could not afford to build individual town houses, apartment living began to appeal to the middle class, and many apartments serviced by elevators were built in Marylebone and in Battersea, popularly known as "mansion flats." Building apartments rather than one-family houses added more effectively to city fabric, and the popular center around Piccadilly Circus became the focus of Edwardian pretensions. Shaw's style became eclectic, and his Piccadilly Hotel (1905–08) and Regent Street Quadrant are imbued with a heavy classicism. His disciple, Reginald Blomfield, later built two sides of Piccadilly Circus (1913–30) in an elegant French baroque. Mewès and Davis built the Ritz Hotel (1906), of which the grand arcade to Piccadilly is modeled on Percier and Fontaine's rue de Rivoli. It is noteworthy that Lutyens took French models for much of his later rural work, and his imperial work in New Delhi, although highly original, is conceived in a spirit of French grandeur. Between 1901 and 1913, Aston Webb laid out the Rond Point with Queen Victoria's statue, in front of Buckingham Palace, and Admiralty Arch in emulation of the Place de la Concorde and the Arc de Triomphe.

Howard Robertson, architect of the Financial Times Building in London, was the main source of theory in the schools, his *Principles of Composition* being based largely on Guadet. The Beaux-Arts dominated architectural education until the outbreak of World War I, with Robertson at the Architectural Association, Albert Richardson at London University, and Charles Reilly and W.A. Eden at Liverpool University. Where the Arts and Crafts model did not hold, it was the classical model that did. Courtenay Square (1914) in Kennington, by Adshead and Ramsey, is probably the last example of a reduced classicism still executed with conviction. By the 1920s, a neo-Georgian style dominated in architecture, as it did in poetry.

Howard Robertson's influence extended beyond theory, and his participation in the Paris Exposition of 1925 led to a considerable enthusiasm for the Art Deco style, which he promoted during the 1920s. This style is demonstrative and populist without attaining the modernist ideal of renouncing style as much. Many town halls, cinemas, and lidos were built in a lighthearted vein across the country, and the most distinguished probably are those by Oliver Bernard, whose foyers for the Strand Palace Hotel (1929–30) are superb. To this taste was added a liking for decorative brickwork stemming from the influence of W.M. Dudok's Hilversum Town Hall, apparent in the Royal Masonic Hospital (1930–34) by Sir John Burnett Tait and Lorne. The latter firm was typical in veering between a monumental classicism, sometimes with Egyptian overtones, and a reduced moderne, until in 1932 it dipped into a crude streamlined modernism, as exemplified in the Mount Royal Hotel on Oxford Street.

A certain eclecticism was in order. The Hoover Factory in Western Avenue by Wallis Gilbert, in a sort of modernized palatial mode, is the most exuberant instance of the hybrid architecture produced in Britain at this time, but the same architect could come close to an authentic modern idiom in his Daimler Car Hire Garage (1931). Charles Holden could build the Senate House and Library (1932–34) for London University in an inflated if stripped-down classical style and at the same time prefigure the modern in his very controlled work for the Piccadilly Line Underground stations at Arnos Grove and Southgate. Only Joseph Emberton, formerly an assistant to Gordon Tait, achieved genuine modernity with his Yacht Club (1930–32) at Burnham-on-Crouch and two London stores, Simpson's Piccadilly (1934–36) and the HMV Building (1938–39) on Oxford Street.

The Modern style as such did not appear in England until the very end of the 1920s by way of private individuals building villas. A breakthrough was made by the architect Amyas Connell in his famous High and Over (1927–29) at Amersham in Buckinghamshire. It is almost contemporary with Le Corbusier's Les Heures Claires at Poissy and appears to derive its aesthetic from the LaRoche-Jeanneret houses in the rue du Docteur Blanche, which Connell had seen on a visit to Paris in 1926. Here the trefoil plan does not conform to the new rationalism but stems, rather, from Lutyens. The influence of Le Corbusier was furthered by the publication in 1927 of Frederick Etchell's translation of *Vers Une Architecture*. Connell joined with two others to form the Connell, Ward, and Lucas partnership, and throughout the 1930s they produced a number of radical houses in a white-walled modern style, with windows arranged in horizontal runs. Particularly noteworthy is a group of three houses at Saltdean where the flat-roof terrace is approached by an extruded external staircase, as in Le Corbusier's "gratte-ciel" houses at Pessac of 1925. However, they also succeeded in building in the heart of conservative

Hampstead a canonic modern house at 66 Frognal.

A wider European horizon was opened up by the arrival of refugees from Hitler's Germany. Walter Gropius, Marcel Breuer, Erick Mendelsohn, and Serge Chermayeff appeared within a short period, and the last two collaborated to build the De La Warr pavilion at Bexhill-on-Sea, Sussex, while Chermayeff also completed a villa (1934) at Rugby, his own house (1935–38) at Bendey Wood near Hallam, and a warehouse for Gilbey's Gin in Camden Town. In several cases, important collaborations were entered on, with an effect on the future of English practice. Gropius collaborated with E.Maxwell Fiy in a house in Chelsea and in several unbuilt university projects as well as the Impington Village College in Cambridgeshire, which became a model for much subsequent English practice. Breuer collaborated with F.R.S.Yorke in a house (1936–37) at Angmering-on-Sea and more famously for an exhibit at the Ideal Home Exhibition of 1936, which projected an ultramodern image of "The Garden City of the Future." Fry succeeded at the same time in invading Hampstead with his own version of modernity, the "Sun House" at 9 Frognal Way, which was well received and prepared the way for a wider acceptance of the Modern style after the war.

There were a few indigenous architects who made their mark in the 1930s and made important contributions to the development of an English modernism: H.S.Goodhart-Rendel (Hays Wharf, 1929–31), George Checkley ("Thurso" house, in Cambridge, 1932), Christopher Nicolson (studio for Augustus John, 1933–34, and the London Gliding Club, Dunstable, 1934–35), Frederick Gibberd (Pullman Curt, Streatham, 1935), Raymond McGrath (house in Chertsey, 1936–37), and David Pleydell-Bouverie (Ramsgate Municipal Airport, 1936–37). It is undeniable, however, that the more original impulses came from abroad: conspicuous were Wells Coates (from Canada), whose Isokon Apartments in Camden, designed for the Pritchards in 1932–34, are still highly desired by young professionals and whose apartments (1934–35) at Brighton are a model of directness and elegance; William Lescaze (from Switzerland), whose buildings (1931–36) for the progressive school at Dartington Hall were architecturally progressive, too; and Erno Goldfinger (from Hungary), who won competitions but whose projects were unbuilt until after the war.

Perhaps most important was the collaboration between the natives Francis Skinner and Lindsey Drake and the Russian émi-gré Berthold Lubetkin in the partnership called Tecton. Lubetkin not only was energetic but also believed that the functionalist creed to which he subscribed did not deny the architect's right to make art. The Penguin Pool (1932) at the London Zoo is as playful as it is geometric, and the apartment blocks constructed at Highgate—Highpoint I (1933–35) and Highpoint II (1936–38)—are equally virtuoso in their deployment of abstract forms. Published in *The Architectural Review,* these buildings signaled the acceptance of Modern architecture by establishment critics. Its acceptance by the general public had to wait until after World War II.

A young architect who first joined Tecton and later worked on his own account was important in effecting this transition. This was Denys Lasdun. In 1948, still collaborating with Tecton, he began work on an extensive estate of public housing at Hallfield, in Paddington, together with a primary school. The elevations are marked by Lubetkin's preference for breaking the pattern of verticals at alternate floors, but the finesse Lasdun showed here gave him a central role in introducing the Modern style to a wider public.

With the election of a Labour government in 1945, England was motivated by a new spirit of cooperation produced through the war years. This spirit was celebrated in the Festival of Britain (1951), a coordinated group of exhibition buildings on semiderelict land on the south bank of the Thames opposite Charing Cross, highly visible to the public. It was put together with speed and virtuosity under the direction of Hugh Casson. With the installation of a Labour government, municipalities and local authorities were given new powers to clear slums and bomb damage and to expand public investment in building housing, schools, new universities, and even new towns. Architecture in Britain in the 1950s was earnest and populist, taking its cue from the Festival of Britain style. In the eyes of the younger generation, it was condemned as fainthearted.

The Smithsons, Alison and Peter, were the first representatives of the postwar generation. Fiercely critical of the Festival style, they expressed a determination to remake architecture in the name of ordinary people without ceasing to be radical. Their design for housing in the Golden Lane Competition (1952) showed how the access decks for high-rise housing could become “street decks,” linking different quarters together with a pedestrian network free from traffic circulation. This was not simply a proposal for housing; rather, it was a fundamental reworking of the city and, in theory, a way of building whole towns. The open-air access deck had been instituted through poor-law housing built by the Peabody Estate in the 1890s, and the system was now adopted by municipalities. The Smithsons provided intellectual leadership for the younger generation, addressing themselves to the architectural establishment as would-be reformers. Their polemic against what they called the “wasteland of the Four Functions” brought an end to the bureaucratic rationalism of CIAM (Congrès Internationaux d’Architecture Moderne) and replaced it with the more self-critical although short-lived meetings of Team X.

Their design for Hunstanton School (1950–54) was broadly Miesian in origin but less monumental, reflecting also the influence of Rudolf Wittkower, who had brought the achievements of Palladio into new focus: if Palladio could create architecture out of farm buildings, surely the modern architect could do it with utilitarian sheds. The light steel structure was used with an extreme economy, and structural walls, pipes, and services were left exposed. The result, in the view of the critic Reyner Banham, was the defining moment of a new approach—the New Brutalism—seeking an absolute honesty by exposing the mechanisms as well as the structure. Although hardly a British invention, Brutalism dominated British architecture for several decades. It was an important influence in the formation of the Archigram Group by Peter Cook in 1962 and led on to the High-Tech style, which by the 1980s had become the dominant style in Britain.

In many respects, the Smithsons’ design for the Economist Building (1963–64) represents their considered view of what an honest architecture “without rhetoric” should be. This design broke with commercial grandiosity and showed how a building could be divided into smaller entities that could be more easily absorbed into the city pattern. After the Economist Building, the Smithsons were well placed to become a successful practice. However, this did not happen, and their public housing at Robin Hood Lane was not well received.

The architects were not alone to blame for this. Both Labour and Conservative governments fell into the trap of assessing housing policy in terms of quantity rather than social effectiveness. Many mistakes were made in terms of both social environment and technical construction. In London, the collapse of an apartment block at Ronan Point signaled the end of the belief that reconstruction had been successful. Later, this collapse took on a symbolic significance, roughly equivalent to the tearing down of the Pruitt Igoe estate in St. Louis. It marked an end to the supposition that progress was inevitable and preordained.

However, this was not just a local phenomenon; it was worldwide in its impact. In the United States, the Vietnam War, in which a powerful industrial nation could not prevail against a determined people, had introduced doubt about the inevitability of technological growth. Europe, too, felt a certain loss of vision after the student events of 1968 and the oil crisis of 1973. Banham was disappointed in the reception of Brutalism by architects and accused them of monumentalism. The influence that led to this tendency was that of Le Corbusier, but it would not have taken hold so quickly had it not been for the advocacy of Leslie Martin. As chief architect of the London County Council (LCC) in 1953, he promoted a rationalized use of the Le Corbusian grid. After the construction of miniature Unite d'Habitation at Roehamption (1951–60), the Le Corbusian style was adopted for much local authority housing in London.

On resigning from the LCC, Leslie Martin founded a new professional school of architecture at Cambridge University. Martin's task was to balance the claims of research and practice and normalize an architecture that could be seen to fit into the traditional campus setting. He took a number of young architects with him who shared his admiration for rational outcomes but who were also able to act with discretion. Among these were Colin St. John Wilson, Patrick Hodgkinson, and Ivor Smith. The influence of Le Corbusier remained primary, but there was also an influence from Alvar Aalto. In Harvey Court (1957–62), a block of student residences for Gonville and Caius College designed with Wilson and Hodgkinson, the structure is in reinforced concrete, but the facing is in brickwork, so that the appearance is softened and adapted to the Cambridge scene. The internal court is also softened by stepping back the accommodation in tiers. Hodgkinson collaborated with Martin in the public housing (1965–73) carried out for Camden Council at the Foundling Estate near Russell Square. Here again, we have a stepped section, with private balconies facing east and west. Quite remarkable is the profiling of the service towers: the tops with their carefully detailed vents have more than a hint of Sant' Elia futurism, and the gable ends reveal a powerful sculptural aspect that comes pretty close to Expressionism.

Another young Cambridge architect heavily influenced by Leslie Martin was Ivor Smith. His fame rests on his role as chief designer to J.L. Womersley, the chief architect to the city of Sheffield, in the construction of housing (1955–65) at Park Hill and Hyde Park, but somewhat problematically it takes on the huge scale of what Banham termed a "megastructure." Another influence in the same direction came from the architect Denys Lasdun, who further adapted the Le Corbusian model by a confident use of the stepped section. His mammoth layout (1962–69) for the University of East Anglia and his residential extensions (1969–70) to Christ's College, Cambridge, both use stepped forms to allow the buildings to melt into the landscape. In another megastructure at Alexandria Road, public housing (1969–79) for the London County Council, the architect Neave Brown created yet another project based on the setback section, but with an explicit ideology not about landscape as such but attempting to recuperate the street as a social space.

The search for a constructional method more suitable for the British climate led to an exploration of brickwork, probably encouraged by Le Corbusier's design for the Maisons Jaoul in Paris. Most visible were the many buildings (1962–75), some using Jaoul-type vaults, constructed by Basil Spence for the University of Sussex. Most influential on other architects was the very precise use of brickwork adopted by the architects Stirling and Gowan, first in their flats (1955–58) at Ham Common and then in their building (1959–63) for the Engineering Faculty at Leicester University, where it was combined with large areas of standard glazing to spectacular effect. After the dissolution of the partnership, Stirling continued this "red-brick" attack on the ancient universities with his History Faculty (1964–67) at Cambridge and the Florey Building (1966–71) at Oxford. Although he built a major extension of the Tate Gallery in London, Stirling was not fully appreciated in Britain during his lifetime. He built in the United States for Rice University, the University of California, and Harvard University, and his Performing Arts Center (1983–88) at Cornell University is a gem of a building. He was appreciated as a master architect in Germany and built there extensively: at Stuttgart (the Neue Staatsgalerie and Music School, 1977–94), at Berlin (the Wissenschaftszentrum, 1979–87), and at Melsungen (the Braun Pharmaceutical Headquarters, 1989–92). He is arguably the most important and distinctive British architect of his generation, and his contribution to world architecture has not yet been fully assessed.

During the 1980s, British architecture was most influential when presented as a continuation of the Brutalist tradition founded by the Smithsons, emphasizing structure and services as principal expression. Important for this outcome were the teaching of Peter Cook and the fantasies of the Archigram Group, which he founded in 1962. Members of this group were employed by Piano and Rogers in making the detailed drawings for the Centre Pompidou (1971–77) in Paris, so there is a direct connection. Rogers's design for Lloyds Headquarters (1978–86) in London was in a similar vein, and specialized industrial buildings in the United States, Wales, and France have confirmed his reputation as a "scientific" architect. More recently, his European Court of Human Rights (1989–94) at Strasbourg and other projects for France show an increasing interest in the use of expressive curves as well as in adapting themselves more cogently to their sites. Designing for buildings in the city center had brought out a need to accommodate to context, and Rogers's commitment to the inner city was confirmed by the publication of his *Reith Lectures* (1995), where he made a strong argument for buildings that will be part of both a sustainable environment and a dense city fabric.

More versatile in his use of industrial components, Norman Foster has become the leading exponent of what is now referred to as the High-Tech style. Originally in partnership with Rogers (and both of their wives) as Team Four, they share a similar approach. He was first recognized for the Willis Faber and Dumas Building (1975) in Ipswich and the Sainsbury Centre for the Visual Arts (1978) at the University of East Anglia. More recently, the elegance of Stansted Airport (1990–91) has made him known to a wider public. The telecommunications tower at Torre di Collserola, near Barcelona, exploits the image of mechanism to great effect, but the Hong Kong and Shanghai Bank (1979–85) in Hong Kong and the Carré d'Art at Nîmes (1984–93) in France, by their very differences, indicate that, for all the emphasis on structure, Foster is sensitive to site conditions and can make appropriate interventions in different contexts. His ability to adjust to existing conditions was proved in the Sackler Gallery (1985–92) at the Royal Academy and confirmed by his renovations of the German Reichstag and the British Museum, both of which use elegant steel-and-glass structures to modernize classical buildings.

Younger architects who followed the High-Tech line were Farrell and Grimshaw. A partnership at the outset, they split dramatically in 1980, when Terry Farrell adopted a more variable Postmodern approach. His most conspicuous success is Embankment Place, a new commercial construction built above Charing Cross Station and highly visible from the river. Nicholas Grimshaw stayed loyal to the fixed canon of industrial architecture, but his Eurostar Terminal at Waterloo demonstrates great verve in the way it exploits the site conditions to make an expressive space. A near contemporary, Michael Hopkins, made a sophisticated industrial tent (1985) for Schlumberger at Cambridge but has shown great sensitivity with his Mound Stand (1987) at Lords Cricket Ground and the new opera house (1992–94) at Glyndbourne. His new offices for members of Parliament, opposite Big Ben, make the exposed ducting for natural ventilation into a sort of medieval roof, a strange metamorphosis of Louis Kahn's idea that the exposed servicing systems should supply the monumental aspect of a modern building.

It may be possible to deduce from these examples that, in today's United Kingdom, discretion is more important than ideology. Yet the worship of technological know-how pervades British architecture, and a still-younger generation bows to it. Will Alsop, of Alsop and Stormer, has risen to prominence with his Town Hall for Marseilles (Le Grand Bleu), and they have constructed a rail station at North Greenwich, one of the many new stations required to service the Jubilee Line, the only completely new Underground line to be constructed in London since the war, most of which make expressive use of steel and glass. Jan Kaplicky, cofounder with Amanda Levete of the aptly named Future Systems, has so far built little but has received funding from the National Lottery for the construction of a spectacular Eco-Centre at Doncaster. All these architects employ industrial components not as rational expedients but with an eye to their expressive potential. It is possible to speak of a trend that looks to revive the expressive aspects discovered by the Brutalists in the 1950s.

Indeed, with the 20th century now safely completed, the drive to attach architecture firmly to its purely physical determinants seems to have weakened to the point where one can discern a movement to revive the concept of architecture as art, as originally proposed by the Russian Constructivists. This tendency was pronounced in the early work of the Office of Metropolitan Architecture, founded in 1975 by Rem Koolhaas, Madelon Vriesendorp, and Elia Zenghelis, which at its inception practiced from London. From that background, Zaha Hadid has risen to prominence, largely because of the rejection of her winning design for the Cardiff Opera House, which led to a sympathetic reaction in her favor. She now has important commissions on foot in Germany, Italy, and Israel. Her presentations, as distinct from her constructions, are still remarkable insofar as they imitate the weightless qualities of Malevich's paintings. When they are transformed into actual constructions, as with the Fire Station (1993, with Patrik Schumacher) at Vitea in Weil am Rhein, some loss of spirit occurs. Rem Koolhaas, who still maintains an office in London, was the originator of this manner; in construction, however, his projects take on a distinctly surreal aspect, as with his Villa Dall'Ava in Paris (1985–91) and his Convention Hall (1991–97) at the International Business Centre at Lille and still more with his villa at Bordeaux.

Even more equivocal, from the rationalist point of view, are the designs proposed in Britain by the American-Polish architect Daniel Libeskind: an extension to the Victoria and Albert Museum in London and the Imperial War Museum for Manchester. In both cases, the design arises from a distinctly personal impulse: it is conceptual, indeed, but above all it is gestural. These designs are hardly representative of Britain, but the fact that they have been accepted by British cities is highly significant. Now the traditional forms of modernism, supposedly derived from rational procedure and with all the security of an objective judgment, suddenly appear as personal expression, which in principle means subject to whim and open to question. Britain, it appears, has finally joined the rest of the world in accepting the fundamental uncertainty of the postmodern condition.

ROBERT MAXWELL

S*ee also* **Archigram; Ashbee, C.R. (England); Breuer, Marcel (United States); Brutalism; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Foster, Norman (England); Grimshaw, Nicholas, and Partners (England); Gropius, Walter (Germany); Hadid, Zaha (Iraq); Loos, Adolf (Austria); Lubetkin and Tecton (England); Lutyens, Edwin (England); Mackintosh, Charles Rennie (Scotland); Postmodernism; Smithson, Peter and Alison (England); Stirling, James (Scotland and England); Voysey, Charles F.A. (England)**

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UNITED NATIONS HEADQUARTERS

New York City, completed 1953

On 26 June 1945, 50 nations founded the United Nations Organization in order to establish international political consultations for the post-World War II period. In April 1946 the United Nations Secretariat and General Assembly officially replaced the League of Nations based in Geneva. After international diplomatic debates, New York City was chosen to host the United Nations Headquarters. New York's influential city planner Robert Moses proposed to locate the United Nations buildings in a park at Flushing Meadows, Queens, on the site of the 1939 World's Fair, but the businessman John D.Rockefeller offered to buy and donate to the United Nations a site in Manhattan between First Avenue and the East River and East 42nd and 48th Streets. Although this site had accommodated slaughterhouses, and despite the lack of building space for the suborganizations (for example, UNICEF), the Secretariat and General Assembly were placed there. Planning began in 1947, and the buildings were finished in 1953.

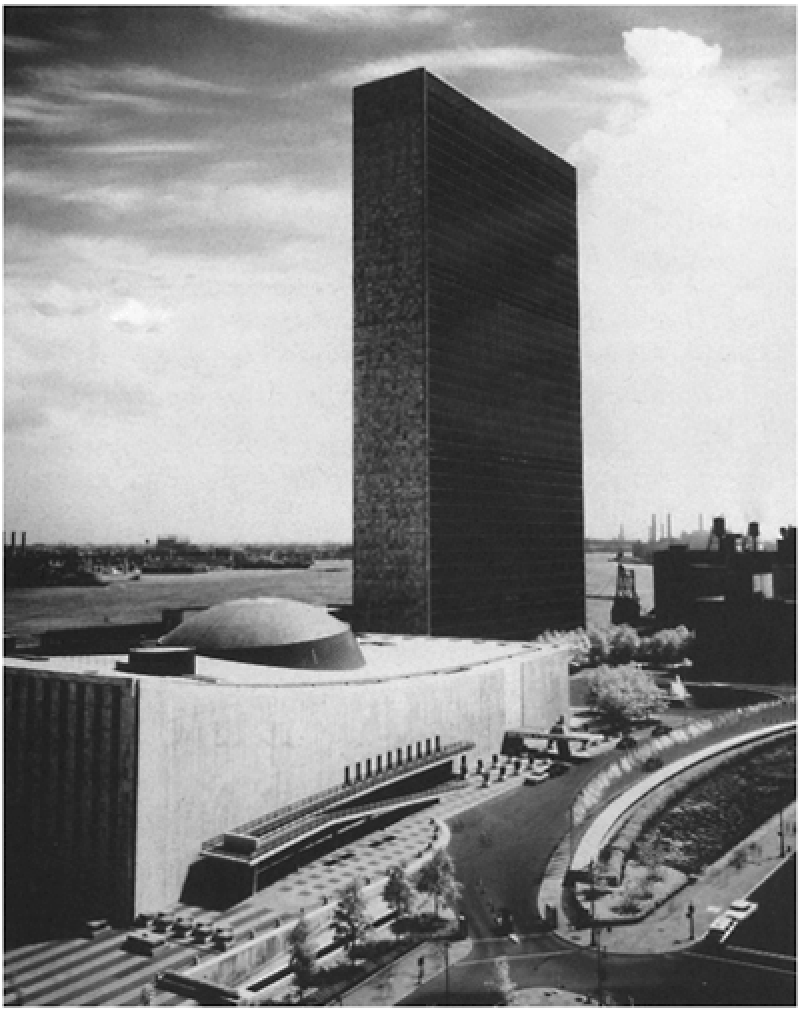
A planning commission of ten international architects directed by Wallace K.Harrison had to devise a design that was both significant and functional. Architects and critics regarded the buildings as important models for postwar political representation through architecture. A series of sketches by Le Corbusier, emphatically promoted and refined by the Brazilian modernist and member of the commission Oscar Niemeyer, directed the style debates toward a modern, functionalist design. Only certain American congressmen, who asked for a conservative classical, domed building, and the Russian delegate, who tried to push through Stalinist neoclassicism, opposed the cultural risk of modern architectural representation. Nevertheless, the International Style pattern was legitimized as appropriate for international and modern politics. Already in the 1920s, at the competition for the League of Nations Building in Geneva, the modernist architect Hannes Meyer had promoted a type of transparent architecture without ornament, dedicated only to efficient administration and political representation without any historic monumental references.

European emigrant architects such as Richard Neutra, Walter Gropius, and Mies van der Rohe had prepared the United States to accept modern architecture, and American architectural firms such as Harrison and Abramovitz and Skidmore, Owings and Merrill were professionally prepared to develop large-scale projects such as the United Nations buildings. This European-American coproduction was reflected in the design process. While the basic idea can be traced back to the sketches of Le Corbusier (who felt himself betrayed by his American colleagues), it was Wallace K.Harrison who simplified and elaborated the concept into a professional design for an administration building, thus presenting to the international public a prototype for modern office towers.

The building complex includes a high-rise slab (544 feet high and 72 feet thick) for the Secretariat offices and, on the northern edge of the site, the curving, low horizontal structure of the General Assembly. In 1963 Harrison, Abramovitz and Harris attached a library to its northeastern corner. All architectural elements of the United Nations complex are generously located in open spaces that were expanded to the west by Dag Hammarskjöld Plaza, and part of First Avenue was tunneled in order to reduce traffic noise at the site. Within the dense building context of Manhattan, this urban scheme of high-rise building and openness became prototypical for urban development in New York City and in other cities of the world during the 1950s and 1960s. Lever House, completed one year after the United Nations buildings; the Seagram Building in Manhattan; and thousands of architectural International Style copies for business uses worldwide produced a new urban order.

The rectangular design of the Secretariat slab with its reflecting curtain wall of green glass in a regular, thin aluminum grid set international design standards for postwar modern architecture. Photographs of it circulated in all international reviews. Representations of the United Nations high-rise building in stamp designs of many countries aesthetically educated postwar planners and citizens worldwide. Only the dynamically rising concrete roof of the Assembly Building breaks with the aesthetic principle of rectangularity. In lieu of applied ornament, the United Nations building complex was equipped with donated works of modern art, among them murals and sculptures by avant-garde artists Fernand Léger and Henry Moore.

Shortly after its completion, the United Nations Secretariat was presented in an exhibition at the Museum of Modern Art as prototypical modern American architecture. In the public debate about the building, the critic Lewis Mumford recognized a specific mixture of Le Corbusian utopianism and American commercialism. Many architects and politicians for different reasons rejected his positive aesthetic evaluation of the transparency and sculptural quality of the slab. Frank Lloyd Wright saw nothing more than a “characterless package” and a gloomy, dismal landmark of International Style in the building, whereas East



United Nations Headquarters, view looking east (1953)

European politicians refused the modern design for ideological reasons. Stalinist architectural doctrine regarded Western modernism as cultural colonialism of the United States. Other critics were worried about the image of bureaucracy and machinery displayed by the standardized curtain wall and office cells.

When postwar International Style architecture spread to the business districts of New York and other global cities by the end of the 20th century, the aesthetic effect of transparency encoded as political openness and honesty of a peace-oriented world administration became corrupted by commercialization and banality.

The United Nations Secretariat's aesthetics of transparency and regular cubic forms were reinterpreted by late modernism with Kevin Roche and John Dinkeloo's towers, immediately west of the Secretariat, for the hotel and office buildings called 1 and 2 United Nations Plaza (1976, 1983), thus promoting political representation by corporate architecture.

Without the historical background of New York's architectural history and international debates about the political iconography of architecture, the United Nations building complex seems to lack importance, perhaps because of the decreasing political power of this world organization. Nevertheless, the United Nations Secretariat and General Assembly buildings remain landmarks of cultural and political history.

PETER KRIEGER

See *also* **Aluminum; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Curtain Wall System; Glass; International Style; Lever House, New York City; Meyer, Hannes (Germany); Mies van der Rohe, Ludwig (Germany); Niemeyer, Oscar (Brazil); Roche, Kevin, and John Dinkeloo (United States); Wright, Frank Lloyd (United States)**

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UNITED STATES

Twentieth-century architecture in the United States exhibits multiple overlapping themes that include historicism, regionalism, and various forms of modernism. Although architects, historians, and critics throughout the 20th century sought continuities, disjuncture appeared more frequently. One attempt at constancy involved reliance on history as the source for design, as in McKim, Mead and White's Pennsylvania Station (1902–10), New York City, and Robert A.M.Stern's Darden Business School (1992–96) at the University of Virginia, Charlottesville. An alternative approach lay with the regionalists or nativists, who sought a unique American expression based on the local vernacular and, often, landscape, such as with Frank Lloyd Wright's early Prairie style houses and Antoine Predock's abstraction of native American forms. The third theme, a quest for a modern architecture, occupied many individuals and includes buildings as diverse as R.M.Schindler's King Road House (Los Angeles, 1921–22), Marcel Breuer's St. John's Abbey (Collegeville, Minnesota, 1953–61), and I.M.Pei's Louvre Pyramid (Paris, 1983–93). All three examples paid homage to abstraction and advanced building materials and techniques. Ideas concerning the American city have ricocheted from grand plazas, as with John Bakewell and Arthur Brown's San Francisco Civic Center and City Hall (1912–16, renovations 1995–99); to setback skyscrapers and elevated roads, pictured by Hugh Ferris's *Metropolis of Tomorrow* (1929); to monolithic towers with little connection to the city, exemplified by John Portman's Renaissance Center (1971–77, Detroit); and finally the ideas of Duany and Plater-Zyberk (Andrés Duany and Elizabeth Plater-Zyberk) for new towns that captured the critical discourse of the 1990s and that make up a movement termed New Urbanism. Instead of singularity, American architecture offers a competition of themes and a bewildering variety of expressions.

American Characteristics

Conditioning American architecture is the unprecedented wealth and standard of living of the country and its emergence as a dominant world power in the 20th century. What would be the nature of American culture and how it would define itself has been a perennial problem as the cult of individuality reigns.

Historicism

The strongest and most continuous theme in American architecture remains an infatuation with history and the employment of imagery from the past. The method of how this past has been quoted—from fidelity to distortion—and the range of appropriation from Colonial to European and Oriental has varied. The semiotician Umberto Eco observed that the American imagination craves the real thing, and to establish that reassurance, Americans fabricate, or reproduce imitations. Architects create buildings in which the quotation is proudly displayed: the English Georgian country houses of David Adler, such as Castle Hill, Ipswich, Massachusetts, (1924–27) or the Roman villa as the basis for the J.Paul Getty Museum (1972–74), Malibu, California, by Langdon, Wilson and Garrett, with Norman Neuerberg as consultant.

The American Renaissance, dominant from, 1890s to the 1930s and led by the firm of McKim, Mead and White and others, posited that American architecture and art could not be invented but, rather, that it should draw upon the classical past of Europe and

America. Out of this approach came the great courts of honor at the various American fairs from Buffalo (1901) to Philadelphia (1926). These courts of honor provided a model of civic architecture and led directly to the City Beautiful Movement and civic centers such as Arthur Brown's in San Francisco and state capitols that lasted well into the Depression, as for example with Cass Gilbert's West Virginia Capitol (Charleston, 1930–32) and John Russell Pope's National Gallery of Art (Washington, D.C., 1936–41).

Opposed to this classicism stood the medieval revival led by Ralph Adams Cram, who argued for the validity of the Gothic and designed over a hundred churches and significant portions of university campuses between 1900 and 1940. Cram succeeded in creating a Boston-based Gothic School that affected thousands of churches across the country, such as Frohman, Robb and Little's (and others) National Cathedral (1906–90) in Washington, D.C.

Colonial Revival, whether Spanish, English, or other nationalities, has proved to be the most lasting historicist approach. The myth of Colonial as the truest, and the earliest, American style had an effect on others that appear to be far removed. The restoration of Colonial Williamsburg (1927–) gave great impetus to Colonial Revival and made the brick Virginia Tidewater Georgian house a national image. In Florida and the Southwest, a Mission and then a Spanish Colonial Revival developed as a localized colonial revival response. Since 1926 towns such as Santa Barbara have continued to rebuild themselves along the lines of a Spanish town, even though that history is mostly fictional.

Recognition of the validity of a historicist approach vacillated in 20th-century America. From 1900 to the 1930s, historicism was the accepted norm, and architectural periodicals showed and promoted historical prototypes. However, beginning in the 1920s, the historical approach came under fire, and by the 1940s the appearance in professional architectural periodicals of buildings in historical dress was rare. From the 1940s through the mid-1970s, serious discussion of historicism as a contemporary approach to design disappeared from the profession, the schools, and writings by most critics and historians. Not all historically based design disappeared, for it thrived with builders and contractors at the suburban house level and also in the hands of many local architects. Allan Greenburg's design for the Brant House (Greenwich, Connecticut, 1979–83), which takes elements of Washington's Mount Vernon, received rave reviews in the professional press, indicating the changed climate. The work of Hartman-Cox Architects (George Hartman and Warren Cox), who began as modernists but turned to preexisting models, received similar praise. Their Georgetown University Law Center Library (Washington, D.C., 1984–89) and their additions to the Chrysler Museum (1982–89) in Norfolk, Virginia, appear as if they have stood since the 1930s.

The recognition of historicism as a valid architectural approach began in the late 1960s with a reevaluation by architects who became known as Postmodernists and by a group of younger historians who began to investigate the hitherto forbidden (i.e., outmoded) Victorian and Beaux-Arts eras. However, the greatest contributing element to the new historicism was the Historic Preservation movement, which gained great support in the 1960s and 1970s because of new federal and local legislation. From 1900 to the 1950s, preservation had a reputation as elitist—only concerned with the homes of the wealthy and in recreating historical villages. In the 1960s, however, preservationists questioned urban renewal and the destruction of sections of older cities and whole buildings such as

Pennsylvania Station (1961) in New York and the construction of unsympathetic modern structures. A reevaluation of the American built past took place with new recognition of the more recent Victorian, American Renaissance, and Art Deco buildings and even streamlined diners. One effect of the preservation movement has been to direct attention to the validity of historically based design. Within inner cities there developed an acknowledgment of the historic townscape and a contextual approach to design. Kevin Roche, a modernist, continued the original architect Francoise Ier's style for an addition to the Jewish Museum (1989) in New York; in Washington, D.C., for a new building in the Federal Triangle, James I. Freed, of Pei, Cobb, Freed, employed classical orders for the Reagan International Building (1989–98). Older structures were adapted for new purposes, such as The Cannery (San Francisco, 1968) by Joseph Esherick and Quincy Markets (Boston, 1976) by Ben Thompson. These so-called "festival markets" helped influence a semisuccessful attempt to revive main streets across the country.

The New Urbanism movement spearheaded by Duany and Plater-Zyberk at Seaside, Florida, and other places and by the firm Cooper-Robertson (Alexander Cooper and Jaquelin Robertson) and others at Celebration, Florida, draws on nostalgic interpretations of the 19th- and early 20th-century small town. All types of revival houses compete for attention. In a sense these are architectural theme parks—Disneyland as permanent lifestyle. The power of historicism and nostalgia for an earlier time are strong traits in America and have created one of its most enduring legacies.

Regionalism and Nativism

The search for a native American architecture that could be based on the local vernacular or nature has animated many architects. A recognition of localized conditions of environment can be traced far back in American history, but regionalism as a coherent architectural approach owes a debt to the Arts and Crafts philosophy of William Morris and his followers that reached America from the 1870s onward. Simple overall form and complex details became a trademark of both furniture and buildings, which often had wood peg joints and leaded glass windows contrasted with plain woodwork. In England one of the fundamental touchstones was an antimachine, anti-industry attitude and a return of artisans to the production of objects and buildings. Some Americans did adopt a handicraft ethic—especially decorative arts artisans—but overall Americans remained tied to the machine, and the Arts and Crafts aesthetic was widely commercialized in America. Frank Lloyd Wright's 1901 talk, "The Art and Craft of the Machine," noted that the machine could better provide the aesthetic qualities of simplicity and rectilinearity than the hand.

The Arts and Crafts movement in America persisted into the 1920s. Although the overall intention was for a regional response, the movement existed at the national level through the writings of publicists like Gustav Stickley and *The Craftsman* magazine. Stickley and others popularized the concept of the bungalow, the low-rising story- to-story-and-a-half house that fit easily into the landscape of suburbia and nature. Bungalows appeared from coast to coast and became the archetypal nativist house for the period of 1900 to 1925. In southern California, Irving Gill abstracted the Mission into a simplified concrete type of construction that was remarkable for its absence of details and purity of form. Also in southern California, brothers Charles Sumner and Henry Mather Greene created a very different expression, making the shingle-covered wood bungalow into an exquisite art object of delicately wrought construction. The basis of their design was the local vernacular and the elaboration of wood construction, as in the Gamble house (Pasadena, California, 1906–08). Farther north, in the Bay Area around San Francisco, Bernard Maybeck created his own personalized—and eclectic—regional response, using various foreign and American elements.

The Chicago area, led by Louis Sullivan and Frank Lloyd Wright, created a distinctive regionalism in the Prairie School. Sullivan's early work was large, urban, and commercial, but after 1900 he found such commissions difficult to secure and turned to house and small-town bank designs that fit squarely within the Arts and Crafts regional ethic. His National Farmer's Bank (1907), Owatonna, Minnesota, designed in conjunction with George Grant Elmslie, demonstrated a nativistic and original creation of ornament drawn from nature and geometry. Sullivan represented one side of the Prairie School; his descendants William Gray Purcell and Elmslie followed his lead with essentially boxy forms articulated by openings, structural members, and ornament.

Wright, who had worked for Sullivan, represents the other, better-known side of the Prairie style. Wright openly attempted to recall the landscape through low-rising forms, open spaces, and ornamental details. Except for his earliest buildings and his inexpensive housing solutions, Wright tended to break apart the form, to stretch it out, to articulate the parts into a coherent whole. The Robie House (Chicago, 1906–08) is composed of a series of layers that move upward and outward, pinned to the earth by a large chimney core, and that shelter a continuous living-dining space. Out of Wright's Oak Park Studio came a group of architects such as Walter Burley Griffin, Marion Mahony, and others who elaborated Wright's ideas and helped spread them not only nationwide but internationally.

Wright's career in the United States went into an eclipse between 1914 and 1936; he built little except for works in Tokyo and southern California. This work moves beyond the Arts and Crafts, as Wright attempted to create a native language appropriate to the site. In the Los Angeles area, Wright drew on preColumbian Indian forms. Although viewed as a modernist abroad and by many at home, Wright always claimed that his architecture came from American conditions, and he employed the word "organic" as a definition. Fallingwater (Bear Run, Pennsylvania, 1935–37) announced Wright's return to prominence and posited that American modern design should respond to the localized conditions of site. His later Usonian houses and the Guggenheim Museum (New York City, 1943–59) were attempts to forge an American architecture free of either historical or European modern prototypes.

Later followers of Wright in this quest for a nativist American design would include his Taliesin Fellowship, a few of his students, E.Fay Jones, and at some removal, independents like Bruce Goff.Jones's work has Wrightian forms and details, though with more vertical articulation. His Interdenominational Chapel (1980), Thorncrown, Arkansas, uses wooden uprights and trusses to create a magical space in the middle of a grove. Goff s work has no parallels, for although he admitted to initially being affected by Wright, his designs departed from the essentially geometrical basis of Wright. Goff eccentrically used prows, peaks, towers, carpeted walls, and fringe. His Ford House (Aurora, Illinois, 1947–50) is a round shape with two attached bedroom pods; the form is composed of lower walls of coal embedded with hunks of green glass that carry a Quonset hut frame covered in lapped siding and shingles. The interior, as with most of Goff s work, is unsettling in its unconventionality and exhilarating in its expansiveness.

Another branch of regionalism, more historically based, continued in the 1920s and 1930s with architects such as John Gaw Meem in New Mexico, Robert McGoodwin in Pennsylvania, and Royal Barry Wills in Massachusetts. They designed buildings that eclectically drew on the local vernacular imagery and met modern requirements. The work of these regionalists was accomplished and in many cases distinguished; Wills's work was especially influential because he publicized it through a series of books for homeowners, whereas Meem created an image for an entire region.

Beginning in the 1930s, a new school of abstract regionalism developed in the far west, where architects in southern California (Harwell Hamilton Harris), in the Bay Area (William Wurster), and in Oregon (Pietro Belluschi) drew on the local vernacular of cabins, barns, and ranches and also on the earlier work of Maybeck and the brothers Greene. Harris and Wurster created a "woodsy" California vernacular, using the older ranch house plan, but with open plans and simplified details influenced by the International Style. By the late 1940s, a new West Coast School was openly acknowledged, though it sometimes went under more specific names: the Redwood School, or the Bay Area Group. In the 1950s and 1960s came Joseph Esherick and the firm of Moore, Lyndon, Trumbull and Whitaker. The latter's work at Sea Ranch (1964–74), with Lawrence Halprin, picked up on the mid-19th century wooden forms from the nearby Russian settlement at Fort Ross and combined them with landscape sensitivity. Also emerging in the late 1960s and 1970s as part of the counterculture revolution would be a "butcher block," or ad hoc aesthetic of buildings constructed of seemingly random elements for specific sites.

The term "critical regionalism," coined by the critic Kenneth Frampton in 1983, although seeming to indicate a regionalist response, was really a recognition of certain local modernist idioms that had grown up internationally. Placing stress on tectonics and building processes, critical regionalism was really a critique of Postmodernism. Architects sometimes labeled as critical regionalists—Samuel Mockbee and Clark and Menefee—do draw on the local forms, but in a modernist vein. Antoine Predock created in the southwest a compelling abstraction of landscape and indigenous building forms, as in the Fine Arts Center (1985–89), Arizona State University, Tempe. The large geometric forms exude an air of nativist mystery in the harsh sunlight.

Modernism

The quest for a new or modern architecture dominated much of 20th-century American architectural thought. A polemical warfare existed between factions who attempted to define modern architecture by rigid stylistic criteria. With historical perspective, however, one can see modernism as a broad theme that contains—and continues to have—a number of different thrusts and styles or idioms, which might be labeled decorative, constructive, abstract, and Postmodern. Common to all approaches was a belief that reliance on older historical styles was intellectually bankrupt, given the tremendous social and technological changes that had occurred. A zeitgeist, or a new spirit, had arisen, brought into being by the machine or other technological advances. Architects would be avant-garde, and like painters they should create a new expression. All architectural modernists paid at least lip service to the notion of functionalism, but how it was interpreted differed widely. Few architects belonged exclusively to the decorative, constructive, abstract, or Postmodern approach. Mies van der Rohe argued that his buildings were reflective of their structure with their revealed frame, as with the apartment towers on Lake Shore Drive (Chicago, 1948–51). However, Mies was equally concerned with creating elegant abstract objects irrespective of the revealed frame, as in his Seagram Building (New York City, 1954–58). Similarly, Henry-Russell Hitchcock and Philip Johnson noted the new methods of construction as a basis for *The International Style* (1932), a book they wrote in conjunction with an exhibition at the Museum of Modern Art. However, they argued that the International Style existed irrespective of technology, with its own abstract principles that included the avoidance of applied decoration, volume rather than mass, and regularity rather than symmetry. The International Style is similar to the American Renaissance in the attempt to fix a single national architecture for all purposes. In this concern for a new universal style, some modernists stand out. Mies van der Rohe created forms that could be—and were—built everywhere.

The decorative modernist approach first emerged in the 1920s and 1930s and frequently goes under the name of Art Deco or Art Moderne. Some American architecture was directly influenced by the International Exhibition of Decorative Arts, Paris (1925), and also by the European Secessionist movement. This comes forth most obviously in the ornamental appliqué Eliel Saarinen placed on his Chicago Tribune Tower entry (1922) or in Parkinson and Parkinson's Bullocks-Wilshire Department Store (Los Angeles, 1928). Saarinen's later work remains within the decorative tradition seen especially in his highly colorful Kingswood School (Cranbrook, Michigan, 1929–31). In the later 1930s and 1940s, he evolved a more reticent and simpler modernism, though it was tied to the ornamental texture of materials.

An aspect of the Art Deco was geometrical elements in a setback form with appropriate ornament, which appeared in Bertram Goodhue's Nebraska State Capitol (Lincoln, 1921–31) and then in skyscrapers by Ralph Walker, Raymond Hood, and William Van Alen. The 1916 New York zoning regulations helped in this development because they mandated setbacks in high-rise buildings, and architects across the country imitated the form, irrespective of local zoning regulations. Hugh Ferris, an architectural renderer, showed architects how the setbacks of the tall masses could be molded. Van Alen's Chrysler Building (New York City, 1928–31) combined setbacks with a stainless steel radiating crest. At an urban scale, Raymond Hood, as the leader of a team of architects, planned Rockefeller Center (New York City, 1928–38)—a group of extravagantly decorated setback buildings.

A new decorative approach appeared in the 1950s and 1960s in some works by Philip Johnson, Wallace K.Harrison, Minoru Yamasaki, and Edward Durell Stone. They introduced patterned blocks and screens and also created forms that recalled classicism, as in Stone's United States Embassy (1954) in New Delhi, India. Johnson's Sheldon Museum (1960–63), University of Nebraska, is bounded by decorative, ahistorical pilasters and arches with subtle curves and profiles that are perhaps too graceful.

The Constructivist approach takes as its premise that technology and construction are the major design determinants and should be reflected in the final product. The 19th-century Chicago School, with its emphasis on the revealed frame, was a major influence on American architecture from the 1930s onward. Construction as the form determinant can be seen most prominently in the work of Albert Kahn, a leading factory designer in the first half of the 20th century. He produced large, elegant factories of curtain walls enclosing trusses, columns, and open interior spaces. In California the Case Study housing program of the 1940s and 1950s, led by designers such as Charles Eames and Craig Ellwood, created steel-framed houses out of industrial components. A High-Tech sensibility emerged in which great prominence was given to industrial materials, the structure, and the heating, ventilation, and air conditioning systems. The later work of Ellwood (Art Center College of Design, Pasadena, California, 1977), the early work of Hardy, Holtzman and Pfeiffer (Orchestra Hall, Minneapolis, Minnesota, 1974), and the work of Helmut Jahn (Michigan City, Indiana, Public Library, 1977) all exploited technology both as the basic expression of the building and as ornament.

Far different is the Brutalist approach of Louis Kahn, who saw technology and structure as elements to emphasize, as with the giant laboratory exhausts and reinforced-concrete, prestressed, posttensioned framing elements in the Richards Medical Laboratory (Philadelphia, 1957–61). Kahn acted as a father figure to a group of Philadelphia-based architects such as Romaldo Giurgola. Kahn's work, however, is more than just construction; it is also a concern for light and an employment of abstract references to historical prototypes such as the Italian hill town towers at the Richards Laboratory; the Romanesque barrel vaults at the Kimbell Art Museum, Fort Worth, Texas; or the tapering Egyptian pylons and Renaissance palazzos at the Phillips Exeter Library (Exeter, New Hampshire, 1965–71). As with many creative architects, Kahn escapes any precise classification.

Abstract modernism, the third major direction, is a radical ahistoricism in which all traditional imagery is absent. It first appeared in the work of émigrés such as R.M.Schindler and Richard Neutra. Schindler wanted an architecture that bore no relation to anything of the past and equally avoided contemporary stylisms. His Lovell Beach House (Newport Beach, California, 1924–26) was a series of stacked trays held aloft by a concrete frame and his later houses were exploded boxes of "Space Architecture," as he claimed, perched precariously on hillsides. Schindler fits in no stylistic categories, whereas Richard Neutra was more derivative of the Europe-based International Style. His Lovell Health House (Los Angeles, 1927–29), with its white gunite skin and steel frame, was actually more advanced technologically than its European contemporaries.

Technology was always an important element of abstract modernism, but never a determinant. The arrival in the later 1930s of another group of European émigrés such as Walter Gropius, Marcel Breuer, and Mies van der Rohe helped to make abstract modernism into the dominant American expression. Mies was the more important form-giver, and through his teaching in the College of Architecture at the Illinois Institute of Technology, Chicago—his campus design served as a demonstration—his steel-and-glass expression came to dominate American cities.

American followers of the International Style included George Howe, who with the Swiss émigré William Lescaze designed the PSFS Building (Philadelphia, 1929–32). The PSFS skyscraper, with its cool, high-styled abstraction, became a forerunner of a post-World War II phenomenon—the large, aggressively modern corporate headquarters. Instead of the safety of history as an image to be associated with, corporation presidents now sought the novel and modern. The American firm of Skidmore, Owings and Merrill became the acknowledged leaders of this building type. Under the guidance of designers Gordon Bunshaft and Bruce Graham, Skidmore, Owings and Merrill created crisp and elegant skyscrapers including the Lever House (New York City, 1949–52) and the Sears Tower (Chicago, 1974–76), as well as suburban headquarters such as Connecticut General Life (Bloomfield, Connecticut, 1954–57). The glass office tower assumed political symbolism with the United Nations Headquarters (New York City, 1947–52), designed by Wallace K.Harrison in association with foreign advisers.

Eero Saarinen provided a challenging pluralism of a different style for each commission in contrast to the single-minded steeland-glass approach. His General Motors Technical Center (Warren, Michigan, 1948–56) suggested a Miesian aesthetic, but he increasingly recognized that form knew no boundaries. In his later works such as the TWA Airport Terminal (1956–62) at New York's John F.Kennedy Airport, or the Dulles Airport Terminal in Chantilly, Virginia (1958–62), Saarinen created tremendously dynamic forms. He also explored a historical contextualism in Morse and Stiles Colleges, Yale University (New Haven, Connecticut, 1958–62), in which the earlier Gothic Revival campus was loosely recalled.

A roughness of concrete and dramatic sculptural form similar to Le Corbusier's late manner at Harvard University's Carpenter Center (Cambridge, Massachusetts, 1960–63) became a popular idiom with a group of architects from the late 1950s through the early 1970s. Paul Rudolph's Yale University Art and Architecture Building (New Haven, Connecticut, 1958–62) echoes both Wright and Le Corbusier in forms. Although Brutalism found a following, more important was the "rebirth of solids" and "a new plasticity," as Marcel Breuer explained it. He exploited the massive concrete frame in a series of large bureaucratic office buildings in the United States and abroad.

From the 1960s onward, minimalist and scaleless exterior forms reflecting the contemporaneous minimal art movement in painting and sculpture became a line of development in abstract modernism. Gordon Bunshaft's Hirshhorn Museum (Smithsonian Institution, Washington, D.C., 1967–74) was essentially a large piece of sculpture—a pure round and monolithic form. Exteriors of buildings appeared to become a single, unified material, such as reflective glass on I.M. Pei and Henry Cobb's John Hancock Buildings (Boston, 1973–77), Kevin Roche's U.N. Plaza (New York City, 1976–83), or Cesar Pelli's Pacific Design Center (Los Angeles, 1973–75). The reflective glass skin was an American trademark; similarly, long stretches of limestone with few subdivisions, as in Pei's East Wing of the National Gallery (Washington, D.C., 1968–78), also produced this clean, minimal effect.

The "white box" of the 1920s International Style experienced a revival in the 1960s and 1970s via a younger generation. The "New York Five" (Richard Meier, Michael Graves, Peter Eisenman, John Hedjuk, and Charles Gwathmey) were greatly influenced by Le Corbusier's pavilions of the 1920s and by the Anglo-American critic Colin Rowe. All moved on to different work, though Meier retained the most allegiance, showing an ability to inflate the white box into a large and more complicated scale, as with his U.S. Courthouse (Central Islip, New York, 2000).

Postmodernism in the 1970s and 1980s might have been considered a separate theme, but as the term implies, it was (or is) not a total break with modernism, but the opening of a discourse with subjects that modernism had ignored up to that point. Born of a sense of disillusionment and what was termed at the time a "failure" of abstract and technological modernism, Postmodernism frequently exhibited a contextual approach in design and a certain nostalgia for the past that contained analogies with decorative modernism. The term Postmodernism did not receive wide currency until its adoption by proponents such as Robert A.M.Stern and Charles Jencks in the mid-1970s, but its roots go back to the dissatisfaction with modernism seen in the work of Johnson, Stone, and others in the 1950s. Jane Jacobs's *The Death and Life of Great American Cities* (1961) criticized the modernist fascination with isolated buildings. Robert Venturi's *Complexity and Contradiction in Architecture* (1966) and his later (with Denise Scott Brown and Steven Izenour) *Learning from Las Vegas* (1972) were the earliest key texts of the movement. Influenced by the contemporaneous pop art movement, Venturi argued that architects should look to the roadside "strip" and that buildings were primarily "signs" with communicative systems involving nonfunctional elements such as ornament. Symbolism treated with irony became his firm's trademark. Venturi's mother's house (Vanna Venturi House, Philadelphia, Pennsylvania, 1962–64) reflects this approach with raised moldings, an oblique entrance, and a split gable that can be read as a pediment. Venturi and his partners frequently demonstrate a witty streak, as in the play on the 1910s revival of the English Jacobean Revival at Princeton University in their Wu Hall (Princeton, New Jersey, 1980–83). Initially, Charles Moore's architecture of the 1960s had a regionalist orientation, as at Sea Ranch condominiums (Sea Ranch, California, 1964–65); however, Moore also showed a sensibility to history and used ornament in an unorthodox and even distorted manner. A peripatetic teacher at many schools and universities, Moore influenced a tremendous number of younger architects. Stylized references through abstraction and distortion to earlier buildings and forms can be seen as the basis of a group of Postmodernists such as Michael Graves. Graves, who began as a neo-Le Corbusian in his earlier works, retained a modernist search for a distinctive personal language. His Public Services Building (Portland, Oregon, 1980–82), with its unique polychrome pastels and over-scaled and patently false applied classical detail, contains a lurking figurative molding of space and form. Similarly, his Den-ver Public Library (1995) has a relation to the particularized western mining context but contains its own individuality. Postmodernism's critique of the failure of modernism included its lack of theory that went beyond function and technology. The result was a theory fad that crashed through academia and promoted approaches drawn from other disciplines such as semiotics, anthropology, and gender studies. The most prominent was a form of abstract modernism called deconstructivism, which emerged in the 1980s and drew on French literary theory and philosophy and also on the Russian Constructivism of the 1920s. Deconstructivist architecture existed not as a unified approach but as a group of individuals, including Peter Eisenman, who challenged harmony, unity, and stability by designing buildings or theoretical projects in which forms are rotated, along with the appearance of odd angles, disruptive materials, and a general sense of alienation of the occupant. As shown in his Wexner Center (1985–89), Ohio State University, and the Columbus Convention Center (1989–92)—both in Columbus, Ohio—Eisenman's work is characterized by a progressive distortion and an additive and subtractive design process to create conflict-ridden, unsettling forms.

Avoiding this complex theoretical base, a new wave of abstract modernism far more sculptural and distorted in form emerged in the 1980s and 1990s, as seen in the work of Frank Gehry, Thom Mayne and Morphosis, and Eric Owen Moss—all centered in the Los Angeles area. Gehry's early work, such as his own house (Santa Monica, California, 1977–78, 1992), delighted in collage and the treatment of fragmentary elements in unorthodox ways, including asphalt floors, open stud frames, and chainlink fencing. As Gehry's work developed, it became more sculptural, as with his Advanced Technology Laboratory (1987–92) at the University of Iowa, Iowa City, and the Guggenheim Museum (Bilbao, Spain, 1993–97). The Iowa work is composed of tiled geometrical blocks, whereas in Spain, the 258,000-square-foot museum exudes a strongly organic feel with its long curling surfaces. Partially clad in titanium, the Bilbao structure continues the collage approach with its juncture of various geometries and materials.

Gehry's Guggenheim at Bilbao and other late 20th-century works such as the Korean Presbyterian Church (2000), Queens, New York, by Garofalo, with Lynn and McInturf—with its extruded frame like wings—have been likened to computer-created designs. Certainly, the working drawings and building materials fabrication were done by computer programs. Computers did aid in opening Gehry and Garofalo's vision to new exciting and abstract forms, but computers did not create the fantastic forms that were still products of the designers' imaginations.

At the end of the 20th century, American architecture was as diffuse as Gehry's project for a 40-story-tall new Guggenheim building in New York and Robert A.M.Stern's design for a Public Library in Nashville, Tennessee. Gehry's project is a wild combination of forms, whereas Stern's library recalls Paul Cret's work of the 1930s. They represent an alpha and omega of architecture: two extremely different ideas of what is American. This multiplicity of approaches in American architecture during the 20th century is its ultimate characteristic. The consequence has been many competing themes and approaches with none totally dominant and, indeed, no promise of that occurrence in the near future.

RICHARD GUY WILSON

See also **Art Deco; Art Nouveau (Jugendstil); Arts and Crafts Movement; Breuer, Marcel (United States); Brutalism; Classicism; Cram, Ralph Adams (United States); Cret, Paul Philippe (United States); Deconstructivism; Eisenman, Peter (United States); Ellwood, Craig (United States); Fallingwater, Bear Run, Pennsylvania; Gehry, Frank (United States); Goff, Bruce (United States); Goodhue, Bertram Grosvenor (United States); Greene, Henry M. and Charles S. (United States); Guggenheim Museum, Bilbao, Spain; Guggenheim Museum, New York City; Historicism; International Style; International Style Exhibition, New York (1932); Kahn, Albert (United States); Kahn, Louis (United States); McKim, Mead and White (United States); Moore, Charles (United States); Neutra, Richard**

(Austria); New York, United States; Pennsylvania Station, New York; Portland Public Services Building, Portland, Oregon; Postmodernism; Prairie School; Predock, Antoine (United States); Robie House, Chicago; Saarinen, Eero (Finland); Schindler, Rudolph M. (Austria, United States); Scott Brown, Denise (United States); Skidmore, Owings and Merrill (United States); Stern, Robert A.M. (United States); TWA Airport Terminal, New York; Vanna Venturi House, Philadelphia; Venturi, Robert (United States); Wanamaker Store, Philadelphia; Wright, Frank Lloyd (United States); Wurster, William (United States)

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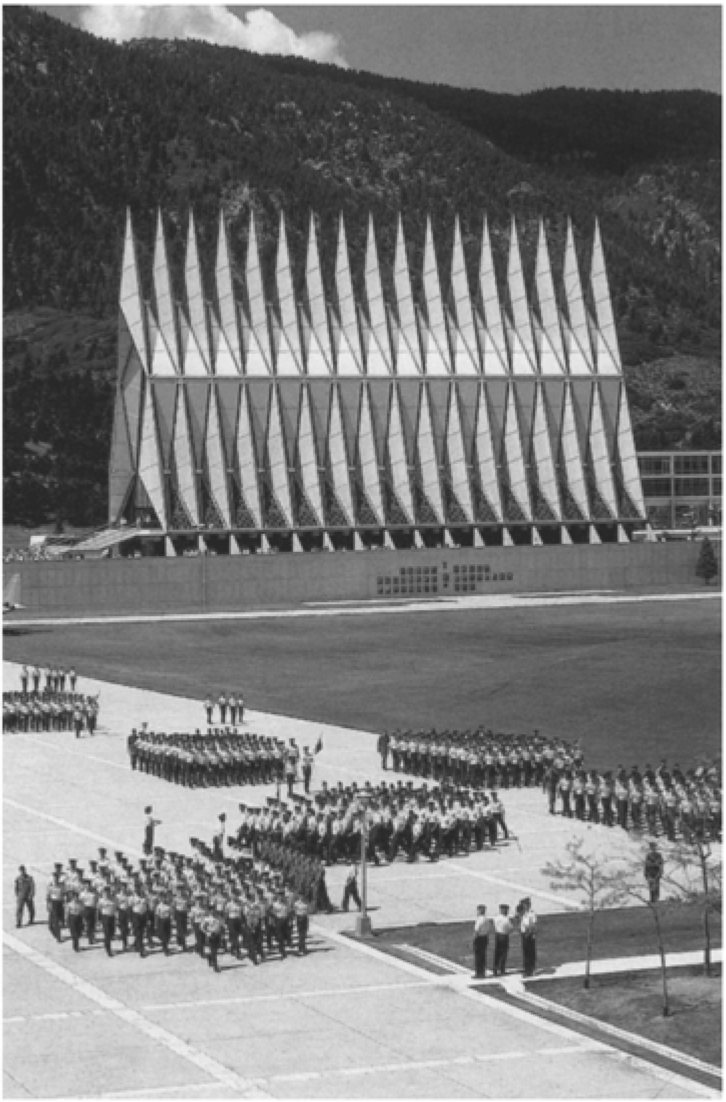
UNITED STATES AIR FORCE ACADEMY CHAPEL

Designed by Skidmore, Owings and Merrill; completed 1963

Colorado Springs, Colorado

The U.S. Air Force Academy Cadet Chapel, today the most visited man-made structure in Colorado, was once the source of a bitter controversy that extended all the way to the U.S. Congress. Because of this battle, the chapel design, completed by Walter A.Netsch, Jr., of the Chicago office of Skidmore, Owings and Merrill (SOM), was altered and finally completed after five years of planning and four years of construction. SOM was also responsible for the overall design of the campus, which they completed in the International Style. The chapel was to be both literally and figuratively the crowning element of the complex with its pointed profile, symbolizing the surrounding Rocky Mountains or, perhaps more appropriately, a group of upended fighter jets, rising above the other structures of the campus.



U.S. Air Force Academy Chapel, Colorado Springs

Photo courtesy United States Air Force Academy Headquarters

Netsch’s first design for the chapel, a modified A-frame structure with folding concrete plates, was not well received when presented to the public as part of the overall campus design in May 1955. It was labeled an “assembly of wigwams” and a “modernistic cigarette factory.” In July 1955, Frank Lloyd Wright led the criticism against the complex when it was presented to Congress, calling the design “half baked” and “resembling a wayside market." Congress held back the necessary funds for the undertaking, but the Air Force fought back, hiring a committee of architectural experts, including Eero Saarinen, Wallace K.Harrison, Welton Becket, and Pietro Belluschi, to help redesign and positively promote the project. Within days, a new scheme, complete with a more traditional chapel design located on a different part of the site, found its way to the Senate floor. Additionally, SOM and the Air Force made it clear that the chapel design was just preliminary and would not be addressed for another four years. The Senate voted to release the monies for the complex, and the Academy was saved, but the future of the chapel's design was uncertain.

Netsch, confident in the quality of his design but distraught over the lack of its acceptance, left for Europe. The trip was not only a much-needed break from the chapel conflict but also a chance to view religious architecture, which he did from Italy to England. Renewed and refreshed, Netsch went back to work

U.S. Air Force Academy Chapel, interior detail of stained glass on ceiling
Photo courtesy United States Air Force Academy Headquarters

on the design of the chapel on his return to the United States. Still, disagreement clouded the process. This time, it was concern over how to provide worship space for three separate faiths: Protestant, Catholic, and Jewish. Should there be three separate chapels, or should there be one chapel that would house all three faiths? Finally, in August of 1957, after a number of design options had been explored, Netsch and SOM presented the chapel's final design to Congress. The building, triangular in profile, was comprised of 19 spires covered with aluminum. The design was modernistic, even industrial, but Congress approved its funding. The Air Force supported Netsch's work by stating that the building would be built as designed, rejuvenating Netsch, who promptly set off with the building's model and plans on a promotional tour across the United States.

Work on the building began under the contractor Robert E. McKee of Santa Fe, New

Mexico, on 28 August 1959. The chapel was placed on a podium adjacent to the Academy's Court of Honor. The only change from the final design to the built structure was a reduction in the number of spires from 19 to 17 because of cost constraints. The spires were fashioned from 100 tubular steel-framed tetrahedrons anchored by joints to concrete buttresses. The tetrahedrons, spaced one foot apart to accept interstitial stained glass, were clad in aluminum. Inside, the chapel was divided into two levels, the upper housing the Protestant chapel and the lower the Catholic, Jewish, and All Faiths chapels. This two-level arrangement might have been impressed on Netsch from his visits to the Sainte-Chapelle in Paris, France, and the monastic church of St. Francis in Assisi, Italy.

The tetrahedrons meet 99 feet above the terrazzo floor of the 900-seat Protestant chapel. Twenty-four thousand pieces of glass, with 35 percent of it chipped to give it a jewellike appearance, fill the spaces between the tetrahedrons. Netsch carefully arranged the layout of the glass by placing the darkest of the 24 shades used at the entrance end of the chapel and progressing to the lighter colors in the front. A special laminated glass fills the triangular spaces at the chapel's northern and southern ends. A 14-foot-tall mosaic reredos completed by the painter-sculptor Lumen Martin Winter, a 46-foot-tall aluminum cross, and a 15-foot marble altar in the shape of a ship fill the liturgical north end.

The major portion of the lower level is reserved for the 500-seat Catholic chapel. The space, accessible from the south on the terrace level, consists of precast-concrete beams and columns filled with blue and amber glass sidewalls. The Baptistery and Blessed Sacrament Chapel are located on either side of the main entrance. The focal point of the space is the sanctuary with its blue-carpeted, three-step predella; a white marble altar; and Venetian glass reredos. The Catholic chapel takes its name from the marble sculpture of Our Lady of the Skies, one of the two figures in bas-relief on the 18-by-45-foot reredos, the other being the Guardian Angel. Winter was responsible for the reredos, Stations of the Cross, and the six-foot sculptured nickel silver crucifix over the altar.

Adjacent to the Catholic chapel on the north is the 100-seat Jewish chapel. Two separate entrances from the terrace arcade give access to the space. The chapel is circular in form and placed within a square foyer of purple-glass panels alternating with windows of green and blue glass. Cypress stanchions separated by translucent pebble glass separate the foyer from the chapel proper. Ludwig Y.Wolpert of the Jewish Museum in New York City designed the ecclesiastical appointments, including the Holy Ark, menorah, and Eternal Light. To the north of the Jewish chapel is the All Faiths Room, a simple space devoid of ornament and religious symbolism in order to accommodate a variety of faiths. The interior furnishing of each chapel was completed under the guidance of leaders of each faith, including the General Commission on Chaplains in the Armed Services to represent Protestant groups, the National Jewish Welfare Board, and the Roman Catholic Military Ordinariate.

On 22 September 1963, nine years after its original presentation, the Cadet Chapel was dedicated. The dedication did not, however, end the controversy surrounding it. The debate over its new, nontraditional, and modern design was reported again in the architectural and popular press. Indeed, the quest for what is appropriate in religious architecture came from the design of a creator-architect supported by a patron, in this case Walter Netsch designing for the U.S. Air Force. As the Air Force superintendent stated at the building's dedication, "The Cadet Chapel is the architectural and spiritual centerpiece of our academy. As such, it plays a vital role in developing and nurturing the character of our cadets. It is a reminder that we are a nation under God dedicated to the promotion of peace and goodwill among all nations of the world. The young women and men who come to study here do so in order to prepare themselves to protect freedom—freedom which is God's gift to all people."

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UNITY TEMPLE

Designed by Frank Lloyd Wright; completed 1909 Oak Park, Illinois

Unity Temple is the building for what was originally Unity Church (since 1961 known as the Unitarian-Universalist Church) at 875 Lake Street in the west Chicago suburb of Oak Park, Illinois, designed and built by Frank Lloyd Wright from 1905 to 1909. The structure was Wright's first church and his first building wholly of concrete. Its stark geometry and new material marked it to contemporaries as a work of modern architecture. It is among the most well-known modernist church buildings of the 20th century. Unity Temple is one of Wright's two outstanding nonresidential works of his first mature period before 1910, the other being the Larkin Company Administration Building in Buffalo, New York, designed and built in 1902–06. In his autobiography, Wright wrote of Unity Temple as one of the works that best exemplified his method of design.

Unity Church in Oak Park had previously worshiped in a traditional neo-Gothic wood building with a tall frontal steeple, which was destroyed by fire in a lightning storm in June 1905, just after Wright had returned from his first trip abroad to Japan. Wright had been raised as a Unitarian and was a member of Unity Church during his residence in Oak Park from 1887 to 1909. After the destruction of its older building, Unity Church acquired a more centrally located site and appointed a committee, headed by Rev.

Rodney Johonnot, that chose Wright as architect for a new building by September 1905. After much discussion, Unity Church approved Wright's design for Unity Temple in April 1906 for the new site on Oak Park's Lake Street amid the expensive monumental stone buildings of other Protestant churches. In the spring of 1906, construction began on Unity House, the lower rectangular southern part of the building used as a parish hall for social events, and it opened in September 1907. Unity Temple proper, the higher cubic auditorium for worship services on the site's north side, was opened for its first service in October 1908, although work continued into 1909.

Working within a tight site and a minimal budget, Wright planned Unity Temple and Unity House as two semi-independently built volumes with a common central entrance hall between them set back from Lake Street. From this street, paths along either side of Unity Temple lead back and up steps to raised outdoor terraces on the east and west sides of the entrance hall. Above the doors on both sides of the hall is a Unitarian motto of the period, affixed in bronze letters, that reads, "For the Worship of God and the Service of Man," perhaps referring to the distinct functions of Unity Temple and Unity House to either side. Once inside the entrance hall, one proceeds directly south on the same level to enter Unity House. To enter Unity Temple, one moves to the north side of the entrance hall, toward its northeast and northwest corners, into walkways on the same level that extend along the east and west sides of the temple but below its main floor. From these low walkways, or "cloisters" as Wright called them, one rises to the auditorium's main floor via half flights of steps in each of its four corners. From the main floor, other corner steps lead upward to the lower and upper galleries around the auditorium's east, north, and

Interior looking north, Unity Temple, Oak Park, Illinois (1909) west sides. These galleries, as well as the pews on the main floor level, address the pulpit in the center of the auditorium's south side, behind which rises the tall organ screen covering the room's central south wall. Worshipers at all levels were to exit the auditorium by filing to either side of the pulpit, where they could greet the minister, and then descend steps back down to the entrance hall.

Unity Temple's auditorium has clerestory windows of mostly clear glass around all four sides and a coffered ceiling of concrete beams filled with panes of colored art glass. The combination of the fully skylit central ceiling and the continuous clerestory windows around all four sides of the space makes Unity Temple's interior consistently bright with daylight. Yet because of the depth of the ceiling coffers and the deep overhang of the roof slabs beyond the clerestory windows, the ambient daylight is even, unlike unmodulated direct sunlight. The overall luminosity of the temple contrasts with the darkness of the low side access "cloisters" so that on entering the temple, one passes through darkness to light. The linear designs for both the clerestory and the skylight glass, like the designs for squared lamps that descend from the central ceiling's four corners, are related to the room's overall square and rectilinear geometry. The whole structure is of concrete, either reinforced with steel rods or encasing steel beams or trusses. Practically, the choice of concrete created a fireproof church. Symbolically, the monolithic construction conveyed the Unitarian ideal of unity, just as the liberal religious concept of divinity residing in humanity was conveyed in the auditorium's volume (which accommodated 450 worshipers who face one another in a room only 35 feet wide between balcony fronts). Wright used narrow dark-stained oak strips to define the variably tinted planar surfaces of plastered and plain concrete. The colored planes and wood lines create the room's abstract aesthetic with minimal means. In 1984, Unity Temple's original interior colors were restored, as were those of the entrance hall. Outside, Wright used repeated wood formwork for pouring walls, roof slabs, corner stair blocks, and ornamentally cast columns. The original exterior revealed the lines of this wood formwork and the pour layers of the concrete, whose surface featured an aggregate of bird's-eye gravel. In 1973–74, the building's exterior was almost entirely recoated to approximate the original surface, which was retained on the ornamental columns and roof slab soffits.

Although highly original as a design for a church building, Unity Temple might represent Wright's response to a wide range of historic and recent sources. The basic plan of Unity Temple and Unity House joined by the entrance hall recalls that of

Unity Temple, Oak Park, Illinois (1909)

the 17th-century Taiyu-in Mausoleum in Nikko, where Wright stayed briefly in April 1905. Wright's cubic geometry and ornamental columns recall the exterior massing and carved surfaces of Mayan temples known to Wright from at least 1893. A sympathetic response to such non-Western architectures would have been consistent with Unitarian convictions as to the oneness of all human religions and the antiquity of the idea of the unity of divinity. As Wright indicated, Unity Temple's square shape and galleried seating reinterpreted a long tradition of Protestant meetinghouses going back to the 16th century, including non-conformist chapels in Wales and England as well as Puritan colonial meetinghouses in New England. In modernist historiography, Unity Temple's cubic exterior and geometric interior were seen as one forerunner of Dutch De Stijl architecture. Retrospectively, Wright himself emphasized Unity Temple as the work in which he first fully engaged with architectural form as an expression of interior space. In Wright's later oeuvre, the idea of a top-lit sanctuary-like room recurred in such works as his Annie M.Pfeiffer Chapel (1938–41) for Florida Southern College in Lakeland and his Guggenheim Museum (1943–59) in New York City.

JOSEPH M.SIRY

S*ee also* **Church; Wright, Frank Lloyd (United States)**

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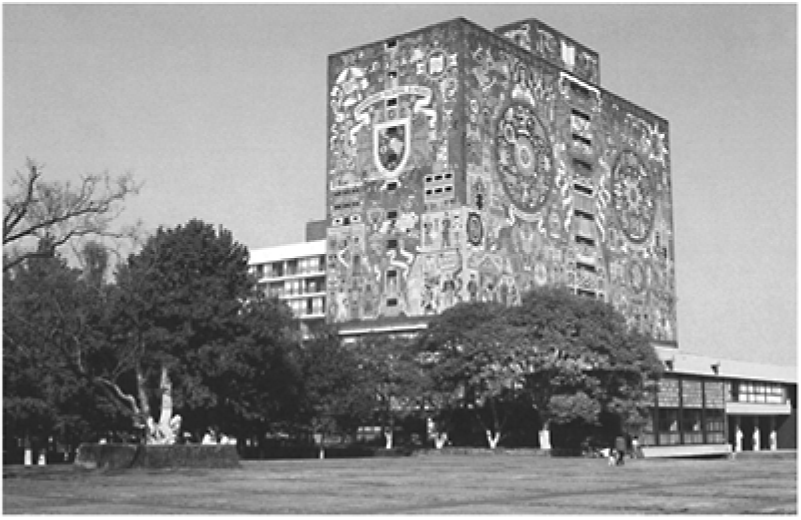
UNIVERSITY LIBRARY, UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

Designed by Juan O'Gorman, Gustavo Saavedra, and Juan Martínez Velasco; completed 1952 Mexico City, Mexico

The University Library at the Universidad Nacional Autónoma de Mexico (UNAM) in Mexico City was built as both a national book and newspaper repository and the main library of the enormous new University City complex. Since its completion in 1952, the 13-story library, its top ten floors sheathed in figurative stone mosaics, has become the signature building of the University City and one of the iconic images of 21st-century Mexico.

By the 1940s, the 400-year-old University of Mexico's outmoded facilities lay scattered across the capital city. In 1947, the Mexican government acquired 1730 acres of land in the wild, 2000-year-old Pedregal lava field at the city's southern edge—immediately adjacent to the site of Luis Barragán's Jardines del Pedregal, where work was just then beginning. Some 200 million pesos were allocated for the construction of a new, integrated campus for 25,000 to 30,000 students, and architects Enrique Del Moral, Mario Pani, and Mauricio Campos were commissioned to develop the overall plan and conduct competitions for the individual buildings. In 1950, Carlos Lazo was appointed director general of the project and made responsible for coordinating the efforts of the more than 100 architects, engineers, and artists, and 7000 workmen. Ground was broken for the first buildings that year, and by 20 November 1952, when Mexican President Miguel Alemán officially dedicated the project, the campus was 80 percent complete.

Juan O'Gorman, Gustavo Saavedra, and Juan Martínez Velasco were chosen to design the University Library. O'Gorman led this team and was also the sole designer of the building's mosaics and relief sculpture. During the 1930s, O'Gorman, an accomplished painter, had also been among the most radical exponents in Mexico of European-style functionalist modern architecture—a devoted disciple of Le Corbusier. The stripped-down, reinforced-concrete houses, schools, and factories that he built during those years were underlain by his fervent belief in the universal applicability of Le Corbusier's ideas and by his equally passionate desire to uplift a Mexican nation wracked by years of internecine warfare. By 1936, however, he withdrew from architectural practice, citing what he saw as the sterility and inappropriateness to Mexican culture of the very architec-



University Library, UNAM, Mexico City

ture that he had advocated and built. When he began designing again in the mid-1940s, it was to assist painter Diego Rivera with the Anahuacalli Museum (1944–66) in Mexico City; built to house Rivera's collection of pre-Columbian art, this was a dense, stone-walled, Mayan Revival-style truncated pyramid with corbeled arches and figurative reliefs. By this time, O'Gorman had discovered the organic architecture of Frank Lloyd Wright—he had stayed at Fallingwater as a guest of the owners and now called Wright the greatest architect of the century—and took this as the inspiration for a Mexican architecture adapted to the peculiarities of site and local culture.

The initial plan for the library submitted by O'Gorman's team called for another truncated pyramid, not unlike Anahuacalli, but larger and cleaner, with translucent onyx windows. This was ultimately rejected for diverging too far from the rectilinear structures that dominated in the central part of the campus. As finally built, the library was composed of two rectangular slabs: a horizontally disposed base surmounted by a tower. Like many of the other buildings on the UNAM campus, the library consists mainly of a reinforced-concrete frame whose interspaces are filled with hollow ceramic tile. The first two stories house reading rooms, offices, and reference and circulation areas. External walls at this level consist of metal-framed glass windows and translucent onyx clerestories. Beyond these are outdoor reading rooms surrounded by heavy stone walls decorated with low-relief sculpture showing Aztec-inspired imagery. Finally, standing directly atop a one-story glass base is the virtually windowless tower containing the book stacks. The ten air-conditioned, fluorescent-lighted stack floors were designed to accommodate 120,000 volumes each, or 1.2 million volumes total.

The building's most striking feature is the 4400 square yards of mosaics completely covering the surface of its tower. Inspired, according to O'Gorman, by the architecture of Antoni Gaudí and the French naifs Fernand Cheval and Raymond Isidore and by Aztec codices and the social realist murals of Rivera and José Clemente Orozco, the library's mosaics depict a history of ideas in Mexico. In this, they are in keeping with the deep and pervasive interest in post-World War II Mexico in defining and giving form to the national character. The north wall is devoted to the Aztecs, the south wall to the Spanish colonial era, and the two narrower end walls to the effects of these two periods on the modern nation. Principal themes represented include religion, humanism, civic life, ceremony, warfare, conquest, education, art, and science. Thirteen different colors of natural stone—brought from all parts of the country and carefully tested for color and durability—were used along with cerulean blue glass. The mosaics were prefabricated in one-meter-square panels, and full-scale drawings were used to guide the placement of the stones and concrete to bind them. Once dried, the panels were lifted and cemented into place on a metal framework fixed to the library walls. O'Gorman touted the mosaics for bringing mural-type imagery outdoors, for blending the building into the landscape (via the colors of the stone), and for their low cost (just over $50,000 for materials and labor).

The library's mosaics, along with the many other mosaics, murals, and sculptures appearing on the campus, were part of a concerted effort to link architecture with the other arts. O'Gorman extolled this "integración plástica," as he called it, as essential to a modern Mexican architecture. Many of Mexico's best-known artists, among them the muralists Rivera and David Alfaro Siqueiros, supported this integration and worked for it at the University City. Many, however, including several of the artists and architects involved there, were disappointed with the results, seeing the university's artwork as either not integrated enough or as unnecessary, undesirable, and injurious to the architecture. In a scathing critique in the November 1953 issue of *Progressive Architecture,* Sibyl Moholy-Nagy faulted the library for its "continuous mural that leaves not a square inch of the building material free to breathe." Several others at the time, however, both inside and outside Mexico, praised the library as a key element in one of the most ambitious, significant, and successful projects in contemporary world architecture—an architectural coming of age for Mexico in which functional modern forms took on a distinctive localized character. The building continues to serve as UNAM's central library.

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S*ee also* **Barragán, Luis (Mexico); Corbusier, Le (Jeanneret, Charles-Édouard) (France); Gaudí, Antoni (Spain); Mexico; Mexico City, Mexico; O'Gorman, Juan (Mexico)**

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UNIVERSUM CINEMA, BERLIN

Designed by Eric Mendelsohn; completed 1928 (Schaubühne am Lehninerplatz, reconstruction by Jürgen Sawade, 1978–81)

The Universum Cinema and the WOGA (Wohnhaus-Grundstücks-Verwertungs-Aktien-Gesellschaft) housing complex—Mendelsohn's sole realized urban project—was conceived and built in various phases between 1925 and 1931 on the last undeveloped block along the western section of the Kurfürstendamm in Berlin. The genesis of the project was made difficult by the evolving program and the rivalry with Jürgen Bachmann, another architect hired for his experience in speculative development by the site owner Mosse.

Mendelsohn's first scheme (1925) for a large residential program was quite revolutionary in the context of the bourgeois district, as it integrated the typological advances of the urban (Paul Mebes in Berlin-Stieglitz) and suburban housing reform movement (Taut and Wagner at Berlin Britz). The thin bars of cross-ventilated apartments with common green areas at the back contrasted with the lot-based character of the neighborhood. As construction proceeded at Paulsborner and Albrecht-Achilles streets according to Bachmann's plans (they showed a similar housing layout and interior residential street), Mendelsohn redesigned his scheme.

The motion picture theater and its characteristic semicircular volume on the Kudamm appeared in the second version of 1926. Lined with shops, the "streamlined" interior street or "Basarstrasse" opened on the boulevard; the other end terminated into an ellipse-shaped Revuetheater. In the definitive layout of 1928, Mendelsohn shortened the inner street and framed it with a seven-story 300-room hotel. To the left the circular Kabarett der Komiker was placed behind a restaurant, whereas on the other side, the interior axis of the 1800-seat Universum Cinema was now asymmetrically shifted to accommodate a ring of shops. A long five-story housing bar closed the site along Cicerostrasse (rebuilt in 1980–81). Its multiple entrances servicing two large apartments per floor were marked by slightly projecting curved balconies. Bands of brick-clad walls connected them, thus creating strong horizontal accents terminated by returning semicircular balconies. The half-cylindrical and glazed staircases rhythmically accentuated the garden facade.

Mendelsohn rejected the urban-utopian component of the Expressionist movement as well as advocates of an International Style that espoused purity of aesthetic means over context. He studied in Munich with Theodor Fischer (1862–1938) along with Bruno Taut, Hannes Meyer, J.J.P.Oud, and Ernst May. Under Fischer's tutelage these architects assimilated the lessons of Camillo Sitte, and further kept the street, albeit reinvented, as the primary element of their urban design strategy.

At the WOGA complex, Mendelsohn attempted to interpret the collective memory of the city. His final and genuinely tridimensional arrangement of masses—elevator shafts, stage tower above the screen, vertical hotel—achieved quasi-medieval spatial effects. The bridgelike structure of the hotel brings to mind the Torhaus or gatehouse, a centuries-old sight of the German city and a popular building type that Walter Gropius used at the Bauhaus-Dessau, and Bruno Taut and Otto Salvisberg in their Berlin housing projects. For Mendelsohn it became a recurrent device as seen in his first project for the Deutsche Metallarbeiter-Verbandshaus (1929–30) or in his design for the Alexanderplatz (1931–32). The shape of the Universum also recalled Friedrich Gilly's sketches for a modern theater (1798) inspired by the Théâtre Feydeau in Paris. Mendelsohn's brickclad volume did not reveal the theater itself as in Gotfried Semper's Opera House in Dresden (1878), but the dramatic foyer was accessed through a recessed entrance between the shops.

The WOGA complex became the point of reference for Martin Wagner's redesign of central Berlin, where the "flow lines" of motorized traffic and the "walking lines" of the pedestrians would smoothly guide the steps of the modern flâneur. This commercial *Grossstadtarchitektur* had to be inexpensive yet striking to capture the buying power of the "distracted" Berliner. From 1924 *(Metropolis)* the facades of the Ufa-Palast and other theaters in Berlin became brilliantly lighted billboards. Mendelsohn made them into architecture (*Reklamearchitektur,* according to Adolf Behne). It was so "cinematic" that its glass walls and rounded corners became the background of *Sunrise,* the first Hollywood film by Murnau in 1927.

Color, form, and light were the ingredients of Mendelsohn's architectural version of Nietzsche's *The Birth of Tragedy,* where "the music of masses in motion was contrasted with the spirit of gravity" (Neumeyer, 1999). The luminous blue of the ceiling dominated the double-height entrance hall, with the futurist glass-enclosed ticket office in the center. The mahogany-red cinema followed Mendelsohn's sketches quite closely: the bright balcony and the ceiling lights made the eyes converge toward the flat screen. For all its modernity, the cinema was still conceived of as a theater, with an orchestra pit and a small fly tower above the screen and its curtain.

The Universum influenced an entire generation of theaters around the world: from Argentina to England (the Odeon cinemas by Harry Weedon) and Tel Aviv, where I. Megidovitch's curved volume of the Kino Esther Cinema at Dizengoff Circle (1938–39) matched Mendelsohn's urban statement. In the United States, two Manhattan interiors prolonged Mendelsohn's experiment in conciseness. Frederick Kiesler's (1890–1965) Film Guild Cinema (1928–30) had a megaphone-shaped auditorium and a curtainless screen in the center of a painted circle; in the New School for Social Research (1929–31) by Joseph Urban (1872–1933), the egg-shaped auditorium displayed a bold set of red and gray colors.

The Ufa Cinema was sold in 1937. Heavily damaged by bombs during the war, it was unsympathetically remodeled several times. Put up for sale in 1975, it was saved by architect Jürgen Sawade, who convinced director Peter Stein and scenographer Karl-Ernst Herrmann to relocate their avant-garde theater, the Schaubühne am Halleschen Ufer. However, the structural problems encountered during construction and Stein's rendition of Gropius's *Totaltheater* eventually imposed a complete reconstruction. In the absence of a fly tower, the entire floor (including the seating) was made up of movable platforms on hydraulic supports. Inaugurated in 1981, the adaptable theater interior bore little relation to the historic facades and volumes. The debate about total reconstruction as legitimate means of urban renewal or historic preservation has been open since, as the controversy about the re-erection of the Berlin Stadtschloss and Schinkel's Bauakademie continues to demonstrate.

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S*ee also* **Berlin, Germany; Gropius, Walter (Germany); Mendelsohn, Erich (Germany, United States); Oud, J.J.P. (Netherlands); Taut, Bruno (Germany)**

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URBAN PLANNING

Cities are mankind's most universal contribution on earth. Throughout human history, it is within cities that mankind has explored all counterpoints of himself in relation to his physical world: man within architecture, man within nature, man as individual and communal being, man and machine, mankind within temple and shelter. From the ancient *urbs* of Rome to the modernity of downtown America, the historical aim of urban planning has been to impose physical order on things that by nature are chaotic. For two millennia, cities have been formed by the seemingly omniscient hand of urban planning or, less fortunately, by the lack thereof. Herein lies the virtually impossible meaning of urban planning.

Defining Urban Planning

Urban planning is both art and social science. It encompasses the contemporary city, the historical site, architecture, the environment, economics, and social interaction. Urban planning constructs the city of today while creating the model of the city that will exist in the next decades. Unlike architecture, urban planning is a public profession dedicated not to individual clients but to the common good, which is a weighty responsibility. Even for an urban planner, it is difficult to define the obligations and limits of the profession. To attempt to define urban planning, this article will limit itself to physical planning, to major Western cities, and to the most influential threads in the history and theory of planning.

Parameters of the subject of physical planning include facilities for housing, transportation, education, health care, and basic urban infrastructure, such as streets, sidewalks, and water supply, down to the most mundane enterprises of sewers and waste disposal. Urban planning, although often unobserved, is operating on the micro- and the macroscale. The city, as we experience its immediate urban form, is composed of street pattern, skyline, vista, and details such as streetscape, signage, and building setbacks. Urban planning must also deal with the larger issues of city form and the distribution of urban land resources through zoning, land use controls, density, and neighborhood considerations. In the urban environment, open space, greenery, and parks are integral to urban planning, and public art enlivens the city; the arts and nature are fundamental to urban design. The context of buildings is an important design element of cities; hence, the relationships of new architecture to existing urban fabric and to historical districts must be respected by the planner. The city must further be considered not in isolation but in its larger regional context. These parameters only begin to define the minimum functional city.

In the greatest of cities, function is only a starting point for urbanism, and urban design reaches higher toward monumentality, achieved through the symbolic meaning of visual configurations and architectural landmarks. We can observe historical examples of planned cities that have exceeded the expectations of function to become symbolic urban spaces in New York, London, Paris, and Rome.

A Brief History of Urban Planning

Modern Western urban planning has its origins in the Roman concept of the *castrum* city, the infinitely logical encampment created in a coherent grid in the Roman provinces, still visible in the antique sections of European towns, such as the City section of London, in the Île de la Cité of Paris, or in Tuscan squares. Thus, the contemporary idea of a city as an entity that can be envisioned, designed, constructed, and administered by a thinking authority, a kind of bureaucratic but benevolent despot (which might be thought of as the theoretical basis of modern city planning), is really quite an ancient concept. After the decline of the Roman Empire, the concept of the ordered city declined as well, as order was more often relegated to the sacred space of the cathedral than to the secular space of the city. In the French town of Chartres, for example, one finds the chaos of the medieval city's streets pushing up against the organized mass of the divinely ordered architectural universe of the cathedral.

The Renaissance, with its rebirth of ancient forms, derived and ultimately monumentalized the Roman ideal of city planning. Michelangelo's plan for the Roman Campidoglio is one of the most complete and perfectly executed plans for a city sector, constructed to front a medieval agglomeration of buildings that themselves had grown up on the edge of the once highly ordered Roman Forum. Although the Campidoglio was intended not as an inhabitable city but as a symbolic urban space, it followed the Roman ideal of the imposition of physical order on chaos. Based on Michelangelo's ingenious geometric patterning and centered on the Roman statue of Marcus Aurelius, this Renaissance masterpiece recalls the order and majesty of ancient Roman planning.

Great baroque urban schemes dwarfed even these Renaissance plans. Bernini's extension of St. Peter's exterior space into Rome via his colonnade set the stage for sweeping baroque urban-planning schemes, with their spatial command and shaping of urban space. Cities extended themselves as medieval city walls were torn down and replaced with dynamic baroque schemes throughout Europe. Whole cities became works of art as urban planning reached its dramatic heights in the 16th and 17th centuries.

The greatest sweep of urban planning, however, was yet to come in the deconstruction and reassemblage of Paris in the 19th century. Paris saw the massive imposition of planning on a chaotic, medieval city with the fervor of Baron von Haussmann's straight, grand *étoile,* or star, of boulevards, with bridges and Napoleonic monuments highlighted. The grand radiating boulevards of Paris created vistas and promenade spaces through the city that we now identify with the French Enlightenment, with clarity and reason in urban design. The influence of French planning can be felt in the United States in L'Enfant's radiating plan for Washington, D.C.

Urban planning in London is quite a contrast to Paris, for London never experienced an overlaid unifying design but remained instead a kind of crazy quilt city of interconnected sectors, some of which have within them their own individual internal order. In the

United States, Boston is the closest analogy to London in form: antique, irrational street patterns contrasting with 19th-century planned sectors. Geometric classicism in urban design had enlightened London from the 18th through the early 19th century in the planning of the west end. London's Bloomsbury, in particular, was developed with order imposed via gridded streets and squares and by the graceful repetition of building forms in the standardized 18th-century row houses.

In opposition to the urbane geometric order of Bloomsbury, however, British urban planning likewise produced plans that were decidedly antiurban and picturesque. The late 19th century in England felt a schism between city and town, urban life and suburban, that developed as a reaction to the tragic consequences of industrialization. Picturesque inventions in urban planning, the schemes for garden cities and suburbs for the amelioration of slums, such as Ebenezer Howard's *Garden Cities of To-morrow* (1902), were alternatives to cities. In the United States, the City Beautiful movement, epitomized by Daniel Burnham's Chicago and San Francisco plans, with their romanticized picturesque curvilinear lines, can be traced to this aesthetic.

Thus, the ideal of the planned city has been seen to move over two millennia from encampment to *étoile,* from geometric griddedness to picturesqueness, and now again will return to the enduring grid, for the most profoundly influential imposition in history of plan on a city is certainly the grid configuration on New York City. The grid of Manhattan, the consummate city, in conjunction with Central Park, created the city plan by which all other cities are judged. The configuration dictates the lives of millions who define their physical space by the plan: "uptown, downtown, east side, west side." The significance of urban planning is demonstrated every day on the streets of New York City, for the concrete canyons of Manhattan, so often romantically sung, are in fact more prosaically the product of New York City's 1811 grid city plan, its 1860s Olmsted park plan, and its 1916 skyscraper zoning laws.

Modern Urban Planning

In the 20th century, there was a tremendous shift in the historical concept of urban planning from art to technics. The practice of urban planning from the mid- to late 20th century had little to do with the artistic grandeur of earlier times and more to do with the technician's approach to the city as a functional entity. Massive urban population growth, the movement from rural to urban areas, two major world wars, the machine economy, the automobile, and the triumph of Marx over monarchy meant that the burden of urban planning became more about the amelioration of living conditions for the masses and less about a carriage ride through the park for those who could afford a carriage.

As urban planning took on the life of the masses, it acquired a new urgency. In the 20th century, theories of urban planning swung in wide and contradictory arcs—with very concrete consequences for cities. From the broad-stroke city plans of Le Corbusier to the curbside observations of Jane Jacobs, the city in the 20th century had seemingly every perceptive perspective and every evil visited on it. There actually exist American cities where one can trace the theoretical swings in urban planning simply by riding a bus across town, seeing the once bright future and the dashed hopes of urban occupants strewn in planned fervor on the landscape. In the East New York section of Brooklyn, where the federally funded Model Cities program collapsed before completion (but not before tearing down all existing buildings), the scarred urban land was left vacant for decades. Urban planning acquired a checkered history in the 20th century. Let us next investigate how this came to be in our times. If good intentions really did make paving, we could put an end to asphalt.

Early 20th-Century Planning

The early 20th century tended toward a utopianism in urban planning that we find bizarre today, exemplified in the metaphorical crystalline city depicted in Fritz Lang's film *Metropolis.* These early utopian planners survived one world war, lived in urban devastation, and were trying to create new cities from the depths of disillusionment with their European past. Certain of the early utopian modernists, such as Walter Gropius and the German Bauhaus designers, had humane aspirations underlying their metaphors, and they tried to bring analysis to tragedy. Empathizing with the proletariat, Gropius sought through planning to bring them the most basic necessities—in his words, "Existenzminimum," or minimum standards for living. He brought to his compassionate stance for the disenfranchised a new scientific standard, attempting for the first time to quantify quality-of-life issues: minimal space requirements, standards of health and hygiene, and light and fresh air in the city.

With their methodological approach, the planners of Germany reconstructed their war-ravaged cities and built some of the largest housing projects for the urban masses ever attempted, the *Siedlungen,* or housing projects, of the 1920s to 1930s. Although perhaps oppressive and mechanistic by today's values, these repetitive plans were humanely intentioned. The modern European ideals of urban planning became international through the meetings of CIAM (Congrès Internationaux d'Architecture Moderne), held in Europe from the 1920s to the 1950s, and were disseminated by J.L. Sert in his prophetically titled *Can Our Cities Survive?* (1942).

The most powerful, although perhaps not the most prudent, voice of CIAM and of 20th-century urbanism in general was, of course, Le Corbusier. Following in the French tradition of Haussmann, through his sweeping unbuilt Parisian plans on paper—the Contemporary City (1922) and the Ville Radieuse (1935)—Le Corbusier reinvented French creative urban design. Although his urban designs were brilliant aesthetic exercises, they were frightening living environments. Le Corbusier's plans are grandiose and potentially destructive of cities that, unlike the German, were not even destroyed by war. Le Corbusier introduced into modern urban planning the fallacy of viewing the city solely as a spatial pattern seen metaphorically and visually from above, forgetting that below, humans seek to live out their sometimes irrational, unpatterned urban lives.

If one were to compare the long-term influence on urban planning of Gropius's Bauhaus functionalism and Le Corbusier's French aestheticism, one might conclude that the derivations of both were harmful to the urban fabric of the 20th century. What differentiates them, however, is intention: the city for the common man or the city for self? While in the history of urban planning we can trace Gropius's methodical study of the angle of the sun as it hit the windows of his *Siedlungen,* we are likewise told the anecdote of Le Corbusier's designing the city of Brasilia while sitting in a restaurant, cavalierly scrawling crossed lines on a cocktail napkin. Although there is ample room for ego and self-aggrandizement in architecture, it should have no place in the discipline of urban planning.

Against the European background of the planning debates of CIAM came the work of the most famous American architect of the 20th century, Frank Lloyd Wright, who designed but never built his theoretical Broadacre City in 1938. The "Broadacre" of the title was accurate, for the design allowed each resident one acre of land for subsistence farming, but the word "City" was certainly a misnomer, for Wright's utopia was the very antithesis of the concept of city. It was antiurban in every sense, isolationist in its vision, and totally automobile dependent, so much so that we may credit Broadacre City with spreading the concept of the suburb and inadvertently its concomitant sprawl all over the United States. Wright's vision, born of his agrarian American roots and of the Depression, was not to ameliorate urban problems but to offer an American alternative that would render the city a nasty anachronism of the preautomobile age.

Critiques of Urban Planning

Without question, by the early 20th century, cities in Europe and the United States needed fixing. By necessity, the rise of urban planning as a profession distinct from architecture, economics, and urban sociology was taking root with such major constituents as the New York Regional Planning Association. After utopianism took its last gasp through the planners of the 1939 New York World's Fair, cynicism about cities replaced beliefs in beauty and human aspiration in urban planning. As planning moved away from beauty and toward technology as its goal, it lost its soul. A nadir of urban planning was reached in the mid-20th century with the advent of statistical and technological planning severed from all humanitarian concerns, as Cold War thinking marked city plans destructively with the introduction of military-industrial planning applied to city planning. Cities lost their individual realities as new planners were schooled only in applications of generic models without human content and taught to substitute mindless formulas invented for the design of complex nuclear war machines. Cities, however, are not submarines, and humans are not mathematical models. With the desperation of those who felt inferior to the technologists, urban planners repressed their innate social motivations. Disastrous results, such as the wholesale destruction of neighborhoods as "slum clearance," were often compounded by highspeed freeways cutting through neighborhoods. Worst-case examples left acres of urban land looking bombed.

By the mid-20th century, thoughtful critical voices were emerging as a counterpoint to the grandiose schemes of the utopian 1920s and 1930s and the cynical 1950s and 1960s. Primary among those voices were those of two American planners and their texts of simple messages, Kevin Lynch's *The Image of the City* (1960) and Jane Jacobs's *The Death and Life of Great American Cities* (1961), which together helped turn the tide of city planning toward a closer examination of the existing urban fabric and to the patterns of behavior of its inhabitants. Both had a kind of folksy style that appealed to urban planners, architects, sociologists, and even the general public, so often the enemy of urban planning, and thus both books have continued to be influential for decades.

Lynch was observational and insightful. On the one hand, he explained the nature of cities with a rational model, defining the city as a hierarchy of spaces; on the other hand, he simultaneously presented the irrational side of urban patterns based on humans' uncanny ability to navigate urban space in relation to memory and landmarks. What makes Lynch's approach so novel is that it was based not on a preconceived or imposed model but on actually asking city dwellers how they moved within their physical environment. Jacobs, who wrote literally from the perspective of her own window on her street in lower Manhattan, showed that the social interactions of an active pedestrian street life of a city are the essence of the urban place. She defended the life not only of city people but of city buildings as well, pointing out cogently the significance of retaining old buildings within cities. *The Death and Life of Great American Cities* remains a memorable David-versus-Goliath of wrong-headed urban planning.

Perhaps the quietly successful revolution of Lynch, Jacobs, and others of this bent now needs reexamination, for it is spurring on movements in urban planning that are actually antiurban. Jacobs wanted to preserve old buildings not as historical artifacts or self-consciously arty edifices but as low-rent generators of urban innovation. Instead, we are today boutiqueing our cities out of existence, falsifying the urban fabric. Further, nostalgic but inauthentic new towns spring forth on former desert- and farmland all over the United States, and these false places are controlled by restrictive covenants that are the antithesis of urban life. Beware planners bearing faux cities that, although certainly pretty, by definition cannot ever be real urban environments.

The Future of Urban Planning

The point of urban planning is to encompass the complexity of human experience and to formulate for that experience a physical environment that will be ever self-renewing. Authentic urban places existed in the 20th century, and they give us hope for the life of the city in the 21 st century. In London, a supreme example of urbane living is still found in Bloomsbury's squares of parks and row houses and in the 20th-century revival of 17th-century Covent Garden. In Paris, a zenith of 20th-century urban design was achieved by the physical reorganization of the museums, from the Louvre to the Gare d'Orsay along the Seine, relating beauty, urban form, antiquity, and modernism, in the image of I.M.Pei's metaphorical pyramid. In Chicago, the last decade of the 20th century witnessed the expansion of urban beauty, fulfilling again the visions presented to the world in the first decade of the century by Daniel Burnham and Edward H.Ben-nett in their *Plan of Chicago*. Parkways, boulevards, urban parks, and well-ordered streets display Chicago's vision as a city in a garden. In New York, urban planning has created the scaffolding on which city life thrives. To find urban planning for oneself, experientially, explore the planned places of Manhattan. Walk any day, any season, from Rockefeller Center up Fifth Avenue toward Central Park. Observe the living urban tableau of sleek skyscrapers, hot dog stands, hasty inhabitants, and yellow taxis in counterpoint to the park's oasis of rocks, trees, and sky. Certainly this is as close to the complete human experience of the active and the contemplative, of order amid chaos, of the power of urban planning, as any city experience is ever likely to come.

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URBAN RENEWAL

Urban renewal defies simple and brief definition and explanation. Historically, constitutive elements of urban renewal have included planning, zoning, the City Beautiful movement, the modernist ideals of the Congrès Internationaux d'Architecture Moderne (CIAM) and others, the development of public housing, slum clearance, segregation in all of its varieties, the rise of gentrification, the effects of suburbanization on cities, the rise of highways (particularly in the United States), and more recently the construction of festival marketplaces and theories of "new" urbanism. Although renewal has taken on different forms in different locations, it has been mainly a top-down hierarchical process, one that is often criticized by the very communities that it was intended to improve. The central impulse behind urban renewal, and certainly the publicly stated purpose behind all such efforts, is to make a place (a neighborhood or a whole city) better than it was before. It is the method or approach taken to such improvement that lies behind most conflicts over urban renewal.

In the early 20th century, urban renewal was often inspired by an earnest desire to help the poor by improving the conditions in which they labored and lived. A desire to help, however, was also commingled with a variety of widely held beliefs about the relationship between the moral character of a neighborhood's residents and its physical condition. Usually labeled "common sense," these assumptions about the recursive relationship between bad neighborhoods and bad residents (i.e., the poor, recent immigrants, and minorities) were often reinforced by early sociological works attempting to explain the social origins of crime, juvenile delinquency, prostitution, and so on. In the United States, furthermore, the city of the early 20th century was the product of prejudices particular to the late 19th century. With the rise of immigration and urbanization, as Peter Hall notes, "many civic-minded bourgeoisie, faced with increasing ethnic and cultural heterogeneity" and a perceived threat of escalating social disorder, saw as their task "the very preservation of the urban social fabric" (1996).

An American solution to this dilemma—one that had its antecedents in Haussmann's reorganization of Paris under Napoleon III—was the City Beautiful movement, the principles of which are expressed vividly in Daniel Burnham and Edward H. Bennett's Chicago Plan of 1909. Their plan sought to restore a lost (in the eyes of the city's elite) harmonious social order by establishing a dominant neobaroque and Beaux-Arts aesthetic that would dominate not only the design of individual buildings but also the layout of the city as a whole. This City Beautiful design conspicuously embraced hierarchies of race and class, subordinating the pressing need for housing, schools, and sanitation, and instead imagined a future for Chicago in which immigrant machine politics had been expelled and proper Anglo-Saxon order restored. The City Beautiful movement spread both throughout Europe and, under the British raj, to New Delhi, India, with a plan designed by Edwin Lutyens and Herbert Baker.

In his groundbreaking text *The City* (1925), Robert Park stated, "In the great city the poor, the vicious, and the delinquent, crushed in an unhealthful and contagious intimacy, breed in and in, soul and body." Park's assessment, with its treatment of crime and poverty as the result largely of individual pathologies rather than structural inequalities and racism, provided an academic justification for the continued restriction of certain groups to the less-favorable sections of the city. If they ("the poor, the vicious") hoped to move up and out of the slums, they would have to undertake a process of self-improvement, of moral elevation. To eradicate the slums, in such a formulation, required the eradication of the individual traits that produced and sustained slums. Park's analysis, although significantly more nuanced than the mainstream interpretation, still served to justify approaches to urban renewal that treated urban decline as the fault of the disadvantaged, as the result of faulty morals and decaying family structures. It was a view that would remain in circulation (particularly in the United States) for decades.

Following World War II, urban renewal occurred on a global scale as nations began rebuilding after the devastation that the war produced. For some nations, rebuilding in the late 1940s meant repairing not only war damage but also the structural decline that had taken effect during the years of widespread economic depression that preceded the war. In addition, in what was then West Germany, urban renewal also required the development of a new, identifiably democratic building style that would break from the traditions of architecture and urban design established by the Nazi regime (similar efforts on different scales and to different ends were also undertaken in Italy, East Germany, and Japan).

In the United States, the decades following World War II were years when the economic might of the government was channeled largely into the development of the interstate highway system and efforts to increase the number of Americans who owned their own homes. Both efforts precipitated decades of urban decline. Highways, when they passed into or through a city, invariably did so by smashing through poor and minority neighborhoods. The U.S. Federal Housing Administration (FHA), responsible for insuring the mortgages that allowed middle- and lower-income families to purchase homes, instituted regulations that discriminated against neighborhoods whose residents were poor and/or nonwhite. The FHA rules, prejudiced against heterogeneous neighborhoods and wary of "inharmonious racial or nationality groups" (Jackson, 1985), served to encourage the rapid decline of urban centers by encouraging the flight of capital and the middle class to the suburbs.

In an attempt to counter the decay fostered by such "white flight" and renovate the aging housing stock of cities such as Chicago, New York, and St. Louis, the U.S. government embarked on a campaign to spur urban renewal through the construction of public housing. The limited success and (in some opinions) monumental failure of this effort are encapsulated best by Jane Jacobs's broadside *The Death and Life of Great American Cities* (1961) and writer James Baldwin's assessment that urban renewal constituted in fact "Negro removal." Entire neighborhoods were razed, and massive housing block developments, usually in some derivative form of the International Style, were built (as cheaply as possible) in the poorer neighborhoods of cities across the United States.

By the late 1960s, the United States experienced several waves of urban uprisings. Discontent was centered around racial and economic inequality, conditions that many felt were symptomatic of modernist urban renewal and housing projects. At around the same time, the U.S. government was channeling public funds in ever greater amounts to the war in Vietnam, diverting public money away from the domestic War on Poverty (the broad collection of government programs responsible for many urban-renewal projects) instigated by President Lyndon Johnson. By the late 1970s and early 1980s, the speculative real estate market was taking an increasingly active role in reshaping impoverished neighborhoods. Gentrification, particularly in the United States, has replaced the government as the primary "renovator" of "blighted" neighborhoods. Gentrification is a process that takes advantage of liberal public policy and capital's endless reproductive drive and is, at the dawn of the 21st century, manifested on a global scale, "having emerged widely in the cities of Canada, Australia, New Zealand, and Europe, and more sporadically in Japan, South Africa, and Brazil" (Smith, 1996).

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UTOPIAN PLANNING

Thomas More's book *Utopia* of 1517 named and inspired a genre of publications concerned with future projections of ideal societies. The term "utopia," in its basic meaning "no place," describes political, economic, and sociocultural structures of a society. One essential part of the utopia concerns the relation between social forms and urban planning. Therefore, the utopia as a literary expression challenged artists, architects, and urban planners to visualize the ambience of ideal communities. More implictly "utopia" referred to an increasing interest in designing ideal cities in the 15th and 16th centuries. Based on the Aristotelian idea of architecture and urban planning as practical philosophy or on strict Platonic models of ideal societies in regular geometric city forms, thinkers such as Tommaso Campanella (*Civitas solis,* 1602) and Francis Bacon (*Nova Atlantis,* 1638) developed the philosophical idea of a better society with architectural and urban concepts. Liberated from any reference to existing political pressures, utopias served as imaginative spaces with experimental values for future development. As political imagination allows radical concepts, the utopia as a reflexive and imaginative medium turned out to be very attractive for architects and urban planners all through history.

In the 20th century, utopian thinking and designing constituted one of the most influential sources for cultural development. Economic changes such as the industrialization or political changes caused by two world wars provided, *ex negativo,* utopian planning with a rich material. Already in 1890, when William Morris published his *News from Nowhere,* the consequences of early capitalism challenged alternative models, that is, utopian visions of humane and ecological living conditions in preindustrial town settings. Opposite to that retrospective utopian thinking, artists and architects of the early 20th-century avant-garde, influenced by Nietzschean cultural philosophy and impressed by the first totally industrialized war in 1914, proposed radical visual concepts for the design of a future society, which in postwar times changed from monarchy to democracy (Germany) or communism (Russia).

With few exceptions, such as Camillo Sitte's famous urban manual, future-oriented urban and architectural proposals dominated utopian thinking during the first third of the century. Russian Constructivism (El Lissitzky), Dutch De Stijl (Theo van Doesburg), German Expressionism (Bruno Taut) and Bauhaus (Walter Gropius), or Italian futurism (Antonio Sant'Elia) required the total negation of cultural heritage to present new architectures for a new type of human race.

In perhaps no other architectural ideology does this condition for utopian design emerge more clearly than in the post—World War I writings and drawings of Le Corbusier. His radical pro-posal for a City of Three Million Inhabitants, situated in a cultural no-man's-land with no traditional references, reveals all the problems of modern utopian planning in the 20th century: a total design of standardized architectural and urban pattern for standardized members of society, thus realizing More's description of total regularity of all cities on the island of Utopia.

The destruction of many European cities during World War II allowed avant-garde architects and planners to transfer utopian wonderlands of architecture into existing spaces. Large-scale projects, such as the urban-renewal programs in the United States, exemplify a kind of utopian planning applied to urban housing. Dense historical networks of urban structures were wiped out in favor of International Style architecture. Out of the cultural critique of totalitarian functionalism (Lewis Mumford, Jane Jacobs, and many others), the retrospective utopia again gained influence. However, the most striking reaction based on insufficient post-World War II planning was the exaggeration of functional and systematic topics of modern planning.

The megastructures in enormous dimensions proposed by architectural groups such as the Metabolists, Archigram, or Superstudio were presented as the ultimate solutions for an overcrowded, polluted, and culturally exhausted planet. More or less seriously elaborated, utopian megastructures at a global scale presented technological instruments as revolutionary sociocultural tools. However, even visions of space colonies (Fritz Haller with the Massachusetts Institute of Technology) could not hide the problems of one-dimensional utopian planning. Challenged by the lack of complexity of many high-tech utopias, Postmodern ideologies, such as the end of history or the rehabilitation of vulgar commercial culture (Robert Venturi), determined utopian thinking in the 1970s and 1980s. Free exchanges of visual meanings, optical pollution by trademarks, and arbitrary style selections in architecture resulted in a capitalist utopia called Global City.

Revising the history of utopian planning now reveals a basic anthropological pattern: society wants to know and explore the future. Whereas negative utopias or frustrated illusions of modernity request difficult and complex reevalutions of the relations between political and aesthetic ideas, contemporary utopian thinking at the dawn of the 21st century reduces More's model to a mere discussion of surfaces. In this way it seems understandable how the politically encoded forms of Soviet Constructivism could be reduced to the banal and global frame of deconstructivism in the 1990s. Therefore, it might seem reasonable that current architectural and urban-planning theories hardly include political and sociocultural dimensions. Finally, reducing the complex imaginative space of utopia seems to be a consequence of many naive utopian intentions to translate political forms into architectural forms. Utopian planning is more reflection than application. Within this cultural context of the late 20th century, science fiction films and computer and Internet technology gained more importance as utopian media than architectural drawings. Film sets for *Blade Runner* or *The 5th Element* display a negative megapolitan utopia for the masses and thus revitalize utopian reflection.

Computer-aided design is located virtually in the "no place" and, if not reduced to a business superstructure, opens spaces of political imagination and aesthetic critique to a global utopian community.

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S*ee also* **Archigram, Bauhaus; Contemporary City for Three Million Inhabitants; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Doesburg, Theo van (Netherlands), Gropius, Walter (Germany); Jacobs, Jane (United States); Sant'Elia, Antonio (Italy); Taut, Bruno (Germany); Venturi, Robert (United States)**

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UTZON, JØRN 1918

Architect, Denmark

Jørn Utzon occupies a special position in 20th-century architecture that defies simple categorization. As a Dane, he invites com-parison with German Expressionism, especially Hans Scharoun; his greatest works are in Australia, Kuwait, and Mallorca; and although he gave Gunnar Asplund, Alvar Aalto, and the Dane Kay Fisker as his mentors, his casual spontaneity, his daring, and the absence of a fastidious refinement go against the grain of Danish tradition in much the same way as Asger Jorn's paintings. His architecture is self-consciously sculptural in its appeal, making Utzon more Finnish and European than Danish. Instead of intensely focusing inward in the way that Arne Jacobsen did, Utzon relocated his vision outside Denmark, taking his models from within the modern Scandinavian tradition and from Le Corbusier; this was, at the same time, allied to a new interest in an anonymous vernacular building aesthetic.

His outstanding contribution was the application of an anonymous vernacular expression to repetitive industrial building production disciplined by geometry to create a more varied, flexible, romantic building form that responds to changing human requirements.

Jørn Utzon was born in Copenhagen in 1918 but spent his childhood at Ålborg, where his father, Aage Utzon, was engineering director of the local shipyard. He completed his schooling at the Ålborg Katedralskole in 1936 and was accepted at the Kunstakademiets Arkitektskole in Copenhagen, from which he graduated in 1942. While living in Stockholm, where he stayed for the remainder of the German occupation, he was awarded a minor Royal Academy Gold Medal (1944) for his design for a music academy in Copenhagen. In 1950, Utzon returned to Denmark and started in private practice.

At the Royal Academy, Utzon was exposed to Kay Fisker and to the historian and planner Steen Eiler Rasmussen, whose experiential theory of architecture in his small book *Experiencing Architecture,* published in 1959, Utzon seems subsequently to have adopted.

Utzon traveled extensively in the early years after the war, first a short stint in Alvar Aalto's Munkkiniemi office in 1946, followed by trips to Morocco in 1947 and to the United States and Mexico in 1949. These travel experiences helped solidify his maturing organic approach. From 1945 to 1957, he vigorously participated in many competitions that he combined with extensive travel, absorbing influences from Islamic, Chinese, and Mayan architecture.

He worked alone and with others, including such Danish contemporaries as Tobias Faber and Mogens Irming; however, the most important collaborator was the Norwegian modernist Arne Korsmo. Other influences were Gunnar Asplund (from his time in Sweden) and the organic architecture of Frank Lloyd Wright, Alvar Aalto, and Le

Corbusier, whom he met in 1948.

Utzon adopted the additive composition principle of combining standard industrial components that could be augmented by adding extra elements, so that his buildings appear to grow in a manner that crudely mimics the replication of cellular organisms. Utzon was inspired in his architecture by natural phenomena, such as clouds, beech forests, and breaking waves, that he adopted in the early conceptual stage in developing his ideas.

A number of architectural ideas recur in Utzon, the courtyard house being one and the motif of the platform as a technique for relating group forms another. In 1953, with Ib Molegelvang, he won the Skaanske low-cost housing competition for “Scania” house types. His scheme was based on the ancient Chinese courtyard house, and although it was not built, Utzon went on to design the Kingohusene Housing Estate (1960) near Helsingør and a more elaborate development (1963) at Fredensborg using the courtyard principle. Although these are less known than Sydney’s Opera House, they are no less significant, and they demonstrate Utzon’s humanitarian commitment to housing innovation. The timber-component house system known as “Espansiva” (1969) took this a step further and attempted to simplify and adapt housing to exploit simple industrial materials and methods. The same concern is apparent in his Utsep Mobler Flexible Furniture (1968) system, which also applied the same additive architecture principle.

Jørn Utzon’s world fame rests largely on one work: the Sydney Opera House. Winning the international competition in 1957 thrust him overnight into the international architectural spotlight. Its completion in October 1973 made Sydney instantly recognizable and provided it with an architectural symbol that emphasized the importance of its harbor.

Utzon’s Sydney Opera House scheme coincided with Le Corbusier’s break with the 1920s cubist aesthetic for the Ronchamp chapel, Notre-Dame-du-Haut, completed in June 1955. Both emphasized the organic quality of their forms inspired by exceptional landscapes: the small plateau and acropolis at Ronchamp and a low-lying sandstone peninsula jutting out into and surrounded on three sides by the harbor in Sydney.

A number of factors help explain the Sydney Opera House’s unprecedented originality and use of shell-concrete roofs. The 1930s in Copenhagen witnessed the early development of shell concrete for the Kastrup Airport Terminal (1939) and the Radiohus Building (1946) by Vilhelm Lauritzen. In 1946, Utzon collaborated on a submission in the Crystal Palace International Competition that introduced the identical theme of concert halls with sculptural shell roofs mounted on a common platform.

Although the accusation was justified that progress on the Sydney Opera House was unacceptably slow, it is unlikely that this fact would have provoked the extreme reaction in Europe that it did in Sydney in 1966. The intransigence of Utzon’s new political master convinced him that he was no longer trusted, and this caused his withdrawal from the project. At the time this happened, Utzon had overcome the last remaining problems of acoustics and construction in the interiors and was in a position to complete the work in a reasonable time and cost. The client, Davis Hughes, and party politics prevented him from doing so.

The interiors and glass walls enclosing the open ends of the concrete vault roofs, completed by his replacement, Hall Todd and Littlemore, are neither as original nor as daring as Utzon's. The Opera House function was emasculated by relegating opera to the smaller hall, which could no longer function as a drama theater. Acoustic problems have dogged the concert hall and will be expensive, if impossible, to remedy. Despite these shortcomings, the outside is clear proof of Utzon's sculptural genius. It stands as a monument to the human imagination, shared by an entire city, on an extraordinarily sensitive site on the edge of the city where it thrusts into the harbor. Not surprisingly, it has since become the foremost symbol of Sydney around the world.

Of his later works the Bagsvaerd Church (1976) in Copenhagen and the Kuwait National Assembly Building (1983), Kuwait City, Kuwait, provide further evidence of his determination to seek a new anonymous industrial aesthetic using standardized

National Assembly Building (1983), Kuwait City, Kuwait

industrial processes that can be varied to match each requirement and that are sensitive to the landscape.

The State Theater complex for Zurich embodied the same' lessons of geometry and standardization that Utzon learned in Sydney and that were transferred to Kuwait and, to a lesser extent, to Bagsvaerd Church. At Kuwait, Utzon introduced simply draped concrete sheets similar to Eero Saarinen's Dulles Airport Terminal (1963) but gave them additional sculptural complexity by folding them laterally so that they echo the folds of the Bedouin black tent. The National Assembly Building is an elaborate mix of standard precast-concrete units that Utzon contrasted with his hanging tent roofs looking out across the Persian Gulf and backed by the desert.

The Bagsvaerd Church incorporates a freely unfolding shell of sprayed concrete that is used to support the outer metal roof and that admits a soft, muted, indirect light into the nave. Inspired in part by medieval stave churches, stacked standard precast elements are used for the double-wall frame. Its linear rectangular plan is of great simplicity and elegance. Outside, it looks more like a factory than a church.

One of Utzon's most satisfying small works is "Can Lis" (1973), his cliff house near Santyani on Mallorca. Its expression is firmly rooted in the Mallorcan vernacular but incorporates deep window embrasures that are reminiscent of the south wall of Le Corbusier's Ronchamp chapel to frame the sea vistas. It was conceived as a miniature village of four pavilions jostling one another at various odd angles that add interest to the whole and form mysterious spaces between.

Shy and charming by turns and not unlike the movie actress Greta Garbo, whom he resembles, Utzon adopted the life of a recluse after 1970. Since the 1980s, Utzon has been less active in architecture, his professional involvement being mostly indirect in a series of collaborations with his two architect sons, Jan and Kim Utzon, on unsuccessful large-scale commercial projects to rejuvenate the Copenhagen waterfront, a project for a Danish Museum of Modern Art (1988) in Fredensborg and museums at Bornholm (1988), Skagen, and Samsø Island (1995–), the latter yet to be realized.

PHILIP DREW

Biography

Born in Copenhagen, Denmark, 9 April 1918. Studied under Steen Eiler Rasmussen and Kay Fisker at the Royal Academy of Arts, Copenhagen, 1937–42; degree in architecture 1942; trav-eled and studied in Europe and North Africa 1947–48 and the United States and Mexico 1949. Assistant architect in the offices of Paul Hedquist and Gunnar Asplund, Stockholm, Sweden 1942–45; assistant architect in the office of Alvar Aalto, Helsinki 1946. In private practice, Copenhagen 1950–52, Sydney 1962–66, United States, Switzerland, and Denmark since 1966; developed a building system, "Espansiva," based on laminated wood sections 1969. Visiting professor, University of Hawaii, Honolulu 1971–75. Honorary fellow, Royal Australian Institute of Architects 1965; honorary fellow, American Institute of Architects 1970. Gold Medal, Royal Institute of British Architects 1978.

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Utzon's resistance to scholarly research and documentation and his reticence to cooperate with critical assessment has created severe problems for the serious historian, with the unfortunate consequence that there is a proliferation of errors resulting from an overreliance on secondary source material. There has been far more publication and interpretation than research into establishing reliable facts. The Fromonot account, for instance, is largely a compilation of material copied from *Zodiac* numbers 5, 10, and 14, with additions. Because these issues are rare, their republication in this way is undoubtedly useful. Utzon scholarship remains at an early stage.

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V

VANCOUVER, BRITISH COLUMBIA, CANADA

The city of Vancouver is truly of the 20th century. When the small town of Granville was incorporated as the city of Vancouver in 1886, it had more in common with American cities west of the Rocky Mountains than with the rest of Canada. San Francisco had served as Vancouver's main link to the east before the completion of Canada's transcontinental railway in 1887. Within five years the community of 1000 had grown to nearly 14,000 and the young city became a supply depot and investment center for the Klondike gold rush of 1897–98. From these boomtown beginnings, metropolitan Vancouver is now home to more than 1.8 million people.

During the early 20th century, rapid growth fueled construction of neighborhoods along the street railway and interurban lines. Before 1910 many homes were constructed of a prefabricated, insulated, four-foot modular system, designed and manufactured by the B.C.Mills, Timber, and Trading Company. Known as Vancouver Boxes, these efficient and economical houses were characterized by a single story set on a high foundation, a hip roof with dormer windows, and a broad front veranda. From 1910 until the mid-1920s, the most popular house for middle- and lower-class families was a variant of the California bungalow, typified by front gables, exposed rafter ends, and wall brackets, and often chimneys, porch piers, and foundations of rough brick or stone. These Craftsman homes, a small-scale version of the Queen Anne style, were popular amongst the suburban working classes. At one point South Vancouver was expanding at a rate of 200 families per month, all housed in California bungalows.

In contrast the region's affluent families required large formal estates for entertaining. British expatriates had a fondness for Tudor revivals, English country manors, or Arts and Crafts-style homes. In Point Grey and Shaughnessy Heights, abundantly timbered properties were developed according to the tenets of the City Beautiful movement, creating elegant neighborhoods of parks and scenic drives. In both Victoria (the provincial capital) and Vancouver, one of the most sought-after architects of this era was Samuel Maclure, whose early bungalows were modest versions of the California style—single-storied, wood-framed buildings with cross-axial plans and wood-shingle cladding. Influenced by the art and architecture of Charles F.A.Voysey and Frank Lloyd Wright, Maclure often used Tudor-revival facades to mollify his clients while creating modern designs that maximized the potential of the site and locally available materials.

Thriving business concerns led to the importation of New York and Chicago skyscraper technologies. In 1908 David Spencer and Company built a nine-story department store that was followed by the 13-story Dominion Trust Building in 1910, touted as the most modern and tallest office building in Canada. Originally designed for the Imperial Trust Company by the English-trained architect J.S.Helyer and his son Maurice, the Dominion Trust Building had a brick exterior with yellow terracotta features emulating the detailing of classical orders and was capped by a lofty Second Empire-style roof. Others followed, including the W.T.Whiteway's World Building (1912), now known as the Old Sun Tower, whose 17-story corner hexagonal office tower eclipsed the Dominion Trust Building; Parr and Fee's Vancouver Block (1912), with its conspicuous clock atop a central tower; and the Weart Building (1913) by Russell, Babcock and Rice, now known as the Standard Building. The Credit Foncier Franco-Canadien (1914) by H.L.Stevens and Company offers the most faithful emulation of neoclassical detailing.

In 1914 architect Francis Swales was commissioned to design the Hotel Vancouver to accommodate business travelers and tourists who used the Canadian Pacific Railway. This impressive assembly of cubic forms with intricate Italianate detailing and overhanging roofs dominated the Vancouver skyline until its controversial demolition in 1949. To serve the competing Canadian National Railway, another Hotel Vancouver was built in the Château style by Archibald and Schofield. Although construction had begun in 1929, it was abandoned during the Great Depression, and the hotel was only completed in time for the 1939 Royal Tour. This building's facade was an elegant expression of the restrained modern classicism in vogue at the time. Another example was the new Vancouver City Hall (1936), constructed near recently annexed South Vancouver. The architects, Townley and Matheson, adhered to the modern classical precedents established by other government architecture of the time by stepping down a series of symmetrically arranged cubic forms on opposing sides of a large central tower.

After World War I, Vancouver's thriving port facilities had fostered development of the waterfront and the commercial heart of the city, even during the Depression. The most noteworthy building of this period was J.Y.McCarter and George C. Nairne's Marine Building (1930). Both the 20-story tower and a 10-story wing have richly decorated parapets, executed in pink and green terra-cotta, which contrast with the pale-red brick walls. The striking Art Deco ornamentation incorporates terracotta panels illustrating histories of transportation and the Pacific coast.

Economic restraints during World War II limited construction to essential projects. Afterward, however, Vancouver thrived, as veterans returned to the city and foreign demand for Canada's natural resources escalated. The immigration of British-trained architects and the influence of Walter Gropius, Richard Neutra, and Marcel Breuer encouraged the development of modernist building. In 1946 a department of architecture was established at the University of British Columbia under Frederick Lasserre that began to attract international attention. Efforts of early modernists, such as C.B.K.Van Norman, Robert A.D.Berwick, Bertram C.Binning, and Peter Thornton, were quickly overtaken by younger designers like Charles E. Pratt, Ron Thom, and Fred Hollingsworth, who used new lumber products and prefabricated building systems to create a distinctive West Coast style. With an intricate arrangement of flatroofed terraces stepping down the West Bay hillside, C.E.Pratt demonstrated the West Coast style in a house designed for lumber company executive William S.Brooks (1947). Wood, steel, stone, and large expanses of glass were presented in a manner that highlighted the interrelationship between the building's interior and its natural surroundings.

In commercial building Semmens and Simpson's design for the Vancouver offices of Marwell Construction (1950) won the inaugural round of the national Massey Medal awards in 1952. Components of this scrupulously functional design transcended the normal barriers between exterior and interior. The first Vancouver high-rise constructed since the Depression era was the Burrard Building (1956) by C.K.B.Van Norman and Associates, which used a space-saving curtain wall facade.

The 1963 competition for a new university in the adjacent city of Burnaby relieved the slow pace of local construction. The successful entry by the Vancouver partnership of Arthur Erickson and Geoffrey Massey proved to be the springboard for Arthur Erickson's international career. His scheme for Simon Fraser University revolved around a strong central axis linking all campus buildings and incorporating contemporary approaches to pedagogy. In addition to the campus plan, Erickson and Massey designed the Transportation Centre (1965) and Central Mall (1965), in which massive girders of douglas fir and steel supported a glass canopy. The campus has continued to expand; Erickson also designed a university extension to the West Mall (1994) that remains faithful to the form and materials of the original campus.

The phenomenal growth of Vancouver forced developers to build vertically. High-rise residential buildings, including Rix Reinecke's Ocean Towers (1958), began to dominate the West End skyline following a permissive 1956 zoning amendment. The consequences of the rampant demolition of the 1960s and 1970s were not fully appreciated until much of the city's architectural fabric had been decimated. An emerging heritage conservation movement encouraged reuse and adaptation, one prominent example being the Sylvia Hotel addition, designed by Henriquez Partners. Noted for being the tallest building in the West End until 1958, the Sylvia Court Apartments (1912), designed by W.P. White and converted to a hotel during the 1930s, received heritage designation in 1975. This staid brick, stone, and terra-cotta structure was expanded by Richard Henriquez's tower in 1987.

Economic recession in the 1970s and 1980s proved to be a transitional stage between modernism and regionalism. Just before this construction hiatus, the firm of Rhone and Iredale was awarded the commission for Crown Life Place (1978). Their principal designer, Peter Cardew, created a dramatic V-shaped office tower in the late modern idiom, using green-tinted glass curtain walls. The 1986 Vancouver Centennial and World Exposition spurred development of Granville Island Public Market and transformation of the False Creek industrial area into a livable community. Canada Place (1986) by Zeidler Roberts Partnership hosts public events and welcomes cruise ships. Its multipurpose design incorporates a docking terminal, the PanPacific Hotel, and a row of large display halls, distinctively covered in white sail-shaped fabric.

In the 1990s competing architectural styles dominated, including Paul Merrick's Postmodern Cathedral Place (1991), a controversial complex that replaced McCarter and Nairne's much admired Georgia Medical Dental Building (1929); Moshe Safdie's Vancouver Library Square (1995); and the Chan Centre for the Performing Arts (1997), designed by Bing Thom Architects.

RHODA BELLAMY

See *also* **Canada; Safdie, Moshe (Canada, Israel)**

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VAN DOESBURG, THEO 1883–1931

Architecture historian, critic, theorist, Netherlands

As founder and polemicist for the Dutch avant-garde group De Stijl, Theo van Doesburg systematically propagated his ideas of the visual arts, architecture, design, and theory in many forms and forums. Van Doesburg was a critic, poet, novelist, performance artist, teacher, publisher, typographer, and art historian. Instrumental in the development of modern architecture, he was committed to the idea of universal synthesis. Although well known in his lifetime through associations with many international art and architectural groups, he was ultimately unsuccessful in achieving the integration of art and life through the doctrine of Neoplasticism (New Forming). Nonetheless, he was innovative in his ideas that connected art and architecture with cultural and political issues through literature, urbanism, exhibitions, performance, education, and criticism.

Immediately after his service in the Dutch army during World War I, he formed the De Stijl group with the poet Antony Kok, the painters Piet Mondrian and Bart van der Leck, the Hungarian painter and designer Vilmos Huszár, and the architects J.J.P.Oud and Jan Wils. In 1917, he began the journal *De Stijl,* remaining its editor and driving force throughout its irregular publication until 1931. Van Doesburg promoted De Stijl as "The

Style," the vehicle to annul the plurality of styles to culminate inevitably in neoplastic synthesis.

Architecturally, van Doesburg enacted this mission by appropriating ideas from painting to several buildings by Oud, Wils, and other Dutch architects. He applied primary colors to window frames and glass panels and developed colored geometric patterns for interiors beginning 1917, simultaneously writing essays and manifestos, launching De Stijl's "Manifesto 1" in 1918. Demanding the reformation of art and culture through collective collaboration, van Doesburg simultaneously emphasized the dystopic condition of the world through his efforts with the Dada artists Kurt Schwitters and Tristan Tzara. As a counterpoint to and groundwork for De Stijl, he wrote essays, sound-poems, and a novel and performed and created art under the Dada pseudonyms I.K.Bonset and Aldo Camini. Hoping to establish a pedagogical base for De Stijl, van Doesburg attempted to infiltrate the Bauhaus in Weimar between 1921 and 1922. When Walter Gropius refused him a teaching position, he formed his own De Stijl architecture course nearby.

Van Doesburg orchestrated De Stijl's international debut at the exhibition *Les Architectes du Groupe "de Styl"* held in the Galerie L'Effort Moderne in Paris in 1923. Here, among several architectural projects by members of the De Stijl group, including Gerrit Rietveld and Ludwig Mies van der Rohe, van Doesburg, in collaboration with Cornelis van Eesteren, developed two theoretical houses in drawings and models influential to the spatial and ideological development of modern architecture. The Maison d'Artiste and the Maison Particuliére were three-dimensional experiments derived from the universalizing forms explored in painting by van Doesburg and Mondrian. Their rectilinear volumes pinwheel about a voided center, emphasizing oblique movement. Their dynamic asymmetries are harmoniously balanced by the primary colors red, blue, and yellow and the noncolors black, white, and gray. Van Doesburg drew several spatially floating axonometrics, or "counter-constructions," from the Maison Particuliére. Unlike the singular fixed vantage point of traditional perspective, these speculative projections allow unlimited points of entry and exit in infinite extension. Van Doesburg photographed the models from below and proposed a sixth elevation for architecture, detached from the specificity of a site. His attempts to define an ungrounded, new conception of space in relation to time were derived from the work of Albert Einstein; van Doesburg owned several books by or about him.

Between 1926 and 1928, van Doesburg transformed two large rooms of an 18th-century building in Strasbourg, France, to the Café Aubette. Designing each as a three-dimensional De Stijl environment, he didactically positioned the rooms in relation to one another. The Small Dance Hall's primary color panels on the walls and ceiling align orthographically with the rectilinear room. Enacting van Doesburg's transition into "Elementarism" and influenced by the oblique "counter-constructions" from the Maison Particuliére, his other room, the Cinema-Dance Hall, features diagonal patterns extending through the room's corners beyond the confines of the space. In the Café Aubette, reconstructed in 1995, the projection of cinema and the oblique gestures of bodies in motion establish the spatial dialogue between art and life. Synthesizing architecture and painting as *Gesamtkunstwerk,* or total work of art, van Doesburg incorporated several different materials into the spaces and designed the menu, furniture, and signs.

Van Doesburg designed and built a house for himself and his wife, Nelly, in Meudon-Val Fleury, outside of Paris, from 1927 to 1930. Intended as a teaching studio and a residence, its main cubic space rests on *pilotis,* suspended over an open terrace. Its narrow site constricted it into a diagonal sectional arrangement. At the same time, van Doesburg planned a series of towers titled "Cité de Circulation." This diagonally oriented collection of 11-story residences, based on previous tower schemes by Le Corbusier, holds four living units per floor, each similar to his Meudon House, pinwheeling around a central open core. A rotated axonometric drawing of the Meudon House demonstrates the interdependence of the two projects—connecting painting to interior to house to city, elevated high above the ground.

MARK STANKARD

S*ee also* **Bauhaus; Bauhaus, Dessau; Le Corbusier (Jeanneret, Charles-Édouard) (France); De Stijl, Gropius, Walter (Germany); Mies van der Rohe, Ludwig (Germany); Oud, J.J.P. (Netherlands); Rietveld, Gerrit (Netherlands)**

Biography

Born in Utrecht, Holland, 30 August 1883 as Christiaan Emil Marie Küpper; renamed himself after Dutch stepfather. Began painting and writing art criticism (1908–10); published essays on Leonardo, Michelangelo, and Rembrandt. Served in Dutch army, 1914–16, subsequently settled in Leiden, began collaborating with J.J.P.Oud and Jan Wils. In 1917 formed De Stijl group and publication of the same name (with Piet Mondrian, Vilmos Huszár, Bart van der Leck, and Georges Vantongerloo). Visited Berlin and Weimar (1921), where he met Raoul Hausmann, Mies van der Rohe, Hans Richter, and Le Corbusier; participated in architectural exhibitions, Galerie l'Effort Moderne (1923, Paris) and Ecole Spéciale d'Architecture (Paris, 1924). Collaborated with Jean Arp and Sophie Taueber-Arp for decorations for Café Aubette, Strasbourg, France; returned to Paris (1929), began designing house at Meudon-Val Fleury with Cornelis van Eesteren; published first issue of avant-garde jour-nal *Art concret* 1929. Died 7 March 1931 of tuberculosis in Davos, Switzerland.

Selected Works

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VANNA VENTURI HOUSE, CHESTNUT HILL

Designed by Robert Venturi, completed 1964 Chestnut Hill, Pennsylvania

Robert Venturi’s house for his mother in Chestnut Hill, Pennsylvania, marked the formal reintroduction of architectural history into the formulaic modernist practice of architecture. Designed and constructed between 1959 and 1964, the Vanna Venturi house represents the integration of historical precedents, the demonstration of Venturi’s architectural theory, and a critique of American domesticity. In a frequently cited description of the house, Venturi explains that it

> recognizes complexities and contradictions; it is both complex and simple, open and closed, big and little; some of its elements are good on one level and bad on

> another; its order accommodates the generic elements of the house in general and the circumstantial elements of a house in particular. (Venturi, 1966)

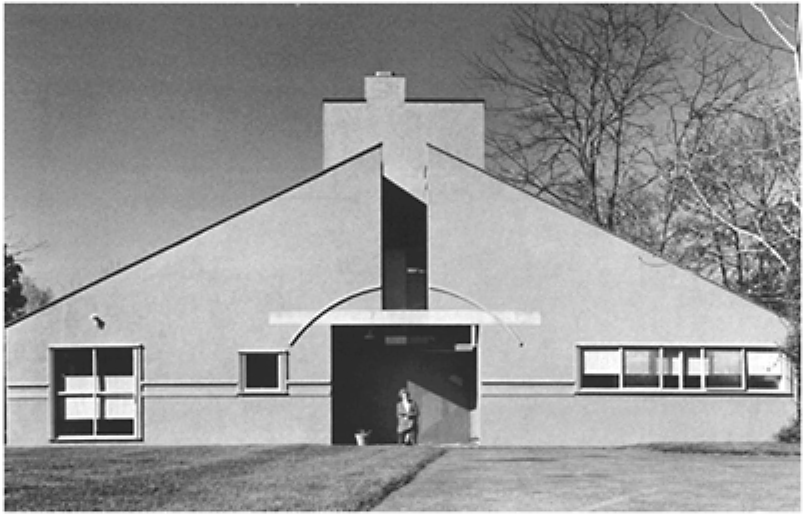
Concentrating a variety of ideological and formal issues into the approximately 1700-square-foot house, Venturi produced five complete preliminary designs before arriving at the sixth and final scheme.

A house for a family member is a typical early commission for a young architect, and Venturi's achieved notoriety through the carefully composed elevational photograph centered at its entry of Vanna Venturi looking up from her book. As it was exposed to the architectural public, the Vanna Venturi house often was vilified but seldom dismissed. It soon was referenced in the work of other architects, as in the facades of the Phillips Exeter Academy Dining Hall (1972) by Louis Kahn, who was one of Venturi's mentors. By reaching low and broadly to vernacular domestic imagery while rigorously manipulating architectural precedent at a time when architecture had turned its back on history, the Vanna Venturi house profoundly disturbed the status quo of architecture.

Robert Venturi, enacting a genteel form of avante-garde disruption, ushered in Postmodernism with a building and a book to accompany it. *Complexity and Contradiction in Architecture,* written between 1956 and 1964, was Venturi's companion piece for the Vanna Venturi house. In a recent interview, Venturi said, "What I wrote in the book was what I was thinking about while I was drawing the house" (Schwartz, 1992). Venturi published plans for the Vanna Venturi house along with a portfolio of his other work as the last chapter of *Complexity and Contradiction in Architecture,* blurring theory and practice while seamlessly weaving his architecture into the canon of significant historical buildings.

Demonstrating a modern version of the strategy of mannerism—the human desire to impair perfection—Venturi appropriated and critiqued the history of Western architecture while remaining deeply engaged with its modernist tendencies. The Vanna Venturi house quotes freely from the nymphaeum at Andrea Palladio's Villa Barbaro (1554), McKim, Mead and White's Low House (1887), Bruno Taut's Double House (1921), the Casa Girasole by Luigi Moretti (1950), and Venturi's own Beach House project (1959), depicted and discussed in *Complexity and Contradiction in Architecture.* Venturi's Guild House, designed between 1960 and 1963 for the elderly Quaker community in Philadelphia, may be interpreted as a public version of his private house for his mother, an elderly member of the Quaker church. Each building has similar configurations in plan and elevation, and they share similar windows, front arches, taut skins, and a combination of marble and everyday materials.

The uniquely pale green, stuccoed front facade of the Vanna Venturi house presents at first impression a Palladian monumental symmetry. This overall symmetry is shifted and rearranged in asymmetrical elements, such as the slightly off-center actual chimney set within the centered, large-scale chimney block and in the reciprocal distribution of five windows on each half of the house, corresponding to the rooms within. The split pediment challenges the norm of the typical gable-roofed house and vi-



Vanna Venturi House, Chestnut Hill, Pennsylvania, designed by Robert Venturi (1964)

sually exaggerates the structural capacity of the exposed concrete beam over the entry. Venturi applied a shallow arced dado molding to the facade, split by the central gap and passing over the concrete lintel. The application of thin moldings and the overall simple edges of the house make “the facades look almost like drawings” (Venturi, 1982). Venturi has privileged the perception of the drawn house over the appearance of the house itself. The front facade frequently has been compared to a child’s drawing of a generic house, conveying “houseness” in its articulation of the fundamental pragmatic and symbolic elements of house—entry, window, gabled roof, and chimney. Both elementary and complex, the front facade of the Vanna Venturi house displays a tension between its perceived ornament and structure and exhibits Venturi’s conception of “superadjacency”—drawing together elements of disparate scales.

The side facades barely exist, leftovers between front and rear. Notched patio spaces at each end minimize their presence. The rear facade combines standard window shapes in a thin-edged floating plane that seems detached from the body of the house. The extended facade wall screens a narrow deck on the upper floor with a “real” arched window behind it, in contrast to the applied arched molding at the front facade.

The plan of the house, which could be contained within a box, is based on an overall symmetry. Similar to the front facade, it diverts into a studied asymmetry. Approaching from the driveway, which is skewed to accommodate a sewer main in the street, the overscaled entry is blocked by the massive chimney. The curved foyer to the right sweeps into the dining area, with its large-scale marble tile floor setting it off from the rest of the house and suggesting a grand vestibule itself. Its high, arched ceiling envelops an independent pipe column. At the focus of the interior, the fireplace and its companion piece—the abruptly narrowing central stair—merge into a codependent entity. The shape of the wall surrounding the overscaled fireplace suggests an enormous version of an elderly woman's shoe, bringing to mind the old woman who lived in a shoe, a figurative domestic association.

The stair to the upper-level bedroom pinches in to accommodate barely one person. The upper level, which Robert Venturi occupied for about three years, contains a tiny utilitarian bathroom and storage spaces tucked under the roof eaves. An even narrower steep stair provides access to clean the high rear window, paint the clerestory, or change the exposed lightbulb. This quotidian finale is pure bathos, extending from elegant refinement to a strategically banal dead end.

From its overall site planning to the ergonomic detail of its stair rail, the Vanna Venturi house simultaneously recalls a typical American residence, gestures to a multitude of historical refer-

Vanna Venturi House interior

ences, and deliberately subverts the status of orthodox modern architecture.

MARK STANKARD

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VAN NELLE FACTORY, NETHERLANDS

Designed by J.A.Brinkman and L.C.van der Vlugt with Mart Stam, Completed 1930 Rotterdam, Netherlands

The Van Nelle factory (1930) in Schiedam, Rotterdam, Netherlands, was designed by the firm of J.A.Brinkman and L.C. van der Vlugt with Mart Stam. Completed between 1926 and 1930, it was admired by fellow modern architects and industrialists alike. The factory complex included industrial buildings for packaging, offices, and warehouse facilities for the Dutch company Van Nelle, renowned for its coffees, teas, and tobaccos. The factory still exists today.

Van Nelle Factory, Rotterdam (1928), by Johannes A.Brinkman and L.C.van der Vlugt

Over a ten-year period, the building plans changed and developed because of World War I as well as Van Nelle's need to purchase and unify an appropriate site not being realized until the fall of 1926, the year construction began on the factory buildings. The design for the project was initiated by architect Michiel Brinkman (1873–1925), who died before its completion, so the project was passed on to his young son, J.A. (Jan) Brinkman (1902–49), who, working with a more experienced architect, L.C. (Leendert Cornelis) van der Vlugt (1894–1936), completed the project.

Key in the building's innovative design was the active role of the factory owner, Kees van der Leeuw, who was involved in the design of the complex, the construction methods, and the spatial planning. As a Theosophist, he cared for his employees, which was reflected in his concern to provide them with adequate daylight. This desire paralleled the insight he gained from his 1925 travels to America, where he saw the modern factories of Albert and Moritz Kahn, all noted for their attention to light. His paternalistic view of the happy worker was similar to that of Henry Ford, and he was keen to test the already proven methods of Taylorism in factory organization and employee comfort. His knowledge of Walter Gropius's newly completed Bauhaus building in Dessau and Fagus factory in Germany inspired the transparent design of the Van Nelle factory.

The main entrance with a gatehouse opens onto the complex by means of the sweeping curved facade of the four-story administrative building for the offices and warehouses. A bridge enclosed in glass and steel connects this building to the factory at the second floor, creating the sense of the assembly lines in the flow of the buildings. The ground floor of the office building is set back, with a column supporting the corner curve that sweeps beyond the main rectangular structure. Along the curved facade are the managing director's office, meeting rooms, drafting offices, and sample rooms, and the open rectangular volume has the combined general administrative offices and employee cafeteria. This program and its manifestation demonstrate the architects' interest in Bauhaus principles.

The manufacturing buildings are sited adjacent to the Overschie River for easy transport of goods. The final built scheme, only part of what was originally planned, consists of a main factory block of different heights in one rectangular bar. The boiler house was built separately for safety. An eight-story tobacco factory, a six-story coffee factory, and a three-story tea factory were connected by glazed exterior stair towers. As a vertically organized factory, typical of the early 20th-century type, the production line moved from the upper to the lower floor, with the final product being transferred to the warehouses via exterior conveyor belts in transparent bridges. The roof of the building is capped with a circular glazed tearoom and viewing platform for visitors and staff.

As an early use of a glass-and-steel curtain wall, the arresting transparent facade is one of the building's genuinely iconic elements. The technical achievements in the design of this glass curtain wall and its construction using machine-made parts led to the further exploration of curtain-wall technologies for many other building types. The vertical mullion elements are steel, sprayed with a zinc coating, and the horizontal spandrels are steel sheets. The effect was of a continuous band of glass and metal in a new industrial aesthetic.

To keep the floors of the factory open for flexible use and to hold the heavy packing machinery, engineer Jan Gerko Wiebenga (1886–1974), who often worked with Van der Vlugt, designed an open system. Using a concrete frame, he placed octagonal concrete mushroom columns on the interior's perimeter within two rows of central columns spaced in 5-by-5.70-meter modules in the tobacco factory and 5.70-by-5.70-meter modules in the other two sections. This design created beamless concrete floor slabs that were cantilevered beyond the perimeter columns and allowed space along the facade for conduits and hallways. The polished concrete floor also contained cables and electric conduits. The last phases of the project included a workers' cafeteria, playing fields, store blocks, and garages. Many years after the Van Nelle factory was constructed, Reyner Banham noted that Mart Stam had played a more significant role in the design of the building than previously considered (footnote in Reyner Banham, *Theory Design in the Machine Age,* Architectural Press, London, 1960).

Van Nelle was seminal as part of the Dutch Nieuwe Bouwen, one of the many groups of European architects who concentrated on the issues of technical progress and modern architecture and who worked to improve the quality of housing and working environments. While providing a decent working environment, the building allowed in plenty of light and air and provided spaces for administrative staff and factory workers, thus being pragmatic in its form to serve the function of the factory. Brinkman and Van der Vlugt went on to design stores for Van Nelle, including housing and commercial buildings.

NINA RAPPAPORT

S*ee also* **Factory; Gropius, Walter (Germany); Rotterdam, Netherlands**

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VAN DE VELDE, HENRI 1863–1957

Architect and interior designer, Belgium

Henri van de Velde was a leading figure of Belgian Art Nouveau. He was born in Antwerp into a family with strong interest in the arts. His father was a pharmacist and a director of the local arts festival. After having contemplated a career as a composer, van de Velde chose to become a painter instead. He studied at the Antwerp Art Academy (1880–83) and at the atelier of Carolys Duran in Paris (1884–85). On his return from Paris in 1886, van de Velde moved to the Belgian countryside, where he started to develop a more holistic approach toward art and environment. In 1887, he discovered pointillism, which allowed him to develop a more analytic approach to painting and form, and from 1890 on, he started to broaden his artistic production to the realm of applied arts, then to interior design, and finally to architecture.

At the same time, van de Velde established himself as a theorist and propagandist. In 1894, he started a series of lectures that promoted the revival of architecture and decorative arts by combining the moral principles of the English Arts and Crafts movement with the acceptance of machine production and social changes. These lectures were published in 1901 under the title *Die Renaissance im Kunstgewerbe* (The Renaissance of Applied Arts). Van de Velde's theoretical position was informed by readings of William Morris, Friedrich Nietzsche, and Leo Tolstoy, in which art and beauty were understood as a significant force for social advancement and cultural renewal.

His first venture into architecture came with his own house, Bloemenwerf (1895–96), in Uccle, near Brussels, where van de Velde, who had no architectural training, collaborated with local craftsmen in a design that is somewhat a combination of a traditional farmhouse and an urban villa. It was van de Velde's first attempt to create a total work of art in which furniture, wallpaper, and even his wife's reform dress are understood as an integral part of architecture.

Van de Velde's reputation spread rapidly in the mid-1890s. The reception was particularly favorable in Germany, and in 1895 the German art dealer Samuel Bing and art critic Julius Meier-Graefe commissioned him to design three room interiors. First exhibited in the Salon Art Nouveau in Paris the same year (and further in 1897 in Dresden), these interiors, characterized by dynamic, curved forms, launched van de Velde's career as a furniture maker and interior designer while also launching a new style: Art Nouveau. Bing and Meier-Graefe played an important part in van de Velde's career, the former becoming van de Velde's dealer in Paris and the latter the first critic to write about his work.

In 1900 Karl Ernst Osthaus invited van de Velde to design the interiors for the Folkwang Museum (1901–04) in Hagen, Germany. Only five years after the completion of their own house, the family moved to Berlin. Contrary to his hopes, Berlin did not offer a breakthrough for other larger projects, and in 1902 he accepted the offer of the duke of Sachsen-Weimar to become the director of the Weimar Kunstgewerblicher Institut. The duke also commissioned van de Velde to design the new school buildings: the Kunstgewerbeschule (school of applied arts, 1904) and the Kunstschule (art school, 1906), which became his first major architectural commissions. During his 12-year tenure at Weimar, van de Velde embraced and inspired the future generation and developed a successful architectural practice. The most notable works from this period include several private villas for Weimar's cultural elite; van de Velde's own second house, called Hohe Pappels (1908); a Tennis Club (1908) in Chemnitz; an interior design of the Nietzsche Archive (1911); and most notably the theater for the 1914 Werkbund Exhibition in Cologne.

Van de Velde's resignation in 1914 came right after the 1914 Werkbund meeting in Cologne, where he came under a fierce attack by Hermann Muthesius (1861–1927) for representing a reactionary and outdated individualist position and resisting the need for standardized production and typification. Van de Velde recommended Walter Gropius as his successor, thus laying the foundation for the future Bauhaus.

This so-called Werkbund debate is indicative of why many other members of the first generation of the Modern movement, such as Peter Behrens and Frank Lloyd Wright, came to surpass van de Velde in their historical significance as pioneers of 20th-century architecture. However, van de Velde was one of the seminal thinkers around 1890, when 19th-century architectural historicism came into a crisis. Informed by *Einfühlung* (empathy) theory, van de Velde believed that line was the fundamental element of art. According to his motto "a line is a force" (*Kunstgewerbliche Laienpredigten,* 1902), form is an outcome of spontaneous, creative expression based on inner necessity, both structural and emotional. This led to a design strategy based on the combination of constructive and functional logic and dynamic formal expression.

Van de Velde's life after leaving Weimar in 1917 was divided among Switzerland, Holland, and Belgium, where in 1925–47 he held a professorship at the University of Ghent. His mature work includes the Belgian Pavilions for the Paris (1937) and New York (1939) World Exhibitions and the Rijksmuseum Kröller-Müller (1937–54) in Otterlo. After his retirement, van de Velde returned to Switzerland to write his memoirs, *Geschichte meines Lebens* (1962; The Story of My Life), a wonderfully creative testimony of his long and eventful life.

EEVA-LIISA PELKONEN

Biography

Born in Antwerp, 3 April 1863. Attended the Academie voor Schone Kunsten, Antwerp 1880–83; studied painting at the Académie des Beaux-Arts, Antwerp 1882–84 and Paris 1884–85. Painter and interior decorator, Antwerp and Brussels 1885–94. In private practice as an architect and designer, Brussels 1895–98, under the title Société van de Velde 1898–1900; practiced in Berlin 1900–05, Weimar 1906–14, Switzerland 1914–21, Wassenaar, Netherlands 1921–25, and Brussels 1925–47. Lecturer, University of Brussels 1894–95; founder and director, Kunstgewerbeschule (later Bauhaus School), Weimar 1902–14; founder and director, École Nationale Supérieure d'Architecture et des Arts Décoratifs, Brussels 1925–36; professor of architecture, 1925–47, chair of architecture, 1926–35, University of Ghent. Died in Zurich, 25 October 1957.

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VENICE BIENNALE PAVILIONS

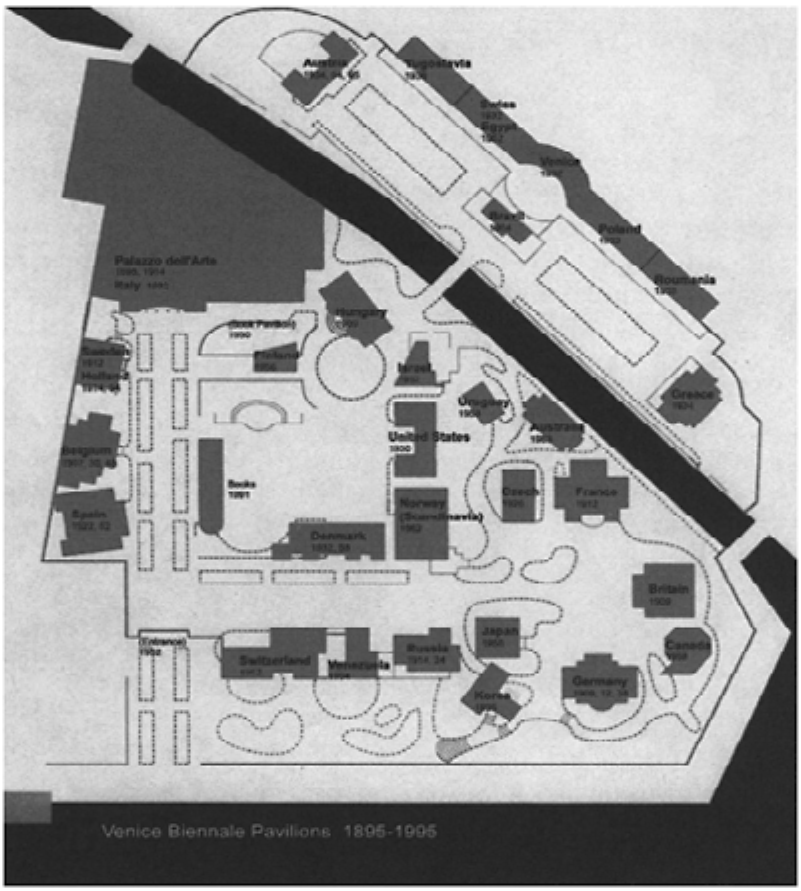
Designed by various architects, 1895–1995 Venice, Italy

The Venice Biennale began in 1895 as an exhibition of international art held every two years in the Castello Gardens at the southeast edge of Venice. Its pavilions, each representing an individual country, perform as autonomous nationalistic objects and as a strategically assembled collection of 20th-century architecture. As an evolving modernist project, new national pavilions accrued between 1895 and 1995, with critical acts of demolition, alteration, addition, refacading, restoration, and re-allocation. The Biennale pavilions, as architectural representations for sovereign nations, can be categorized in terms of Neoclassicism, vernacular nationalism, historicist nationalism, ideological nationalism, and international modernism.

Two fundamental definitions of the word describe these pavilions: “a summerhouse or other decorative building in a garden” and “a temporary stand at an exhibition.” Although often dismissed by critics as diminutive pleasure follies or curiosity collections for tourists, they form a permanent extraurban community of 20th-century modernist icons—exterior representational expositions encasing interior mutable exhibitions. Their status oscillates between architectural ambassador and miniature museum for contemporary art.

The original Castello Gardens were constructed on reclaimed marsh between 1808 and 1812 by Giannantonio Selva. In 1895, the Biennale was founded, and its first building, the Palazzo dell’Esposizione (or Central Pavilion) by Enrico Trevisanato, contained 16 exhibition rooms around a domed space. The artists Marius de Maria and Bartolomeo Bezzi designed its neoclassical facade.

Belgium provided the first national pavilion, or “house of art,” in 1907, a contemporary Art Nouveau project by Léon Sneyers. Most of the early pavilions displayed a neoclassical or vernacular character, derived from both museum and villa architecture. The British Pavilion (1909) by Edwin Rickards, built on a prominent hill, quotes Andrea Palladio’s 16th-century villas and their modifications as Italianate English country houses. A Venetian architect, Daniele Donghi, designed the Bavarian Pavilion in the same year. Figural ornament was added to its neoclassical facade when it became the German Pavilion in 1912. Géza Maróti's Hungarian Pavilion (1909), a richly ornamented, transplanted vernacular building, was picturesquely sited off the main axis of the Gardens. The neoclassical French Pavilion (1912) by the Venetian architect Fausto Finzi joined Great Britain and Germany at the southeast corner of the Gardens. Ferdinand Boberg designed the Sweden Pavilion in 1912, converted to the Holland Pavilion in 1914. The Central (Italian) Pavilion received a concave Liberty-style facade by Guido Cirilli in 1914. Just before the outbreak of World War I in 1914, the Russian Pavilion, resembling a vernacular Byzantine church, was completed by Aleksej Scusev. In 1924, its facade was accessorized under the new Soviet state with the letters "URSS," a red band, and a hammer and sickle.



Plan for Venice Biennale Pavilions (1895–1995)

Most pavilions built between World Wars I and II recirculated historicist imagery or conveyed an ideological nationalism. Spain's pavilion (1922) by Javier de Luque featured a Churriguersque facade displaying its country's 18th-century synthesis of architecture and sculpture. Uniquely, the Czechoslovakian architect Otakar Novotny designed his country's pavilion (1926) as an example of contemporary Czech Cubism. Delano and Aldrich created the United States Pavilion (1930) as a neoclassical colonial version of Thomas Jefferson's neo-Palladian Monticello. Carl Brummer's neoclassical Danish Pavilion (1932) occupied the middle of the Gardens. A Venetian Pavilion for decorative arts (1932) by Brenno Del Giudice was built on the other side of the Canal di Sant'Elena, with flanking pavilions for Poland and Switzerland. Its white, "*stile-littorio* classicism" followed official state architecture under Mussolini. Identical pavilions for Romania and Yugoslavia were added in 1938, stringing together autonomous nations in a unified structure. Duilio Torres's similar new facade for the Central (Italian) Pavilion (1932) proclaimed itself "Italia" in large block letters. Josef Hoffman's minimalist Austrian Pavilion (1934), north of the Venetian Pavilion, contained an open central arcade and clerestory lighting. The masonry, neo-Byzantine Greek Pavilion (1934) by M. Papandréou was sited axially opposite Austria's pavilion.

Under Hitler, Germany's pavilion was demolished in 1938 and replaced by a monumental "meta-neo-classical" structure by Ernst Haiger. After Germany invaded Austria, Czechoslovakia, Poland, Romania, Hungary, and Yugoslavia, their pavilions were closed. Italy displayed military imagery in the British, French, and United States Pavilions in 1942.

After World War II, the Biennale reopened in 1948. The Venetian architect Virgilio Vallot replaced the facade of the Belgium Pavilion that year. Carlo Scarpa designed several projects for the Biennale, beginning in 1950 with the triangular/trapezoidal Book Pavilion near the Italian Pavilion portico. This pavillion, Scarpa's leaflike Ticket Office (1952), and his Italian Pavilion courtyard (1952) have been destroyed. Significantly, the first post-World War II new pavilion was for Israel (1952), an "international modern" trapezoidal structure by the Tel Aviv architect Zeev Rechter. Bruno Giacometti designed Switzerland's pavilion (1952), a complex assemblage of volumes, sited near the Gardens entry. Egypt occupied the former Swiss Pavilion. The Spanish Pavilion was stripped of its ornament and received a simpler masonry facade by Joaquín Vaquero Palacios in 1952. Carlo Scarpa's innovative Venezuelan Pavilion (1954–56), wedged between those of Switzerland and the Soviet Union, referred to traditional Japanese architecture and the work of Frank Lloyd Wright and Ludwig Mies van der Rohe. In 1954, Gerrit Rietveld designed a new "late De Stijl" Dutch Pavilion, replacing the previous one. Alvar Aalto's wedge-shaped Finnish Pavilion (1956) was similar to Scarpa's Book Pavilion. Painted Finnish blue and white, it was prefabricated and transported to the site. The Le Corbusian Japan Pavilion (1956) by Takamasa Yoshizaka is a concrete box on four massive supports with an Oriental garden on the sloping land below. Denmark's pavilion was extended with a series of brick boxes by Peter Koch in 1958, and Uruguay built a simple new pavilion in the same year. The Italian architects BBPR erected the octagonal Canadian Pavilion (1958) around two existing trees. Several trees were also retained

Dutch Pavilion, by Gerrit Rietveld, Venice Biennale (1954)

within the Norway Pavilion (1962) (now for Scandinavia) by Sverre Fehn. The innovative concrete structure remains open to the Gardens and was conceptually derived from the neighboring United States Pavilion. The Brazil Pavilion (1964) by the Venetian Amerigo Marchesin occupies the axial crossing of the pavilions on the island of Sant'Elena.

Louis Kahn proposed designs for a Meeting Hall and a new Italian Pavilion in 1968–69. Little architectural work took place at the Biennale Gardens until the metal-clad, domestic-scaled Australian Pavilion (1988) was built by Philip Cox along the Gardens canal. Slipped within an allée near the Gardens entry, James Stirling and Michael Wilford produced the Book Pavilion, or "bookship," in 1991. In 1995, Josef Hoffman's Austrian Pavilion was significantly altered by the Viennese architects Coop Himmelb(l)au. They infiltrated the historic pavilion with an assemblage of columns, a roof, and a screen. Seok Chul Kim's Korean Pavilion (1995) acknowledges the rising titles by lifting itself up on metal stilts. Its hinged wood screens protect the pavilion during off times—a solution common to both Venice and Korea and a recognition of the ephemeral condition of the Biennale. Many of the pavilions and the Gardens themselves are in poor condition, and as Venice continues to be inundated by the lagoon, this unique collection of 20th-century architecture requires preservation and the ability to evolve. The Venice Biennale Pavilions serve collectively as a connotative inventory of 20th-century modernism.

MARK STANKARD

Further Reading

Very little has been published in English on the Biennale Pavilions as a whole. Catalogs have been published for each of the Biennale exhibitions; these often contain mentions of the Pavilions, as do reviews in several art periodicals. There are also books on the Austria, Finland, Israel, and Dutch Pavilions and on the works by Scarpa.

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VENTURI, ROBERT 1925

Architect, United States

Robert Venturi is the principal partner of Venturi, Scott Brown and Associates with Denise Scott Brown, Steven Izenour, and David Vaughn. He is best known for his architectural ideas outlined in his two influential books, *Complexity and Contradiction in Architecture* (1966) and *Learning from Las Vegas* (1972), written with Scott Brown and Izenour. Both texts critique the often dogmatic and narrow design agenda of modernist architecture and have been viewed as an antidote to the polemics of modernist architects such as Adolf Loos, who famously wrote that "ornament is crime," and Le Corbusier, who authored the classic manifesto *Towards a New Architecture* (1923). Directing 20th-century architects to study the commercial landscape of Main Street and the roadside as well as the classical tradition, Venturi and Scott Brown embrace historicism, decoration, language, and vernacular symbols. *Learning from Las Vegas* in particular argued for the celebration of both "high" and "low" architecture of the past, from the richness of classical Rome to the messiness of the commercial strip. Its emphasis on visual ambiguity, contradiction, dialectic, context, and complexity led to designs that were full of wit and rich in connotations. Venturi's residential architecture of the 1960s expressed his interest in the vernacular symbols and historical allusions outlined in *Complexity and Contradiction.* The Guild House (1960), a senior citizens apartment complex in Philadelphia, Pennsylvania, referenced the classicism of Andrea Palladio in the design of its facade and pointed to the architecture of commerce with its prominent sign above the entry. The Vanna Venturi House (1962) in Chestnut Hill, Pennsylvania, borrowed from the forms of the American saltbox (shingle style) and emphasized axial symmetry.

The humorous and historical came together in Venturi's creation of Benjamin Franklin's "house" and museum (1973–76) in Independence National Historical Park in Philadelphia. Rather than reconstructing the long-demolished home of Franklin, Venturi and partners designed a vividly colored steel-frame outline of the house, which had been described by Franklin in letters to his wife, and placed the museum in the ground below. The firm has long had an interest in urban design, reflecting its focus on the American landscape. Planning work has included the South Street Rehabilitation Plan (1970) for Philadelphia and the Pennsylvania Avenue Project (1978–79) for Washington, D.C.

Other projects have included industrial design and furniture design as well as exhibitions. "Signs of Life: Symbols in the American City" at the Renwick Gallery in Washington, D.C. (1976) was an exhibit of historical and contemporary signs. The display celebrated the American bicentennial by presenting the rich variety of signage found in the United States. Such work remained consistent with the firm's appreciation of the vernacular and illustrated how Venturi and his partners have refused to limit the application of their ideas to one field.

After 1980 Venturi received a number of large commissions. Such projects, while remaining true to the original theories of the firm, have tended toward the practical, thus helping shed Venturi's reputation for superficial cleverness. Important commissions for universities and museums evidence the office's wider acceptance. Princeton University commissioned three buildings, including Wu Hall (1983), which referenced the style of English manor houses, thus complementing the campus's eclectic mix of buildings. The Sainsbury Wing (1991) of the National Gallery in London alluded to the adjacent classical building yet reconfigured the purist style, referencing Victorian train sheds in the interior. Recent designs continued to reflect the firm's commitment to historical styles and vernacular symbols. The Seattle Art Museum (1991) contained sensitive gallery spaces as well as massive incised lettering along the top of the limestone exterior. The Mielparque Nikko Kirifuri Resort (1997) in Nikko, Japan, reflects the traditional rural architecture of Japan.

The global influence of Venturi and his partner Denise Scott Brown has been widely recognized through extensive writing, teaching, and lecturing. Consistent with an aesthetic of contradiction, Venturi's works deal with both the formal and theoretical intersections of modernism and Postmodernism by engaging with the conditions of contemporary society, construction, and culture.

NICOLAS MAFFEI

S*ee also* **Color; Postmodernism; Scott Brown, Denise (United States); Vanna Venturi House, Philadelphia**

Biography

Born in Philadelphia, 25 June 1925. Attended Princeton University, New Jersey 1943–50; bachelor of arts degree 1947; master of fine arts degree 1950; studied at the American Academy, Rome, on a Rome Prize Fellowship 1954–56. Married architect Denise Scott Brown 1967:1 child. Designer with the firms of Oscar Stonorov, Philadelphia; Eero

Saarinen, Bloomfield Hills, Michigan; and Louis I. Khan, Philadelphia 1950–58. Partner with Paul Cope and H. Mather Lippincott, Venturi, Cope and Lippincott, Philadelphia 1958–61; partner with William Short, Venturi and Short, Philadelphia 1961–64; partner with John Rauch from 1964; partner with Rauch and Denise Scott Brown from 1967; Ossabow Island Project, Savannah, Georgia, from 1977; principal, Venturi, Scott Brown and Associates, Philadelphia from 1989. Assistant professor, then associate professor of architecture, University of Pennsylvania, Philadelphia 1957–65; State Department Lecturer in the USSR 1965; architect-inresidence, American Academy, Rome 1966; Charlotte Shepherd Davenport Professor of Architecture, Yale University, New Haven, Connecticut 1966–70; member, Panel of Visitors, School of Architecture and Urban Planning, University of California, Los Angeles 1966–67; visiting critic, Rice University, Houston, Texas 1969; trustee, American Academy, Rome 1969–74; member, board of advisers, department of art and archaeology, Princeton University 1969–72, from 1977; member, board of advisers, School of Architecture and Urban Design, Princeton University from 1977; Walter Gropius Lecturer, Graduate School of Design, Harvard University, Cambridge, Massachusetts 1982. Fellow, American Institute of Architects; fellow, American Academy of Arts and Sciences; fellow, American Academy, Rome; fellow, Accademia Nazionale de San Luca, Rome; honorary fellow, Royal Institute of British Architects; honorary fellow, Royal Incorporation of Architects of Scotland. Gold Medal, American Institute of Architects 1972; Commander, Order of Merit, Italy 1986; Pritzker Prize 1991.

Provincial Capitol Building, Toulouse, France (1999), by Robert Venturi

Photo by Matt Wargo © Venturi, Scott Brown and Associates

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VERNACULAR ARCHITECTURE

Although it had been in use among specialists for well over a century, the term “vernacular architecture” became widely accepted only with its adoption in 1976 by the International Council on Monuments and Sites (ICOMOS). Other terms persist, such as “traditional,” “rural,” “regional,” “local,” “peasant,” “folk,” and “indigenous” architecture, serving collectively to identify the field of building encompassed by the vernacular. Its original meaning (from the Latin), “the language of the people,” is applicable to architecture as an extension of the commonly employed idea of “architecture as language,” in which styles of design are analogous to grammar or syntax.

“Arquitectura popular,” used in both Spanish- and Portuguese-speaking countries, corresponds to the increasingly prevalent definition of the vernacular as “the architecture *of,* and *by,* the people.” With the wider acceptance of the term “vernacular architecture,” a distinction is made between buildings that are self-built or community built and used and those that are designed for the people, such as fast-food outlets, chain stores, filling stations, and strip malls. Including mobile homes, these latter types, as professionally designed structures for general use, are regarded as popular architecture. As such, they are distinguished from the vernacular, which broadly corresponds to the building traditions depicted in Bernard Rudofsky’s exhibition and *catalog Architecture without Architects* (1964) at the Museum of Modern Art, New York. The exhibition emphasized the aesthetic merits of vernacular traditions from nearly 30 countries that had been an inspiration for many architects in the 20th century.

As early as 1910, Frank Lloyd Wright applauded “folk building[s] growing in response to actual needs, fitted into environment by people who knew no better than to fit them to it with native feeling,” which were “for us better worth study than all the highly self-conscious academic attempts at the beautiful throughout all Europe” (see Gutheim, 1941). A year later, Le Corbusier was sketching the peasant houses of Serbia and Bulgaria and praising “the *konak,* the Turkish wooden house,… an architectural masterpiece.” He was profoundly drawn to the vernacular buildings of the Greek islands and the Algerian M’Zab, and many architects followed his pursuit of purity and function in the “white” villages of the Mediterranean. Independently, Alvar Aalto in Finland, Michel de Klerk in the Netherlands, and later Luis Barragán in Mexico were among the many architects who drew on regional building for inspiration. In such cases, the vernacular was a source of stimulation for some and a justification of their design aesthetic for others. Simplicity of form and structure and the moral value of the Miesinspired truth to materials and economy of means were increasingly established as the modernist architecture par excellence. Following the legacy of Adolf Loos’s essay “Ornament and Crime” (1908), vernacular traditions that employed decoration were generally disregarded in favor of reductivism. Vernacular examples offered less to architects who were seeking models of varied spatial experience, but their “fitness for purpose” and, above all, their functionality were seen as paradigms of modern approaches to architectural design.

Undoubtedly, all these qualities could be seen in a wide range of vernacular buildings, from farmhouses to workshops, granaries to cow barns, and lime kilns to windmills that not only helped clarify design objectives in the minds of many architects but also served to reinforce modernist principles. However, although some followed Wright's advice to study "folk building," his somewhat patronizing view of its builders was echoed by many architects and writers who referred to the "spontaneous," "unconscious," or "intuitive" building processes. Professional architects studied the vernacular more for their own benefit than for any that might accrue for the survival or protection of the traditions themselves, which in the years following World War II were threatened. The ravages of war, industrialization of building processes, need for mass housing, and universal adoption of Le Corbusian "tower blocks" and "slab blocks" marked the international success of modernism and, in many instances, the imminent demise of many vernacular traditions.

Decline in the vernacular in many Western countries had been evident since the beginning of the 20th century. Largely through voluntary effort, examples of folk and traditional building were salvaged in many countries and displayed in open-air (*Openlucht* or *Freilicht*) museums, the earliest example being the Skansen in Sweden (1897), followed by museums in Maihaugen, Norway; Seurasaari, Finland; Arnhem, Holland; and Lyngby, Denmark. Other policies of protection, such as in situ conservation, relocation, rebuilding, reconstruction, and environmental rehabilitation, were implemented, exemplified in the United States in Old Deerfield; Colonial Williamsburg; the Henry Ford Museum and Greenfield Village in Dearborn, Michigan; Old Sturbridge Village, Massachusetts; Cades Cove, Tennessee; and many other sites.

In Europe, the open-air-museum movement resulted in many thousands of buildings being saved and open to the public in literally hundreds of locations in Scandinavian and Central European countries. Only a few museums opened in Germany and Britain, and none, until the 1980s, opened in Spain, France, or Italy. Although such enterprises did much to conserve specific vernacular buildings, the unfurnished interiors could appear bleak. Many curators solved this problem by depicting a historic period with appropriate artifacts and furniture, or with reenactments of daily life in the form of dioramas. Such methods were instructive, if nostalgic, ensuring the popular success of these museums but associating the vernacular only with past ways of life, having little relevance to the present or the future. Unfortunately, in most European countries, relatively little continuity of vernacular building was seen in the second half of the 20th century, as the imperative lessened and skills declined in the face of the expansion of the city suburbs and high-rise developments and the industrializing of building components and construction.

Globalization, it might seem, is incompatible with the vernacular, and traditional building of and by the people seems scarce. However, this is not the case. At the middle of the 20th century, the world's population was estimated at 3.5 billion; by the end of the century, the population had almost doubled to six billion. Attempts at urban housing schemes have failed to make a significant impression on the demand for dwellings, as the everexpanding *bustees,* favelas, *barriadas, bidonvilles, gecekondu,* and other peri-urban squatter settlements in the industrially developing world dramatically demonstrate. Built of scrap materials and frequently illegal, they are the desperate measures taken by migrants to the cities; however, lacking in expression of skills or tradition and meeting no other needs beyond crude and minimal shelter, they are not vernacular.

Of the world's six billion people, a third live in the People's Republic of China, and another billion on the Indian subcontinent. In these countries, housing is mainly vernacular, as it is in Indonesia and Southeast Asia and in much of Africa. The

Earth-molded, nontrabeated structures, including granary, shade shelter, and living unit from Gurunsi culture, northern Ghana

growth in population has been accommodated largely through the absorption of families within existing unmodified structures and through the lateral or vertical extension of others. New building to traditional models has been not only of dwellings but also of innumerable stores, workshops, and religious buildings. It is unknown how many vernacular buildings are extant worldwide, whether old and still in use or of recent date and purpose built. Estimates (that might well be conservative) of around 800 million are cited, representing over 90 percent of the total building stock.

To a great extent, these vernacular traditions have been overlooked by architects and architectural historians. Those histories that acknowledge that architecture is not solely a European and American phenomenon pay attention principally to monumental temples, pagodas, mosques, and palaces, with some reference to colonial or administrative buildings, commercial structures, airports, and stadiums in the International Style of the 20th century. Lack of recognition has served as a disincentive to do original research in vernacular architecture; this was left to the enthusiasm of concerned architects and the personal motivations of devoted amateurs.

Serious recording of vernacular buildings was undertaken in Germany in the late 19th century, in the 1900s by English architects, and more widely in Europe and the United States with the growth of the open-air museums. American research was boosted in the 1930s by the Historic American Buildings Survey (HABS), and subsequently, in France, Portugal, and Romania, intensive national surveys were undertaken, recording the state of the vernacular on a provincial basis. Later, such surveys were conducted in Europe, although often only with institutional support. Methodologically, they followed conventional architectural practices, with plans, elevations, sections, and details being drawn, often with supporting photographic record and sometimes with historical documentation. Frequently, as in France and the United States, a typological approach was taken, although the concept of "type" was for some the identification of function and for others the classification of features, such as plan or roof form.

As early as 1882, British architect W.Simpson published a report on the architecture of the Himalayas, prompting regional officials of the Western colonial powers to occasionally examine the indigenous buildings in their territories. Lacking any agreed program, objectives, or coordination of research, such studies varied greatly in quality and method and were widely dispersed. A concerted study of the vernacular traditions of French Cameroun by architectural students of the École des Beaux-Arts, published in 1952, marked a significant advance in research in non-Western countries. Preparation of materials, building construction methods, and domestic space use were examined and recorded. Preoccupations with typologies or historic derivation were shown to be largely irrelevant in such contexts, where the respective economies, material resources, and available technologies were important in the determination of their building forms.

In the ensuing years, a number of important studies were made of specific vernacular traditions in parts of Asia, sub-Saharan Africa, the Middle East, North America, and to a lesser extent, Latin America. Often these were local, and researchers had problems developing appropriate methods for comparative studies. Historical resources such as wills, deeds, or parish records used in European research were seldom available, and conventional orthographic techniques were unsuitable for recording cave dwellings, tents, or molded, nontrabeated structures. Comparison of building traditions or the identification of the distribution or diffusion of structural systems or details was hindered by lacunae in research and the lack of comprehensive reference works. Many former studies, although useful in indicating constancy or change in buildings, were superficial visual records. Researchers encountered techniques of, for example, earth construction, which previously had not been subject to scrutiny; craft skills in the working of different kinds of stone, timbers, palms, and fibrous plant materials involved tools and methods of assembly, jointing, and cladding that were largely unclassified or undocumented.

Classification of building forms seemed necessary so that the vast range of vernacular structures could be comprehended. From the domes of the Zulu (southern Africa) to the ring-walled multiple dwellings of the Keijia (southeastern China), they demonstrated both the persistence of systems transmitted over generations and the variety to be found within every tradition. Although the fundamental rectangular prism of trabeated structures and mass-walled stone and adobe and brick structures was widespread, so too were the *rondavels,* or cylindrical units, whose diversity was evident in their compound clusters. Roof forms displayed even greater variety, with gabled, hipped, and half-hipped roofs of diverse pitches evident throughout Europe, from Scotland to Moldavia. Upswept gables that were dispersed throughout insular Southeast Asia, from the Batak of Sumatra to the great saddle roofs of the Toraja of Celebes, were perceived as characteristic of indigenous "styles."

Although the technical problems were not inconsiderable, vernacular studies revealed indigenous methods of climate modification, such as the Egyptian *mashrabiyah,* or balconied window screens, and the "wind scoops," found in hot, arid climates in the Middle East, that transmit cool air to rooms. Hot and humid or monsoon climates require cross ventilation and protection from seasonal precipitation, whereas hurricanes necessitate shallow roof pitches and light construction. In temperate climates, protection is required against heavy rainfall and strong winds, whereas insulation and safeguards against snow loading are necessary in cold conditions. Such means of adaptation led to theories of climatic determinism, with broad principles being defined for settlement forms and building types in certain environments, including desert, savanna, forest, coastal, and insular locations. Exceptions arising from the demands of different economies, whether nomadic or sedentary, pastoral or agricultural, emphasized, as Forde had done in the 1930s, the relationship among society, economy, and habitat.

The publication in 1969 of *House Form and Culture* by Amos Rapoport and of the edited collection of case studies *Shelter and Society* marked a new stage in vernacular studies. Although anthropologists such as Lewis H.Morgan and Victor Mindeleff in their researches among Native American tribes in the 1880s had demonstrated the significance of culture in defining building form, their work had been neglected. Now the cultural and anthropological aspects of building were given as much attention as their structural and architectural characteristics. The writings of anthropologists such as Griaule on the Dogon (Mali) and Bourdier on the Kabyle (Algeria), among many others, revealed the importance of kinship, social structures, belief systems, ritual, and symbolism in the vernacular architecture of cultures the world over. Features formerly regarded as styles were now revealed as signifiers of values and expressions of collective identity and were elucidated in, for example, the work of Hugh-Jones (Amazonia), Nabokov and Easton (Native America), and Bourdier and Minh-ha (West Africa).

Anthropologists brought a cultural awareness to the study of vernacular but were seldom familiar with building principles and processes. The need for interdisciplinary dialogue and research inspired in the 1980s the biennial "Built Form and Culture Research" conferences alternating with those of the International Association for the Study of Traditional Environments (IASTE). Both emanated from the United States, but IASTE meetings were also held in Europe and North Africa. Both published proceedings, and books on local vernacular architecture proliferated. Some of these were written by non-Western authors, with the publications of the Aga Khan Award for Architecture (AKAA) providing a forum for Islamic and development studies.

For some years, there had been a growing awareness of the vernacular on the part of architects in the Middle East and Asia. Several endeavored to relate their buildings to local traditions, notably the Egyptian architect Hassan Fathy, whose village of New Gourna in West Luxor used the vault construction skills of Sudanese mud builders. In Turkey, Sedad Hakkí Eldem interpreted traditional models. More widely recognized was the work of the Indian architects Charles Correa and Balkrishna Doshi, whose large-scale projects were modernist in approach but who also designed more modest projects compatible with the local vernacular. Geoffrey Bawa in Sri Lanka, Robi Sularto in Indonesia, and Andre Ravereau in Africa were among the architects who respected regional traditions.

Despite the extent of research, the lack of informed awareness among architects and their clients, whether public or private, of the significance of vernacular traditions has led to disparagement, disregard, and often demolition. By the late 1980s, the need for a comprehensive reference work that could inform both anthropologists and architects and professionals and politicians became increasingly apparent. A ten-year project led eventually to the publication in 1997 of the *Encyclopedia of Vernacular Architecture of the World,* to which researchers from more than 80 countries contributed. Organized on a cultural rather than a national basis, it was unprecedented in bringing together research on the vernacular architecture and its cultural contexts extant on all continents in the 20th century. Principles of building with available resources, the nature of craft skills, environmental conditions and responses, and economies and their bear-ing on building functions, meaning, symbolism, and motifs are considered in relation to societal systems and building needs. However, attention is drawn to the deficiencies of certain vernacular traditions with regard to services, sanitation, and health.

Much remains to be done, but the question of why such work should be undertaken and acted on must be addressed. Vernacular architecture not only accounted for the vast majority of all buildings up to the 1950s but also met immense housing demands as the world population doubled in the second half of the 20th century. Yet this achievement has never been measured, and neither has the effort in human endeavor or the use of available or renewable resources in building or land. By comparison, officially sanctioned housing, whether government promoted or commercially developed, is minimal in its effect and produced at costs that would be beyond the capacity of most national economies in attempting to meet the demands of the next half century. Although neither acknowledged nor budgeted, vernacular architecture will be essential to meet the housing needs of the projected further doubling of the population. Recognizing this and providing adequate support in services while planning the economic survival of rural communities, developing nations could ensure that appropriate housing can be achieved through vernacular means, as it has been in the past.

PAUL OLIVER

Further Reading

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VESNIN, ALEXANDER, LEONID VESNIN, AND VIKTOR VESNIN

Architects, Russia

Among the many architects whose work adhered to the principles of Constructivism, perhaps the most stalwart and productive proponents of the movement were the Vesnin brothers: Leonid (1880–1933), Viktor (1882–1950), and Alexander (1883–1959), all of whom were raised in the town of Iurevets on the Volga River.

Although the brothers went to St. Petersburg at the beginning of the century for their professional education (Leonid graduated from the architectural program at the Academy of Arts in 1909 and Viktor and Alexander from the Institute of Civil Engineering in 1912), their careers were largely connected with Moscow both before and after their graduation. For example, in 1905–07 they worked as assistants to such leading Moscow proponents of the neoclassical revival as Ilarion Ivanov-Schitz and Roman Klein, and in 1909 Leonid worked with the artist V.A. Simonov in designing a large Arts and Crafts-style house for V.A. Nosenkov in the Moscow suburbs. Alexander, the most artistically gifted of the three, worked in Vladimir Tatlin's studio between 1912 and 1914 and also revealed a considerable talent as a stage designer.

During the material restrictions of the early postrevolutionary years, the theater stage provided the Vesnins—Alexander in particular—with a means for exploring methods of dynamic construction in space, under the obvious influence of Tatlin. The most remarkable product of this phase was Alexander Vesnin's set design in 1922 for Alexander Tairov's production of *The Man Who Was Thursday* at the Moscow Chamber (Kamernyi) Theater. With its intersecting planes and ramps, the set not only emphasized the dynamic of the actors' motion but also bridged the gap between the theoretical constructions of artists such as El Lissitzky, Kazimir Malevich, and Antoine Pevsner and the practical design of large structures.

The Vesnins' progression from dynamic, avant-garde set constructions to the much larger scale of major architectural projects was soon evident in their 1923 design for the Palace of Labor competition. Although their submission was awarded only third prize, it served as a programmatic statement in the development of a Constructivist aesthetic, combining both monumentality and severe functionalism in the massing of simple geometric shapes in a complex balance. The center of the plan was the oval meeting hall in the form of an amphitheater, 75 by 67 meters in size. The array of radio masts and docking ports for airships around the top was functionally justified despite its futuristic appearance in the context of a war-ravaged country reestablishing a modicum of civilized existence.

In 1925 Alexander and Viktor Vesnin, together with Moisei Ginzburg, founded the

Constructivist organization OSA (Organization of Contemporary Architecture). Indeed, the preceding year Alexander had designed the book jacket for Ginzburg's programmatic work *Style and Epoch.* With the quickening tempo of state construction during the late 1920s, all three brothers were actively engaged in projects extending from the Caucasus to the colossal hydroelectric dam across the Dnieper River, the DneproGES, designed by Viktor Vesnin in collaboration with Nikolai Kolli and others. Although each brother maintained a separate, distinct practice, they are best known for the projects they did together.

The brief flourishing of private commerce toward the end of the New Economic Policy (NEP) period is represented in the Vesnins' design of the Mostorg retail department store (1927–29) in central Moscow. Located on an awkward trapezoidal lot in the Krasnaia Presnia working-class district, the store, with its double-glazed facade framed by a ferroconcrete structure, appeared strikingly modern when first constructed in its context of 19th-century brick buildings. It has since suffered by the addition of another story and by a lack of proper maintenance.

Like other major architects of the late 1920s, the Vesnins were much concerned with the creation of institutions for social communication. One of the most modernistic of such designs—and one of the last Constructivist buildings in Moscow—was the club for the Society of Tsarist Political Prisoners, begun in 1931. In addition to meeting rooms and a theater hall, the extensive complex was to contain a museum. In 1934, however, the society was disbanded (an ominous prelude to the Stalinist purges, which would create an altogether new society of political prisoners), and the larger plans for a museum were eliminated. Even in this truncated and deformed version, the harmony of the pure, undecorated volumetric forms is evident and reflects, if coincidentally, some of the oldest formal traditions in Russian architecture.

The culminating project in the Vesnins' Constructivist oeuvre was an outgrowth of the concept of the workers' club. In order to serve the social needs of the Proletarian district, which contained an automobile factory and workers' settlement in southeast Moscow, the Vesnins designed a large complex of three buildings. The site overlooked the Moscow River and was adjacent to the Simonov Monastery, part of whose walls were razed in the course of constructing the project. Yet the largest part of the ensemble, a theater with a circular hall designed to seat 4000, was never built, nor was the projected sports building. The central element, however—the club building itself—was built between 1931 and 1937. This period was marred by the death of Leonid in 1933 and by the brothers' increasing need to defend their Constructivist designs.

Nonetheless, the Vesnins persevered to a remarkable degree, bending to the system without rejecting the work that stood at the center of the Constructivist movement. In their writings it is clear that Viktor and Alexander Vesnin considered the Proletarian Region Club one of their most significant works, not only for its union of functions—a 1000-seat theater, ballroom, meeting halls, and exhibition space—but also for the way in which form followed function and space flowed effortlessly from one component to another.

The manner in which the design combined an acute aesthetic sensibility with function was particularly important at a time when Constructivism was under attack for its purported inability to recognize the people's aesthetic needs. In the club building, the

Vesnins' fluency was reflected on the exterior in such details as the contours of the large rounded bay window over the entrance to the auditorium and a semicircular conservatory extending from the river facade. The club also included a small astronomy observatory, which created an additional visual component for the upper structure. Unfortunately, the interior of the building has been considerably modified since the Vesnins' original design, but the structure itself is still relatively well maintained.

In 1935 the Vesnin brothers attempted a reply to the growing retrospectivist tendency in Stalinist architecture by stating that "the canonization of an old form, however excellent, is a brake on the development of content." At the same time, Viktor and Alexander remained active in the architectural profession, were awarded high state honors, and participated in major competitions, such as the design for the People's Commissariat of Heavy Industry (unrealized). Although structural concepts of the classical revival with which they began their careers appeared in their later designs, they continued to reject the role of monumental painting and sculpture that became so prominent in architecture of the late Stalinist period. To the end they adhered to their belief in the integrity of structure as the determining principle in architectural design.

WILLIAM C.BRUMFIELD

S*ee also* **Constructivism; Ginzburg, Moisei (Russia); Monument to the Third International (1920); Russia and the Soviet Union**

Proletarian Region Club (1937), Moscow, by Alexander, Leonid, and Viktor Vesnin

Biographies

Alexander Vesnin

Born in Iurevets, Russia, 16 May 1883. Attended the Institute of Civil Engineering, St. Petersburg, 1901–12; studied painting with Yan Tsionglinsky, St. Petersburg, and Konstantin Yuon, Moscow 1909–11; visited Italy and studied Palladio 1913–14. Assistant to Ilarion Ivanov-Schitz, Roman Klein, and O.R. Munts 1909–11; worked in Vladimir Tatlin's studio, The Tower 1912–13. Served in the Russian Army 1916–17. Became involved in stage design 1920; editor, with Moisei Ginzburg, *Sovremennaya arkhitektura* 1926–30; director, architecture studio of the Mussoviet, then the architecture studio of the Commissariat for Heavy Industry and Ministry of Petroleum 1933–35. Professor of painting, VKhUTEMAS, Moscow 1921–24; taught at the Institute of Architecture, Moscow 1930–36. Member, Inkhuk (Russian Institute of Artistic Culture) 1921; founded, with Ginzburg, OSA (Russian Union of Contemporary Architects) 1925; member, All Union Academy of Architecture 1933. Died in Moscow, 7 November 1959.

Leonid Vesnin

Born in Nizhni Novgorod, Russia, 10 December 1880. Studied at the Academy of Fine Arts, St. Petersburg 1901–09. Professor of architectural design, Moscow Higher Technical College. Member, OSA (Russian Union of Contemporary Architects); co-president, Moscow Association of Architects 1922. Received the Order of the Red Banner. Died in Moscow, 8 October 1933.

Viktor Vesnin

Born in Iurevets, Russia, 9 April 1882. Attended the Institute of Civil Engineering, St. Petersburg 1901–1912; visited Italy and studied Palladio 1913–14. Assistant to Ilarion Ivanov-Schitz, Roman Klein, and O.R. Munts 1909–11; director, architecture studio of the Mussoviet, then the architecture studio of the Commissariat for Heavy Industry and Ministry of Petroleum 1933–35. Taught at the Institute of Architecture, Moscow 1930–36. Secretary, Union of Soviet Architects 1937–49; first president, All Union Academy of Architecture 1939–49; member, OSA (Russian Union of Contemporary Architects). Received the Order of Lenin; Gold Medal, Royal Institute of British Architects 1945. Died in Moscow, 17 September 1950.

Alexander, Leonid, and Viktor Vesnin

Collaborated on numerous projects but never established a formal partnership; most active in the period between world wars.

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Pravda Newspaper Building (unbuilt), Leningrad, 1924
Institute of Mineralogy, Moscow, 1925
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Dnieper Dam and Hydroelectric Station, 1930
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Palace of Culture, Moscow, 1937
Proletarian Region Club, Moscow, 1937

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VIDHAN BHAVAN (STATE ASSEMBLY BHOPAL)

Designed by Charles Correa, completed 1986 Bhopal, India

The Vidhan Bhavan (1980–86), designed by Charles Correa, sits on a crest that offers magnificent views of the city of Bhopal, the capital of the state of Madhya Pradesh. It houses the state assembly (the lower house with 366 members, the upper house with 75), the offices of the chief minister and other ministers of the cabinet, the speaker, the chief secretary, various committee rooms, and rooms for the supporting staff.

The design is conceived in terms of the circular fortified enclosure within which are housed various buildings that can be accessed from three directions. The formal organization of this complex follows a nine-part layout that the architect attributes to the mandala diagram. Each of the nine parts is distinct, partly because of the function that each section houses and partly because of the iconographic scheme. For example, the Vidhan Sabha (Lower House) is located at the southwest corner within the form of a stupa, representing the stupa at Sanchi, a major architectural monument in the state. The focus of movement is invested in the two axes, whereas the places of congregation—the "Combined Hall," the Vidhan Sabha, the Vidhan Parishad (Upper House), and the library—are located at the four outer corners. The three main entrances are situated on the two axes, with the legislators' entrance and the VIP entrance for the speaker opposite each other and the public entrance on the southwest axis.

The legislative axis takes one from the legislators' entrance through the foyer and central hall and ends at the legislators' foyer adjacent to the VIP entrance. The Vidhan Sabha and Vidhan Parishad sit on either side at the end. In contrast to this axis, if one follows the more dominant axis of movement, which is supposed to be for public entrance, it seems to have more of a symbolic aspect incorporated into the sequence of movement. It can be compared to the Indian temple, wherein the most sacred element is situated at the very end of the axis—in this case, the cabinet room and the chief minister's office. The architect engages with the images associated with land and water and reverses the traditionally received conceptions along this axis. Here the entrance area is paved in a pattern of waves and has the map of the state on one side, which marks the water body. This entrance plaza leads to the court of the people, which is in the form of a traditional *kund* (water tank). The images associated with the sea are repeatedly employed within the complex, such as the conchlike shapes for the combined hall and the undulating wavelike form for the roofs.

The uniqueness of the project is its use of mythical and historic symbols not only in its organizational scheme but also in its decorative scheme, although the manner in which these symbols are employed in both cases is strictly figurative. The use of folk art in the murals and other artwork in this complex contributes to the revival of traditional art and motifs without an excessive feeling of pastiche. The large murals covering the walls around the *kund* (painted by the finest folk artists of the Bastar region), sculptures such as the green-marbled sculpture of the Goddess of the Narmada River floating above the reflecting pool, and paintings and other artwork found throughout the building are distinct examples of the rich artistic traditions of the state. At the same time, the building is replete with iconic elements, such as the gateway of the Sanchi stupa, which is replicated at the entrance of the Vidhan Sabha.

Although the building has a monumental character, because of the use of a fortified citadel-like enclosure, the architect manages to break down the feeling of a monolithic whole by the use of a series of courtyards, pathways, and halls, thereby creating the feeling of a city within a city. Formally expressed as a unified assembly building, the complex is not so much of the country as it is of the diverse nature of the state of Madhya Pradesh through the use of iconographic elements that are supposed to be emblematic of different aspects of the state.

This project received the Aga Khan Award in 1998 and has been commended by critics for its “heroic scale,” “the wide range of spatial experiences that it offers,” and its “use of mythical and historical symbols.” Although much has been written about the “ritualistic pathway” and the building’s being a veritable temple to democracy, the success of these aspects of the building might be overstated. The complex can be seen as one more exploration of what has often been referred to as the “architecture of horizontal planes—of roofs and platforms, open colonnades, verandahs and courtyards,” a characteristic seen in a chain of other projects by Correa, such as Bharat Bhavan, the Crafts Museum, and

Vidhan Bhavan (State Assembly), Bhopal, India, designed by Charles Mark Correa

especially Jawahar Kala Kendra, which is also organized in a nine-square mandala.

AARATI KANEKAR

See *also* **Correa, Charles Mark (India); India**

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VIENNA SECESSION

The Vienna Secession has attained such an exalted role in the saga of early modern architecture and design that its origins as a society composed mostly of easel painters has been almost forgotten. Like the Munich and Berlin Secessions, which were also formed in the 1890s, the organization—whose official title was the Vereinigung Bildender Künstler Österreichs (Secession) (Association of Austrian Fine Artists [Secession])—was born of a revolt against the artistic establishment, but its objectives were initially as much commercial as ideological. However, it soon emerged at the forefront of the efforts to reform art and architecture, and until the split of the Klimt faction in 1905, it became virtually synonymous with the Vienna Moderne.

The target of the young *revoltés* in Vienna was the Künstlerge-nossenschaft (Artists' Association), or as it was more commonly known, the Künstlerhaus, a private artists' alliance that, in the absence of a well-developed gallery system, exercised nearly complete control of exhibitions and sales of art. The proximate cause of the rebellion was the reelection of the archconservative Eugen Felix to the presidency of the Künstlerhaus in November 1896. Many of the more radical members, including the painters Josef Engelhart, Carl Moll, and Gustav Klimt and the young architect Joseph Maria Olbrich, already angered by the treatment of impressionists and plein air painters, formed a new, alternate exhibiting society at the beginning of April 1897, and in late May, Klimt and 12 others artists formally resigned from the Künstlerhaus. They were eventually joined by many of the city's other progressive artists, designers, and architects, including Josef Hoffmann and, in November 1899, Otto Wagner.

From the start, the Secession espoused no single artistic philosophy or style. What united its members instead was a shared rejection of historical realism in painting and revivalism in architecture, and although the Secessionist movement subsequently became closely associated with the Austrian Art Nouveau or Jugendstil (or, as it was often referred to at the time, the Secessionsstil), the association's membership represented a wide array of modernist influences and ideas, from naturalism and impressionism to Art Nouveau and protofunctionalism. The Secession also brought together artists working in a variety of media: painters, sculptors, graphic artists, typographers, and designers, as well as architects. The aims of the group were similarly broad. The formation of the Secession developed, as Klimt expressed in a protest letter to the leadership of the Künstlerhaus,

> out of a recognition of the necessity of bringing artistic life in Vienna into more lively contact with the continuing development of art abroad, and of putting

> exhibitions on a purely artistic footing, free from any commercial considerations; of thereby awakening in wider circles a purified, modern view of art; and lastly, of inducing a heightened concern for art in official circles. (quoted in Vergo, 1975)

To realize these aspirations, the Secessionists launched their own journal, *Ver Sacrum* (Sacred Spring), in 1898. The title of the journal was drawn from the Roman ritual of consecration of youth in times of national peril, a reflection of the Secessionists' goal of aesthetic and cultural regeneration. Lavishly produced in its early years, *Ver Sacrum* encapsulated the desire of the Secessionists not only to elevate the standards of Austrian artistic production and to embrace the new but also to bring together all the arts. In addition to reproductions of paintings, drawings, graphic design, and architecture, the journal featured music, poetry, and essays by leading Austrian and foreign modernists.

Even more central to this program was the series of exhibitions that the Secessionists organized just before and after the turn of the century. The first of these exhibitions opened in late March 1898. It featured, along with works by the Austrian members of the association, paintings, lithographs, and drawings by Fernand Khnopff, Alphonse Mucha, Auguste Rodin, Giovanni Segatini, James McNeill Whistler, and others. The responsibility for the design and arrangement of the exhibition (held in rented rooms of the Horticultural Society Building on the Parkring) was accorded to Hoffmann and Olbrich, who also outfitted a "*Ver Sacrum* room," the first of a series of spaces combining the newest ideas in the applied arts and interior design. The inaugural exhibition proved to be a huge financial success (despite Klimt and his colleagues' vociferous disavowal of the rampant commercialism of the Künstlerhaus), but it also underscored the need for a permanent exhibition hall. Through various connections with the Vienna city government, the Secessionists succeeded in securing a long-term lease on a parcel of land on the Karlplatz adjacent to the Academy of Fine Arts, and the task of designing the new building was given over to Olbrich.

Olbrich's gallery, which was completed in time for the second exhibition in November 1898, has become the most recognized architectural symbol of the Secession. Emblazoned over its portal are the words of the critic and supporter of the Secession Ludwig

Secession House, detail of door, designed by J.M.Olbrich

Hevesi: "Der Zeit ihre Kunst, der Kunst ihre Freiheit" (To Every Age Its Art, to Art Its Freedom). It was the building's golden dome—an open, gilded ironwork sphere of laurel leaves and berries—however, that drew the immediate attention, as well as the sarcasm, of the Viennese public, who mockingly christened it "the golden cabbage" and "the Mahdi's tomb." However, the revolutionary nature of Olbrich's creation extended beyond its gleaming dome, chaste white walls, and sinuous vegetal graffiti. By relying on a light steel truss and glass roofing system supported by thin columns, Olbrich provided a remarkably open and adaptable space, one that suited perfectly the Secession's ambitious and varied exhibition program.

The second exhibition, like its predecessor, again featured easel art by Viennese and foreign artists. A large area, however, was given over to a group of architectural drawings by Otto Wagner and his students, and an entire room was devoted to a display of applied arts by Olbrich, Hoffmann, Koloman Moser, and others. The emphasis on architecture and the applied arts reflected a conviction within most of the Secession's confraternity of a changing relationship of art and design. Painting and sculpture—previously regarded as a higher form of artistic work—were now displayed on an equal basis with furniture, metal- and glasswork, textiles, and graphic design. Although this trend was evident in avant-garde circles throughout Europe, in Vienna the striving toward a unification of the arts was even more pronounced, and it accounted for the special character of many of the Secession's subsequent exhibits.

The idea of the *Gesamtkunstwerk,* or total work of art, reached its apotheosis in the 14th exhibition, held from April to June 1902. It featured a single work, a statue of a seated Beethoven by Leipzig artist Max Klinger, which was placed on a carefully framed platform at the far end of the gallery. Surrounding it were murals by Klimt, Roller, and others. Klimt's Beethoven frieze, recently permanently reinstalled in the Secession Building, constituted a visual representation of ideas of the music and ideas of Beethoven's music—perhaps, as some historians have argued, the final, choral movement of Beethoven's Ninth Symphony, which was performed at the exhibit's opening. The installation also included an abstract relief by Hoffmann, one that likewise merged the newest ideas in painting and the decorative arts.

Many of the Secession's early exhibitions also included the works of some of the foremost modernist designers in Europe. The eighth exhibition presented objects by Charles Robert Ashbee, Henri van de Velde, and Charles Rennie Mackintosh and his wife, Margaret Macdonald. Later exhibitions introduced many of the leading young designers in Vienna, among them Joze Plecnik, Robert Örley, and Leopold Bauer.

Before 1901, both the exhibition designs and most of the objects on display evinced the swirling forms of the early, curvilinear Jugendstil. However, by 1901 there was a decided trend toward a new rectilinearity and reductivism in design. This transformation was most evident in the works of Hoffmann and Moser, who together forged what became the emblematic form language of the Secession, a modular, geometricized vocabulary that anticipated the later emergence of functionalism. The era of the geometric Jugendstil in the Secession proved to be shortlived, however. In 1903, Hoffmann and Moser founded their own artists' collective, the Wiener Werkstätte, and they increasingly devoted their time and efforts to its operation. Many of the exhibitions after 1903 also failed to match the quality and inventiveness of the Secession's early years. Among the few significant later exhibitions was the 23rd, which included Wagner's projects for the Steinhof Church and his ill-starred Stadtmuseum.

The decline in standards was in part the result of a growing rift within the Secession that began to manifest itself around 1904. The split was a consequence largely of differing views in the membership over the relative roles of painting and applied arts.

Many of the pure painters *(Nur-Maler)* resented the privileged role of Hoffmann and the other *Raumkünstler* (decorative artists), charging that architecture and design were being promoted at the expense of easel art. The Secession had broken into two opposing camps: the Klimt-Gruppe, which included Hoffmann, Moser, Wagner, and most of the other architects and designers, and the pure painters, led by Josef Engelhart. For a time, the two groups continued to coexist, but in 1905 Klimt and most of the other prominent artists, architects, and designers resigned over an argument concerning the Klimt faction's affiliation with a local gallery, leaving the more traditional painters in control. Although the Secession survived as an organization and continued to mount exhibitions, it ceased to be a driving force in Austrian art.

During its heyday, the Vienna Secession provided a vibrant forum for the city's avant-garde to explore the newest currents in art, architecture, and design. For a time, the union succeeded brilliantly in achieving its goals of elevating the standards of Austrian art, establishing contacts abroad, and promoting modernism. However, the Secessionists failed in their bid to win full government support, a situation that would have fateful consequences for Wagner, Klimt, and many of the other progressive members. The position of the Secession in the larger history of modernism is also an ambiguous one. Although Hoffmann, Moser, Olbrich, and the other applied artists were able to foster an extraordinary new design direction, their reliance on traditional craft and deluxe materials ensured that most of the Secession's products would remain inaccessible to a broad spectrum of society. In the end, the growing reliance on industrial production and mass marketing would render their achievements more and more irrelevant. The *Gesamtkunstwerk* ideal of the complete aestheticization of life proved to be unsustainable.

CHRISTOPHER LONG

S*ee also* **Art Nouveau (Jugendstil); Ashbee, C.R. (Great Britain); Hoffmann, Josef (Austria); Mackintosh, Charles Rennie (Scotland); Olbrich, Josef Maria (Austria); van de Velde, Henri (Belgium); Wagner, Otto (Austria)**

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VIETNAM VETERANS MEMORIAL, WASHINGTON, D.C.

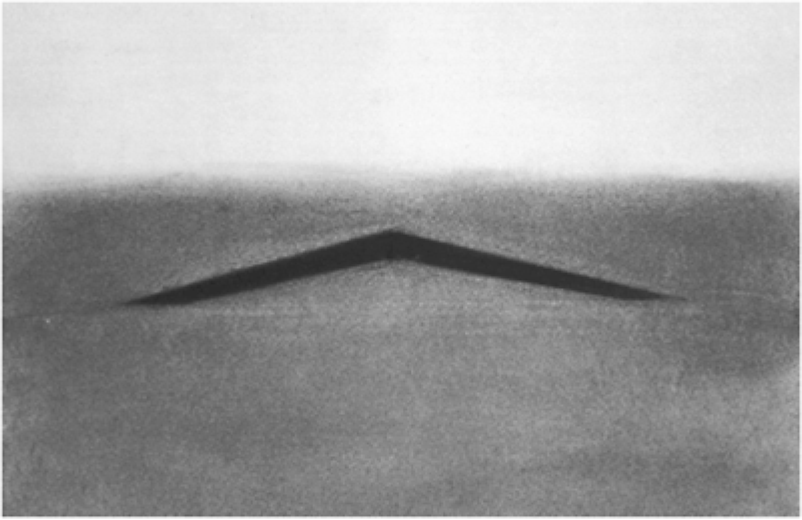
Designed by Maya Lin; completed 1982

From the time of its dedication in 1982, the Vietnam Veterans Memorial in Washington, D.C., has enjoyed a rare combination of both critical and popular acclaim. Perennially one of the most visited sites in the nation's capital, the landscape-and-earthworks construction was the competition-winning design of then-21-year-old Yale University student Maya Ying Lin. On completion the work was also one of the most controversial public landscapes ever executed in the United States. Lin's design was attacked by various conservative cultural and political audiences offended by the memorial's rejection of the officially sponsored neoclassical language of white monuments conventional to the Mall. Despite that vocal minority opinion, the lucid minimal design garnered critical praise as a rare example of the highest quality of public work.

The power of Lin's design resides, at least in part, in its inversion of conventional expectations for memorials on the Mall. In lieu of representing the state-sanctioned official history of U.S. involvement in Vietnam, the Wall (as it came to be known) was conceived and designed as an "open work" intended to be read in multiple ways by diverse audiences. Each participant is capable of reading the Wall's contents relative to the particulars and specifics of his or her own unique experience. Rather than objectifying the state's powerful interest in recording a received history of the war, the Vietnam

Veterans Memorial was conceived, financed, and constructed as a memorial by and for the public rather than its government.

Lin's conception encompasses two black, granite-faced retaining walls cut into a mound of earth known as Constitution Gardens. The two sloping wall segments intersect at their highest point, forming an interior angle of 120 degrees, whereas the lower ends are axially aligned with the larger site beyond, effectively grounding the work's geometry in the broader landscape. On the reflective surface of the black stone panels, the names of each of the 58,000 U.S. personnel missing, presumed dead,



Vietnam Veterans Memorial, architectural drawing (ca. 1980) showing memorial as plan and perspective, with textual description, for competition

Vietnam Veterans Memorial

Photo © Mary Ann Sullivan

and killed in the Vietnam conflict are inscribed. Organized chronologically, the inscription of those lost suggests the relatedness of those killed at a particular point in time while embedding any particular sought-after name in a sea of adjacent and nearly indistinguishable names. The public and collective experience of searching for a lost friend's or relative's name has sponsored the related material practices of rubbing engraved names to record them on paper and the leaving of memorial objects at the base of the Wall. Although the Wall reinterprets certain well-established American funerary traditions, the closest precedents for the work can be found in cultural developments within minimalist sculpture and land art, both of which found receptive audiences in schools of architecture in the Postmodern era. Lin's design, which earned her a "B" in her class in funerary architecture at Yale, was selected from among more than 1400 entries to an open design competition by a jury of distinguished figures in architecture, landscape, and public art. Lin's conception of an inverted, absent monumentality takes the form of a low wall retaining the earth behind, implicating the surrounding landscape and one's experience of it as the context for the work. By rejecting the contextual clues of the surrounding neoclassical monuments, Lin's design offers an intimate, individually constructed, and ultimately political work of Postmodern landscape sculpture.

Although garnering immediate critical support in the art and design communities, as well as being warmly embraced by untold numbers of veterans, the design was roundly and loudly criticized by culturally conservative constituencies and many political operatives, including several key members of the Republican White House under Ronald Reagan. For many of these conservatives, the Wall was seen as elitist, abstract, and not appropriately representational of what they took to be the legitimately heroic content of the war. At the height of this sentiment, the Wall was infamously referred to as a "black gash of shame" by veteran and Purple Heart recipient Tom Carhart. The memorial's many detractors eventually succeeded in compromising the Wall's simple planar geometry with the addition of a piece of figural sculpture to the site. This sculpture, "The Three Fightingmen" (1984), by Frederick Hart was intended to provide an appropriate literalness that a minority of culturally conservative lay audiences found lacking in the somber power of Lin's "anti-monument." Similar concerns over the Wall's inclusiveness of reading by various constituencies led to the incorporation of a second figural sculpture depicting the sacrifices of women veterans of the Vietnam era. This second sculpture, titled "Vietnam Women's Memorial" (1993), by Glenna Goodacre, although enjoying similar political and financial support for its inclusion on site, never approached the cultural and critical achievement of Lin's original design while fundamentally compromising its accomplishment. Rather, it is precisely the Wall's clear refusal to engage in an uncritical ahistorical valorization of the Vietnam War that affords multiple viewers the possibility of reading into the work something of their own experience. Understood as an "open text" intended to be read differently depending on the expectations and experience of the viewer, Lin's design offers a subtle and mutable lens through which various political contents might be read. Subsequent public reception of the memorial has been equally kind, and the Wall continues to enjoy broad public support in the United States and internationally as a seminal work of Postmodern landscape. The extraordinary and seemingly unparalleled breakthrough of Lin's design rests precisely on its ability to be read simultaneously by countless individuals implicated in its subject matter toward absolutely diverse political, social, and personal conclusions.

Although the status of the Vietnam Veterans Memorial will continue to change over time, the open interpretive nature of the work ensures its continued relevance well beyond the life expectancy of state-sanctioned monuments whose contents may be rendered redundant by the passage of time. More so than traditional historical representations of official state history, the meaning of the memorial depends on the reading of social and political history by future generations of participants. Whereas traditional monuments codify for future legibility the consensus view of history concretized by their creators, the Wall constructs a surface of reflection from which changing and multiple viewpoints on historical events might be read.

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S*ee also* **Lin, Maya (United States); Memorial**

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VILLA MAIREA

Designed by Alvar Aalto, completed 1939 Noormarkku, Finland

In 1937, the Finnish industrialist Harry Gullichsen and his wife, Maire, commissioned Alvar Aalto to design a family residence

Villa Mairea, main entrance, designed by Alvar Aalto.

Photo © G.Welin/Alvar Aalto Archives

Villa Mairea, living room

Photo © Alvar Aalto Archives

in Noormarkku, Finland, that would be traditionally Finnish yet modern. By this time, Alvar Aalto was well known as a proponent of modern, concrete construction and already famous for his International Style buildings, such as the Tuberculosis Sanitorium in Paimio, Finland. The International Style aesthetic of whiteness and abstraction, with an emphasis on industrial production, was and is fundamentally at odds with the strong traditions of handcraft in Finland. As a result, the Villa Mairea is never quite what it appears to be. Early on, the house was received as a masterpiece but, because of the many apparently contradictory elements, remained problematic as to its meaning and significance.

The first glimpse of its dominant white volume amid pine trees suggests a rigorous modern composition of clear geometries. As one approaches more closely, the free-form entry canopy is the first surprise, contrasting with the “pure” white volume behind. More surprising still, this irregular canopy is screened and supported by lashed bamboolike poles, suggesting primitive, perhaps even Japanese, construction. Here, at the entry, Aalto has announced a dialectic between traditional and modern that is sustained throughout.

Once inside, one’s attention is pulled diagonally to the left by the fireplace in the far corner of the living room. Aalto takes the traditional Finnish corner stove, with its extra children’s bunk above, and transforms it into something uniquely modern by converting the stair opening leading to the bunk into a hollowed sculptural profile at the side.

Perhaps the most memorable aspect of the living room is a modern stair of open risers that is elaborately supported and intricately joined to vertical wooden poles. The whole ensemble is adjacent to a large, sliding glass panel leading outside to the rear courtyard. The juxtaposition of stair and glass produces an unexpected result; the view through the stair to the courtyard is reminiscent of looking out through the forest’s edge into a landscape beyond. The blurring of the distinction between inside and outside is enhanced by the extensive use of wood in the ceiling and occasional interior columns wrapped in rattan.

At this remove, it is generally accepted that one of Aalto's most significant achievements is this creation of a "forest space." This metaphorical experience of a forest inside his buildings is a reference to the primary experience of his beloved Finland. The living room at the Villa Mairea is the one of the clearest statements of this idea.

Despite the abundant stylistic contradictions, the house is a comfortable, livable home. The interior unfolds as a succession of controlled vistas and carefully formed spaces. Much of this ease results from the L-shaped plan, which is divided into a kitchen-servants' wing and a family-living area. This organization is probably derived from plans of 19th-century aristocratic Scandinavian manor houses, with which Aalto would have been familiar. Meanwhile, the "L" also forms a courtyard that is reminiscent of much older Finnish peasant farms and faintly of Italian courtyards. Thus, even in the plan, Aalto makes references to other architectures and other places and resolves complex programmatic issues. The combination of conflicting references continues within the courtyard, where there is a traditional sauna combined with a free-form plunge pool. Although the pool is an unfamiliar farm element, the larger reference is to the Finnish landscape with its many lakes. The wooden sauna with its turf roof is a rustic, vernacular structure, and it is connected to the house by a turf-covered breezeway supported by metal pipe columns and a single concrete pier. Countering the sauna, diagonally across the courtyard, is Maire Gullichsen's second-floor study, which is collaged onto the main, white volume of the house. The ambiguous form of the study, sheathed with vertical wood strips, is a combination of crafted material with abstract modern form. Despite the modern elements, the overall effect is to integrate the building with its place. Such an integration is unusual for modern buildings of this period, which usually were treated as objects distinct from their sites.

In all these examples and in the whole of this project, Aalto successfully brought together the opposed worlds of Finnish vernacular and International Style modernism. In so doing, he produced a work that has had a substantial and lasting influence on the history and development of modern architecture. Here, he provided one of the few examples of a "humanized modernism" that recognized the significance and experience of the individual as opposed to focusing on the often dehumanizing effects of industrial technique.

In recent years, the Villa Mairea, with its references to other architectures, times, and traditions, has been a significant touchstone for Postmodernism, whose practitioners see in Aalto's work useful examples of referential and metaphorical design strategies. In particular, various critics have remarked on Aalto's design method as being fundamentally "typological"; that is, designing in plan, elevation, and detail with specific references to historic and basic "types" of architecture. It was Aalto's genius that constantly transformed and mixed those types to produce complex works whose richness, subtlety, and variety set a new standard for architecture.

Despite all the referential games that he played in his buildings, Aalto awakens the viewer to the deep and fundamental connection between humans and the natural world. It is this awareness that remains the moving and transforming core of the Villa Mairea.

LAURENCE KEITH LOFTIN III

Further Reading

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VILLA SAVOYE, POISSY, FRANCE

Designed by Le Corbusier, completed 1930

Le Corbusier (Charles-Édouard Jeanneret) had been living in Paris since 1916, collaborating with Amédée Ozenfant in the production of the review *L 'Esprit nouveau,* constructing several private homes, including the La Roche-Jeanneret houses (which would later become the Fondation Le Corbusier), and proposing ambitious projects for mass housing. By 1925, he succeeded in securing official backing for the construction of an experimental housing enclave at Pessac, near Bordeaux—an enterprise that seemed to presage a revolution in the building industry by bringing to construction the benefits of mass production that had made the automobile industry. He now began to receive commissions for luxury villas from families with interests in industry or with American connections. Among these were the designs made for Mongermon, one of the directors of the Voisin car and airplane industries, and in 1926 a villa at Garches for Michael and Sarah Stein.

The process by which Le Corbusier obtained the collaboration of his clients was not an easy one, as his ideas were as much directed to using new materials and developing a new lifestyle as they were to securing satisfied clients. In the case of the commission for the Villa Savoye, which arrived in 1928, the clients rejected his first design but returned to it after he had explored alternatives and presumably after he had succeeded in gaining the confidence not only of Pierre Savoye but of his wife, Emilie, as well. The villa was completed in 1930, at a cost almost double that of the estimate. It was used by the family as a weekend retreat until it was abandoned at the outbreak of war in 1939. However, it was plagued by leaks from the windows, skylights, and flat-roof terraces, and in September 1936 Madame Savoye complained to the architect that "it is raining in my bedroom."

During the war years, the villa was commandeered by the Germans, then by the Americans, and came under threat when the Commune of Poissy planned to absorb the land for the construction of a school. Le Corbusier was forced to make representations in high places, including to his friend André Malraux, minister of cultural affairs, in order to prevent its demolition.

Despite Villa Savoye's rather unsatisfactory history of cost overruns and architectural defects, it was acquired by the government as a national landmark. More than any other of the time, the Villa Savoye embodies the qualities that were to be ascribed to modern architecture produced under functionalism, and as such it has entered into history. In 1938, Henry-Russell Hitchcock and Philip Johnson published their influential book *The International Style* and chose a picture of the Villa Savoye for the dustcover. It embodies the idea of a functional architecture pared down to essentials, and it has, in addition, something exceptional that makes all the difference: a sweet sense of form, and a flair for style. There is a marvelous balance between form and content, each increasing the effect of the other, and so it seems to crystallize the very idea of modernism in architecture.

Villa Savoye, Poissy, France (1930)

Photo © Alan Windsor

The villa occupied an extensive field surrounded by a belt of trees. Le Corbusier placed it on the slightly higher ground in the middle of this field, so that it commanded views in all directions, and gave it four similar sides, one for each direction. There is some weight in the critic Colin Rowe's suggestion that it compares with Palladio's Villa Rotunda, just as the villa at Garches can be compared with Palladio's Villa Malcontenta, and there is much about the design that gives it a classical feel, but this aspect has been totally transformed by the idea of the machine aesthetic. To begin with, the frontality of the plan is full of paradox. For a weekend house some 30 kilometers from Paris, the car is obligatory. Instead of directly approaching a front porch, the visitor drives under the house on a gravel surface, sweeps around the back, and stops at the opposite side. The back becomes the front. The ground-floor accommodation is retracted to allow this, and it curves precisely to the sweep of the car.

The entrance door is classically placed on the central axis of the house, but the hall opens out asymmetrically. Directly opposite, instead of the traditional staircase there is a narrow ramp that dives deep into the house before bending back at the half landing. Although the front door, which parts in the center with two sliding leaves, is on the centerline of the house, this axis is also occupied by a row of columns, and on the half landing one crosses this line.

The space of the ramp is fully glazed above, so that it attracts the visitor upward toward the light. Once on the second level, it can be seen that it continues farther upward, on the outside, providing access to the solarium on the roof. The house now appears like an apartment, with all the family accommodations on the raised level, the ground level reserved for the servants' quarters. However, a good slice of this upper level is given to an extensive roof terrace, onto which the living room looks, with large sliding windows facing southwest. There is a Mediterranean feeling about this terrace, with its fixed concrete table ready for the moment of the aperitif. All the family spaces around the house are lit by a continuous band of glazing, the glass omitted where the wall traverses the terrace, so that the appearance on the outside is constant on all sides. The regularity of the outer face is offset by the dynamic thrust of the ramp and the curved roof forms that shelter the solarium from the wind.

In this design, Le Corbusier synthesized elements from his art with elements from his idea of a machine architecture derived from industrial processes. To review the different stages by which he arrives at the final design is to review a tentative process, for it only crystallizes along the way. Yet the finished result is so imbued with his conviction, so certain in its balance, that it sums up not just an episode but an epoch as well.

ROBERT MAXWELL

S*ee also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France); Hitchcock, Henry-Russell (United States); International Style**

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VILLANUEVA, CARLOS RAÚL 1900–72

Architect, Venezuela

Known as Venezuela's greatest 20th-century architect, Carlos Raul Villanueva straddled opposing political regimes, cultural milieus, and architectural styles during his long and eclectic career but left no school or followers. His most significant contribution to the country's architecture, a modernist style inflected by Venezuelan vernacular architecture and influenced by the Venezuelan tropical climate, proved too personal to be imitated. Although his residential designs are well known, it is in the public sphere—schools, housing projects, and universities—that Villanueva had the greatest effect. In particular his commitment to implementing his vision of the "synthesis of the arts" in public spaces made his work important to the Venezuelan urban context.

Villanueva began to practice his profession in Caracas in 1929 when he was appointed to the post of architect and director of building in the Ministry of Public Works under the regime of General Juan Vicente Gómez. From this period buildings such as the Plaza de Toros de Maracay (1931–33) and the Museums of Fine Arts and Natural Sciences (1934–35), among others, demonstrate how Villanueva tempered his interest in vanguard European architectural movements with a Neoclassicism designed to appeal to a conservative elite.

The next period of the architect's career is marked by a clearer influence of European modernism, as buildings such as the Gran Colombia School of Caracas (1939; today Francisco Pimentel), lack the ornamentation of earlier projects and instead employ molded reinforced concrete to create curving forms and masses. These buildings also illustrate Villanueva's evolving concern with light and shadow. Demonstrating his early interest in incorporating works of art into buildings, Villanueva integrated a sculpture by Venezuelan modernist sculptor Francisco Narváez into the main wall of the school.

In 1940 Villanueva was named chief architect and consultant of the Banco Obrero (Workers' Bank) of Venezuela, a government institution whose mission was to improve the living condi tions of the lower and working classes. One of his first projects was to remodel the neighborhood of El Silencio (1941–43), a barrio in the center of the city known for its high crime and unhygienic, poor housing conditions. With the remodeling of this zone would begin his preoccupation with urban spaces, in particular with the design of large-scale public housing. El Silencio embodied the challenges faced by Villanueva in attempting works on this scale, produced under competing interests and compromised by political circumstances.

In 1944 he commenced work on the University City of Venezuela (Ciudad Universitaria, also known as the Universidad Central de Venezuela [UCV], or Central University of Venezuela), which would not be completed until 1959. At the UCV, Villanueva achieved the apogee of his personal style, a Le Corbusian-derived, Venezuelan-inflected organicism that took as its touchstone the modernist dream of the synthesis of the arts. For Villanueva the creation of this "aesthetic consortium" would enable the city's inhabitants to become truly integrated in aesthetic, spiritual, and functional terms, as he believed that the natural environment of painting and sculpture is "plazas, gardens, public buildings, factories, and airports: all the places where man perceives man as a companion, a partner, a helping hand, a hope, and not as a flower withered by isolation and indifference" (Villanueva, 1957, 11). Although its style has not been duplicated elsewhere, the UCV had a great effect on the course of Venezuelan architecture. In particular, Venezuelan intellectual and political elites came to see modernism as the style most appropriate for embodying Venezuelan identity, and the incorporation of works of art into buildings was an idea taken up by succeeding architects.

Concurrently with his work on the UCV, Villanueva continued his association with the Workers' Bank and the Taller de Arquitectura Banco Obrero (Workers' Bank Architectural Workshop, or TABO). The projects commissioned by the Workers' Bank, beginning in the late 1940s, became larger and more frequent under the regime of Venezuela's last dictator, Marcos Pérez Jiménez (1952–58), ending with some of the largest public housing projects ever built in Latin America by the end of the decade. The most representative of these, Villanueva's housing community "23 de Enero" (23 January 1957), originally named "2 de Diciembre," is usually cited by critics as a turning point in the city's growth. Because of its massive scale, it stood as a concrete symbol of the regime's objective of eradicating the ranchos, or slums, that had sprouted on hillsides, under bridges, and in ravines in Caracas. In projects such as this, Villanueva incorporated elements from different phases of his career, such as the use of polychrome paintings as exterior decoration; window and wall treatments that protected interiors from wind, sun, and rain; and Le Corbusian–derived ideas about rational living spaces.

Villanueva's critics describe his use of modernist styles as superficial and eclectic, and in comparison with the work of other modernist Latin American architects, Villanueva's personal style is less fully realized. However, in context, Villanueva stands out as the first Venezuelan to combine a tropical sensibility with European modernist architecture. For this reason the UCV is regarded as Venezuela's most important architectural monument. This, perhaps, is Villanueva's most important legacy: the incorporation of works of art into architectural projects, particularly in the capital. Large-scale freestanding sculptures and mu-rals are found all over the city—in private office buildings, plazas, and subway stations and alongside highways—making Caracas a significant public art center on a par with New York City and Paris.

MARGUERITE MAYHALL

S*ee also* **Caracas, Venezuela; Ciudad Universitaria Campus and Stadium, Mexico City; Ciudad Universitaria, Caracas**

Biography

Born in London, 30 May 1900, the child of a distinguished Venezuelan family originally from Spain. Educated at École des Beaux-Arts in Paris, graduated 1928; Organized the first Department of Architecture in Venezuela (Ciudad Universitaria) and taught courses as professor in the School of Architecture (1944).

Selected Works

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In addition to his own copious writings, Villanueva gave innumerable public lectures and interviews, many of which have been published in more than one venue. As a result of his significance within the architectural community, and his effect on the Venezuelan landscape, critics and scholars have published frequently on his work as well. Critical analyses of his work, however, are almost nonexistent. In addition, Villanueva's work is not well known outside Latin America, and recent publications in English are therefore scarce. For further bibliography, see the entry on the Ciudad Universitaria.

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VILLE RADIEUSE (Ca. 1930)

Designed by Le Corbusier

While working on the Tzentrosoyuz (central statistical office) building in 1930, Le Corbusier received an inquiry from the Soviet officials concerning the reorganization of Moscow. His illustrative proposal, entitled "Ville Radieuse" (radiant city), was grounded essentially in individual freedom, exerted no influence in the Soviet Union, and remained a project on paper only. Le Corbusier continued to develop and relentlessly promote Ville Radieuse as a platform on which to present his thoughts about urbanism; it became a theoretical summary of Le Corbusier's most advanced views on town planning and design, eventually evolving into a model of a modern "ideal city" in the best tradition of old-fashioned utopias.

Le Corbusier treated the Moscow inquiry as a case study assessed through a relatively independent theoretical framework: the answers to the questions "were Moscow," but the illustrations (about 20 of them) "were the phenomenon of the organiza-tion of life in the city of the machine age, the present age" (Le Corbusier, 1935, p. 90). Essentially, Le Corbusier tried to solve the city as a problem and kept pursuing an absolute formula that would guarantee the highest quality to any urban space. His approach was not wholly new; Ville Radieuse included and refined Le Corbusier's earlier thoughts on urban design, including the Contemporary City for Three Million Inhabitants, the Voisin Plan for Paris, and the ideas expressed in his books *Urbanisme* (The City of To-morrow) and *Precisions*.

This new city was a revised version of his Contemporary City for Three Million Inhabitants, first launched for the Parisian Autumn Salon in 1922. It remained rectangular in form but allowed for lateral growth on both sides of the central communication axis, thus eliminating rigidity, the major shortcoming of the previous model. The business center, in the pattern of sixteen wide-spaced, cruciform skyscrapers, was concentrated at the "top" edge of the plan, tangential to the circular transportation terminal with a heliport on its rooftop. The industrial zone was located at the "bottom" end of the city. Areas of civic and commercial activities flanked the NW—SE communication while serving as a buffer zone to the set-back, residential superblocks. Le Corbusier's preoccupation with a total, wholesome living environment, filled with air, sun, light, and greenery inside and out was presented as an immersion of buildings into the large green areas. Although the "garden city" suburbs and the hierarchic population distribution used in previous models were eliminated, the principles like a multilevel transportation system and a "biological unit," the cell of 14 square meters per occupant, were elaborated on, and a nursery, kindergarten, and primary school were introduced in the "neighborhood unit" of 2,700.

Throughout the 1930s, applying "radiant city" urbanization principles, now formulated as a more universal model of urban planning, Le Corbusier produced a wide variety of unbuilt projects, mostly competition entries for various cities, the majority of which were included in the subsequent book titled *The Radiant City; Elements of a Doctrine of Urbanism to Be Used as the Basis of Our Machine-Age Civilization*.

The book spanned projects from his Voisin Plan for Paris of 1925, which was designed to revitalize the center of the city, to four Latin American cities, among which the site and ambience of Rio de Janeiro inspired particularly poetic expressions, resulting in the concept of an elevated highway with incorporated housing below; this megastructure was to become a focus of the later plan for Algiers. Although the geometry of Le Corbusier's model seemingly presupposed a flatness of site and indifference to topographic concerns, the scheme was only intended to facilitate the paradigm, whereas some of the most imaginative of Le Corbusier's applications were inspired by the most irregular topographies.

He blamed the migration to cities for some of the gravest urban problems and proposed solving it by redevelopment and revitalization of the rural areas. The resulting concepts for the Radiant Farm and Radiant Village eulogized the modern highspeed connection between the city and country, but his proposed modernization targeted only country living and did not include working conditions.

With the Ville Radieuse, Le Corbusier established some of the 20th century's most memorable and influential urban images and created the concept of urban environment that still underlies much of contemporary design, despite the fact that he was denied urban planning commissions for most of his lifetime. Yet, through the Charter of Athens, a manifesto of the Modern movement, and CIAM gatherings, Le Corbusier promulgated the Ville Radieuse approach to urban planning and design as a recipe for the quality of the living and dwelling environment. His vision presupposed a revolution in dwelling, architecture, and urbanism. That Le Corbusier's romanticized and futuristic urban dreams exerted such influence among generations of architects all over the world was a result of his sophisticated theories that successfully combined a persistent and contagious enthusiasm for the architect's doctrine.

GORDANA KOSTICH-LEFEBVRE

S*ee also* **Contemporary City for Three Million Inhabitants; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Voisin Plan for Paris**

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VISITOR CENTER

The visitor center is a product of the post-World War II automobile age, welcoming road-weary tourists with promises of comfort, education, and entertainment. Prominently situated at historic areas, national parks, and state borders, the visitor center combines a wide range of functions, such as rest rooms, information kiosks, bookstores, and museum exhibits, that were once housed separately.

The term and concept of "visitor center" were brought into widespread use by the National Park Service during its "Mission 66"building improvement program (1956–66). Under Mission 66 the Park Service promoted 100 newly created visitor centers as the hub of a ten-year, billion-dollar effort to improve tourist and administrative facilities in the national parks. Mission 66 aimed to satisfy an astronomical rise in the number of visitors, growing from 17 million annually in 1940 to 54 million a year by 1954, at park sites that had not been substantially upgraded since the 1930s. Rangers could not handle the massive influx of tourists in the existing structures, small "rustic" buildings often lacking basic conveniences such as air-conditioning or indoor rest rooms.

Under Mission 66, Park Service planners created a prototype design for a new building type—the visitor center—that could be adapted to the unique character and specific requirements of each site. The prototypical visitor center consisted of a compact building equipped with clean rest rooms, public telephones, a large circulation lobby, an information desk, staff offices, and areas for interpretive exhibits. Centers for more popular parks might include an auditorium with regularly scheduled orientation films, a cafeteria, a research room, and a library. A convenient parking area nearby accommodated visitors' automobiles and trailers. These basic elements remain at the core of visitor center planning today.

As the first stop for tourists, the visitor center created a transition zone between the environment outside the park and the natural and cultural features inside. Park planners sited the buildings at strategic points in an effort to funnel tourists through an orientation process, a critical component of the Mission 66 visitor center campaign. Once inside the building, visitors found interpretive exhibits, safety guidelines, educational pamphlets, maps, and a helpful ranger to answer questions. Many of the buildings offered panoramic views of nearby scenic vistas; a well-marked exit might lead to an open patio for an on-site ranger presentation or the first stop on a self-guided tour.

To attract visitors, architects created innovative, high-profile buildings that promised modern facilities in even the most remote locales. Bold dramatic rooflines, wide expanses of glass, overhanging eaves, and prominent entryways raised the visibility, and therefore the appeal, of the buildings to the public. To maintain a contextual continuity, architects incorporated physical or symbolic characteristics of the site in the building design. For example, architect Richard Neutra designed the Visitor Center and Cyclorama Building at Gettysburg National Military Park (1961) as a memorial to Abraham Lincoln and his famous address. The monumental profile of the stark white cylindrical building, displaying such modern design elements as movable sun louvers and a concrete spider-leg, reflects the commemorative character of the 1863 Civil War battlefield and nearby cemetery. Similarly, Romaldo Giurgola of Mitchell/Giurgola Architects conveyed the spirit of innovation in designing a visitor center for the Wright Brothers National Memorial at Kill Devil Hills, North Carolina (1960). The center's sweeping sculptural concrete form rises prominently from the sand dunes and connects the historic past to the present by invoking the character of modern airport terminals of the 1960s.

Quarry Visitor Center (1956–58), Dinosaur National Monument, Jensen, Utah

© Christine Madrid French, 2000

The visitor center prototype introduced by the National Park Service in the mid-1950s has been widely adopted by other civic and corporate entities in the decades since. Older structures designed as small-scale museums, information centers, or nature centers were remodeled or replaced by multipurpose facilities; others were simply renamed "visitor centers." In the late 1960s, Pacific Gas and Electric of California established visitor centers at its nuclear power plants as part of a massive pronuclear public relations campaign. British Nuclear Fuels Limited followed quickly with its own center, featuring a life-size model of a nuclear reactor core and a walk-in "Fission Tunnel." Other government agencies, such as the U.S. Bureau of Reclamation and the National Forest Service, followed the Park Service example and created their own system of visitor centers in the 1970s at national recreation areas and national forests.

Once considered gateways to other featured attractions, visitor centers are now marketed as destinations in themselves. It is not unusual to find photographs of visitor centers proudly displayed on postcards or prominently featured in promotional brochures. Indeed, several early examples of the building type are now recognized by leading architects and scholars as American cultural landmarks, worthy of preservation and interpretation.

In the 50 years since its introduction, the visitor center has evolved into an entertainment complex as well as an information service center, combining full-scale museum features, retail outlets, and research facilities. It is a testament to the utility and adaptability of this modern building type that we now consider the visitor center a timeless element of the American roadside landscape.

CHRISTINE MADRID FRENCH

Further Reading

Architectural histories focusing on the development of National Park Service building types are provided by Good (1938) and McClelland (1998). Architect-specific publications provide photographs and descriptions of the Wright Brothers Visitor Center; see Giurgola (1983), and the Gettysburg Cyclorama, see Boesiger (1966). Allaback (2000) focuses on the promotion of the visitor center under the Mission 66 program. Further analyses of the building type are available in magazines and journals dating from 1955 to the present, including Tilson (1993) and Dheere (1999).

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VOISIN PLAN FOR PARIS (1925)

Designed by Le Corbusier

In the Voisin Plan, Le Corbusier adapted the principles of his Contemporary City for Three Million Inhabitants (1922) to the specific situation of Paris. In 1922 a sketch accompanying the Contemporary City demonstrated an adaptation of the plan to the historic center of Paris. In 1925 the renovation of Paris became the main issue. The plan was exhibited at the Pavilion of Esprit Nouveau at the International Decorative Arts Exhibition of 1925. The pavilion was an architectural manifesto that showcased two projects: a residence type that systematically used standard elements and a study of the principles of standardization in their urban and interurban context. The former was represented by a full-scale model of a unit from the Immeuble Villas block. The latter, the Voisin Plan and the Contemporary City, were featured in an annex of the pavilion. Although a theoretical exercise, the plan was also a concrete proposal aimed at the transformation of Paris and marked the first of Le Corbusier's numerous proposals for Paris, including the Ville Radieuse (Radiant City; ca. 1930) and *Le Destin de Paris* (The Destiny of Paris; 1941). Eugène Hénard's *Études sur les transformations de Paris* (Studies on the Transformations of Paris; 1903–06) was an influential precedent. Somewhat sensational, the radical Voisin Plan was severely denigrated by critics who accused Le Corbusier of wanting to destroy Paris.

The plan addressed the urgent problems facing Paris: overcrowding, traffic congestion, and the lack of office space. Central to the plan was Le Corbusier's conception of the relationship between skyscrapers and traffic routes, based on the principles of high density, open space, and speed. Le Corbusier wrote in *Urbanisme* (*City of Tomorrow,* 1925) that the plan did not provide definitive solutions to the problems of Paris but that its primary aim was to cut through small, uncoordinated efforts at renovation and raise the level of discussion to large-scale reforms that would incorporate contemporary issues. To transform Paris into a modern city, Le Corbusier invoked the tradition of urban planning. Facing the dilemma of medicine or surgery, he referred to the tradition of applying both and chose surgery for the historical center. The projected site was an L-shaped area of 240 hectares located northeast of the Louvre on the Right Bank. Most buildings and streets were to be demolished for the area to be built anew in a rigorous geometric pattern. Only a few isolated, historic buildings were to be preserved: the Louvre, Palais Royal, Place Vendôme, Place de la Concorde, Arc de Triomphe, Opera, and a few churches and town houses.

In the business district on the eastern half of the area facing the Ile de la Cité, 18 cruciform office towers, surrounded by open, green space, were to be built along the axis of the Boulevard Sébastopol. In the western, residential district were to be the setback, or *redent,* blocks, either of the Immeuble-Villas type that form large blocks or covered with immense sheets of glass. Streets were replaced by elevated terraces with shops, cafes, and restaurants for social and commercial functions. Underlying the ideology of creating well-being and happiness through large-scale planning was the political notion that the problems of social disorder could be resolved by the provision of the essential joys of sunlight, greenery, and leisure.

Another essential component of the plan was hygienic and comfortable dwellings. The exhibited full-scale model unit was a standardized modern duplex that, superimposed with other duplexes, formed the apartment block. This seminal building type marked a new approach to architecture. Built in reinforced concrete and Cubist in form, its design centered around spatial proportions and volumes rather than around a two-dimensional facade. Its double-height living area and garden terrace would recur in Le Corbusier's designs. The unit was furnished according to the purist canon of *objets-types* that balanced folk, craft, and machine-made objects.

The name Voisin points to one of the essential aims of the project: the creation of a wide east—west artery parallel to the rue de Rivoli for fast automobile traffic. To finance the Pavilion of Esprit Nouveau, Le Corbusier sent out letters to the biggest names in the automobile industry—Voisin, Michelin, and Citroën—asking them to contribute funds in exchange for publicity. The Voisin car and airplane cartel, which was interested in mass-produced housing, supported the project. Le Corbusier regarded locomotion simultaneously as a modern influence threatening Paris that required reorganization and also as one of the fundamental sources of power for the modern commercial city, as is illustrated by his entrepreneurial aphorism "A city made for speed is a city made for success." Financially, however, as with other aspects of the plan, the construction of the artery was not a viable idea. If enacted, it would have been one of the most costly as well as destructive projects to be carried out in Paris. Financially and politically, the plan was unrealistic.

In the history of urban planning, the Voisin Plan has often been singled out as a symbol of the Modern movement's disregard for the past. However, Le Corbusier's own view was that through the plan the prestigious vestiges of Paris were not only preserved but rescued as well. By opening up the area around the monuments, they were to be protected from the daily urban activities that endangered them. According to this logic, the buildings now became monuments to be conserved and thus were reintegrated into the fabric of the modern city. In this way Le Corbusier's dogmatic project nonetheless underlined the dynamic between renovation and conservation. Moreover, in later plans some of the most radical features of the plan were modified. In 1933 the cruciform skyscraper was replaced with a smaller, Y-shaped type that allowed in more sunlight. In the later plans, these skyscrapers were to be built far from the existing center. Although it was the earlier, cruciform towers that were enthusiastically adopted by planners through the 1960s, other aspects of the plan, such as the Immeuble-Villas unit and the overall call for systematic planning, fundamentally influenced 20th-century architecture.

HAZEL HAHN

S*ee also* **Contemporary City for Three Million Inhabitants; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Inter-national Exhibition of Decorative Arts, Paris (1925); Ville Radieuse (ca. 1930)**

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VON MOOS, STANISLAUS 1940

Architecture historian and critic, Switzerland

In the history of modern architecture, Switzerland is the European country whose role and import have been sorely underplayed and underacknowledged. However, thanks to the assiduous and careful scholarship of Stanislaus von Moos, the Swiss contribution to 20th-century building has been immeasurably enhanced. More than any other Swiss national, Von Moos has maintained a vigorous sponsorship of art and architecture from his native country through a varied program of publishing, curatorial practice, and above all, pedagogy.

Born in Lucerne in 1940, Von Moos studied at the Eidgenös-sische Technische Hochschule in Zurich and later at the University of Zurich and the Università degli Studi in Florence. From the university he received a Ph.D. with a thesis on military architecture and its impact on 15th- and 16th-century European palaces and villas, later published as *Turm und Bollwerk: Beiträge zu einen politischen Ikonographie der italienischen Renaissancearchitektur* (1974). However, during his studies in Zurich, he had the good fortune to serve as research assistant to Sigfried Giedion, whose *Space, Time, and Architecture* (1941) certainly whetted his appetite for future studies of the modern period in architecture and served as a template for his own major publications.

Von Moos's foray into 20th-century topics began when he was asked to contribute to a series of monographs on notable Swiss men and women, an assignment that would determine the trajectory of his career from that moment forward. Noting the absence in the late 1960s of a comprehensive and critical study of Le Corbusier, Von Moos embarked on such a project, to be published in 1968 as *Le Corbusier; Elemente einer Synthese* (published a decade later in English translation). For the first time since Le Corbusier's death in 1965, and continuing more or less to the present day, Von Moos's chef d'oeuvre was and is the only attempt to understand Le Corbusier's career from a synthetic point of view, encompassing his paintings and graphics, writings, unbuilt projects, and built work. The success of the work is tied to Von Moos's meticulous research and his access (beginning with Giedion) to many of Le Corbusier's compatriots and collaborators.

L*e Corbusier: Elements of a Synthesis,* the work's English title, is presented as a series of essays on different aspects of Le Corbusier's work, including purism, urbanism, utopian visions, typology, and public commissions. Von Moos writes of Le Corbusier's "visual and poetic approach to reality," a formal reading that allows the author to establish a teleology of Le Corbusier's oeuvre from the Villas Fallet and Schwob (his earliest works in Switzerland), to his purist paintings of the 1920s, to the later works of Chandigarh and La Tourette monastery, foregrounding what Von Moos sees as Le

Corbusier's Ruskinian tendency to identify a fundamental order and organization within nature.

As the first book to treat Le Corbusier as a historical subject, *Elements* is responsible for many of the originary ideas about the architect's works; for example, Von Moos indicates the use of continuous typologies for specific building uses, such as the orthogonal box for dwellings, the spiral for museums, and the triangle for assembly halls. In doing so, Von Moos builds on earlier work by Colin Rowe that analyzes Le Corbusier's recycling of themes and motifs in differing projects as a process of "displacement." Thus, the book's strength lies in its central belief in a specific architectural practice's underlying system that found its ultimate epiphany in Le Corbusier's Modulor system of measurement, one that expressed "a common denominator between human proportions and elemental geometry."

Von Moos's interest in architectural polemicists led him to his next major subject: the writings and practice of Robert Venturi. Von Moos had already broached the similarities between Venturi and Le Corbusier in *Elements,* which led him to recognize the attention to typological study that bound these two architects together. While teaching at Harvard University in the early 1970s, Von Moos found in Venturi an introduction to American vernacular architecture; building on the apparent relationship between Le Corbusier's *Towards a New Architecture* (1923) and Venturi's *Complexity and Contradiction in Architecture* (1966)—which share an ahistoricism and privileging of aesthetics over history—he embarked on the first major study of the latter's work (*Venturi, Rauch, and Scott Brown: Buildings and Projects* [1987]).

The book is arranged as an extended essay and catalogue raisonné, with the essay "The Challenge of the Status Quo: 5 Points on the Architecture of VRSB" belying a further debt to Le Corbusier. Von Moos adopts the role of apologist, elucidating one of the first and most extended defenses of Venturi's built work and providing the means away from a narrow vision of Venturi as mere pop theorist and toward one that considers his architecture in a serious manner. As in his treatment of Le Corbusier, thematic and typological motifs (such as the segmented arch, adapted from Louis Kahn) are traced through their use in different contexts as a means of exploring the plastic and fungible quality of architectural themes in Venturi's practice.

Von Moos also fashioned a career as an important curator, having organized important exhibitions devoted to Venturi ("Venturi and Rauch: Architektur im Alltag Amerikas") for the Kunstgewerbemuseum in Zurich (1979) and a major show cele-brating Le Corbusier's 100th birthday ("L'Esprit nouveau: Le Corbusier und die Industrie, 1920–1925") for the Museum für Gestaltung in Zurich (1987). In the latter exhibition, Von Moos revisited familiar terrain, focusing on Le Corbusier's early theories and their organization around industrial themes. In addition, as curator of the Swiss Pavilion for the 1998 Milan Triennale, he initiated a recuperation of another much maligned figure: the Swiss artist/architect/teacher Max Bill.

Von Moos's work displays an admirable ability to project patriotic pride while avoiding xenophobia. One of his most enduring and selfless projects was as founder and editor in chief of the architectural quarterly *archithese*. From its appearance in 1970 and continuing to the present, this journal has provided a crucial voice for European architectural criticism and theory, with a purview beyond mere Swiss national concerns.

As a professor in Europe and abroad, Von Moos has maintained a commitment to pedagogy seemingly at odds with the vast amount of writing and research required of his manifold other projects.

NOAH CHASIN

See *also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France)**

Biography

Born in Lucerne, 1940. Married; two daughters. Ph.D. from University of Zurich in 1967 (thesis: "Turm und Bollwerk: Beiträge zu einer politischen Ikonographie der italienischen Renaissance-Architektur"). Taught at Harvard University (1971–75); University of Bern, Switzerland (1974–78); Technische Hogeschool, Delft, the Netherlands (1979–83); University of Zurich (1982-present); Princeton University (1997); Graduate Center of the City University of New York (1998). Founding editor of *archithese* (1970–80). Curator of "The Other Twenties: Themes in Art and Advertising" (Harvard University, 1975); "Venturi und Rauch: Architektur im Alltag Amerikas" (Zurich, Berlin, Hannover, Freiburg, Milan, Florence, 1979); "L'Esprit Nouveau: Le Corbusier und die Industrie, 1920–1925 (Zurich, Berlin, Strasbourg, Paris, 1986–87); "Le Corbusier before Le Corbusier" (Baden and New York, 2002–03). Fellowships at Swiss Institute, Rome (1968–70); Institute for Advanced Study, Berlin (1985–86); Getty Center, California (1992–93); CASVA, Washington, D.C. (1996). Schelling Prize for Architectural Theory, Karlsruhe (1998).

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VOYSEY, CHARLES FRANCIS ANNESLEY 1857–1941

Architect and designer, England

C.F.A.Voysey was, on the one hand, a late product of the English Gothic Revival and, on the other, an original and innovative architect who is regarded today as important for the development of the new architecture of the 20th century. Although he lived long enough to know and to dislike the International Style of the 1920s and 1930s, the publication of Voysey's designs in British, German, Belgian, and Austrian magazines before 1900 was definitely influential on those who formulated the new architecture. Soon after the turn of the century, his work was also noticed, exhibited, and admired in the United States and in Scandinavia. C.R.Mackintosh, whose work Voysey did not like, acknowledged his formative influence. Acknowledged as an enigmatic architect with somewhat ambiguous ties to the English Gothic and Arts and Crafts movements of the 19th century, Voysey nonetheless provided many architects of the first third of the 20th century with a sense of invention and synthesis in his practice of design. Seeking to extract meaning from rural vernacular architecture and from contemporary work by C.R. Ashbee or Arthur H.Mackmurdo, Voysey emphasized simplicity, a principle that mattered to many architects both inside and outside the Modern movement.

He was born at Hessle in Yorkshire, the eldest son of a Church of England clergyman, and his father had a profound influence on him. The Reverend Charles Voysey was a man of resolute faith who was nevertheless eventually expelled from the Anglican Church for heresy: He denied the doctrine of everlasting hell. Reverend Voysey then formed his own Theistic Church based on rational principles. Voysey's religious convictions, firm independence, and unshakable integrity owed much to his father's example. He was taught at home until he was 14 and then attended Dulwich College for two years (1871–73), after which he briefly had a private tutor. As he was a slow learner whose grammar and spelling always remained shaky, his education appears to have been narrow and limited.

At the age of 17, Voysey was articled to John Pollard Seddon and remained in his London office for six years. He then worked briefly (1879) in the office of Saxon Snell, who specialized in hospitals, before spending the next two years with the fashionable country house architect George Devey.

In 1881, at the age of 24, Voysey set up his own practice in Westminster. He was a passionate devotee of the writings of both Pugin and Ruskin, both of whom had been known personally by his father; from them, he developed his conviction that the laws of design and construction should be learned from the study of nature. One of the strongest professional influences on Voysey was that of A.H.Mackmurdo, a protégé of Ruskin's, who introduced Voysey to the design of wallpapers and encouraged him to join the Art Workers' Guild in 1884.

"To be simple is the end, not the beginning of design," Voysey wrote in 1893. He usually drew together the elements of his houses into a single volume, covering this rectangular form with a high-pitched gable or hipped roof of slate. Wall surfaces were plain, characteristically rendered with gray- or white-painted roughcast. Buttresses, incorporated sculpturally into the wall treatment, were needed to support the deep, sweeping roofs. His windows were usually stone mullioned, with metal casements, and arranged in long horizontal groups. Chimney stacks were few and were sculpturally related to the walls and buttresses in material and form.

Voysey's first commission was for The Cottage (1888–89) in Warwickshire, for which he employed roughcast rendering, as his client was a cement manufacturer. From that time on, he preferred this wall treatment; he also almost always used greenish gray slates for roofs, seldom paying attention to local building traditions. His tall, narrow, white and gray house at 14 South Parade (1888–91) in Bedford Park still contrasts sharply with its red-brick, red-tiled neighbors by Norman Shaw, although he was obliged to use the latter materials for his twin town houses, 14 and 16 Hans Road (1891–92).

Similar in style is a superb series of houses in the country: Perrycroft (1893) in Malvern; Lowicks (1894) in Tilford; Annesley Lodge (1895), for his father, in London; Greyfriars (1896),

House at Lowicks, Surrey, designed by Charles F.A. Voysey

© Alan Windsor

for the American writer Julian Sturgis, in Surrey; Norney and New Place (both 1897; both in Surrey); and his own house, The Orchard (1899), in Chorleywood. All have cool, spare interiors. The welcoming entrance hall has a fireplace; the staircase rises, usually with a screen of tall, thin, plain, square-sectioned wooden balusters uniting the lower and upper floors. Living rooms usually have inglenook fireplaces, ceramic tiled or paneled with plain marble sheets. In each bedroom, a small ventilator panel of pierced and decorated metal admits fresh air through three narrow slits in the center of the gable outside. Norney and New Place have semicircular, or “bow,” windows, a feature that subsequently became very popular in England for small suburban houses. The guttering of the house is characteristically supported at intervals on thin, prominent iron brackets. Doors have long wrought-iron hinge straps terminating in a heart shape and are sometimes pierced with a hole of that shape; another Voysey signature is the sly, almost hidden grotesque caricature of himself or of his client as an unobtrusive profile molding on a staircase or porch bracket. “Simplicity, sincerity, repose, directness and frankness are moral qualities as essential to good architecture as they are to good men,” wrote Voysey.

At Broadleys (1898) on Lake Windermere, Voysey’s most celebrated masterpiece, he introduced three commanding bow windows to provide maximum enjoyment of the views of the lake and the mountains beyond; Voysey’s houses are always sensitively responsive to their settings.

An exceptional commission was for the Sanderson’s Wallpaper Factory (1902) in Chiswick: a three-story rectangular building in which concrete floors resting on steel joists are supported by hollow piers that act also as ventilation shafts. Between these extend large steel-framed windows; there are no walls. The roof is hidden behind a tall parapet of wavy-topped sections between each pier. The whole building is clad in white-glazed bricks, and although quite unlike any of his houses, Voysey’s design vocabulary is here perfectly consistent with certain aspects of his style, particularly that of his furniture.

Despite his international fame, Voysey’s practice almost ceased after 1914, and for the rest of his long life, apart from a handful of commissions and some extensions to earlier houses, his main income came from designing wallpapers, fabrics, metalwork, and furniture. In 1924, he became master of the Art Workers’ Guild. He was awarded the Royal Gold Medal of the Royal Institute of British Architects in 1940.

ALAN WINDSOR

Biography

Born in Hessle, Yorkshire, England, 28 May 1857. Apprenticed to architect J.P.Seddon 1874–79. Married 1885. Chief assistant to J.P.Seddon 1879–80; assistant to architect H.Saxon Snell 1879–80; assistant in the office of George Devey 1880–81. Established a private practice, London 1882; also designed furniture, wallpaper, fabric, tiles, and metalwork. Gold Medal, Royal Institute of British Architects 1940. Died in Winchester, England, 12 February 1941.

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W

WAGNER, OTTO 1841–1918

Architect, Austria

Otto Wagner's career spanned the transition from 19th-century historical revivalism to the emergence of a new modern architecture. From the mid-1890s to the time of his death at the end of World War I, he occupied a place at the forefront of the modernist assault in Vienna. Yet Wagner's works and ideas were often complex and contradictory, and his position with respect to the modernist program was not infrequently ambiguous. Although he was among the foremost early proponents of a new tectonic rationalism, Wagner never wholly shed traditional notions of style and beauty, and his lifelong ambition, to become the architect to the Habsburg imperial household, stood in glaring opposition to his desire to forge a new building art for the modern metropolis.

Wagner's early years paralleled the development of the Vienna Ringstrasse, and many of his assumptions were shaped by the prevailing ideals and practices of the era. Born in 1841 into a family of wealthy bourgeois bureaucrats, Wagner received his early architectural training at the Vienna Technical University (1857–59) and the Royal Building Academy in Berlin (1860), where he studied with the successors of Karl Friedrich Schinkel. However, it was at the Academy of Fine Arts in Vienna, which Wagner entered in October 1861, where he encountered the two figures who would form his architectural outlook: August Sicardsburg and Eduard van der Nüll. Sicardsburg and van der Nüll, designers of the Vienna Opera House, had long advocated the necessity of finding a "rational expression for modern architecture" (quoted in Graf, 1987). Wagner's later appreciation of utility and his search for a new language of construction arose from their teachings, and it was to van der Nüll that he attributed his refined facility for drawing.

After completing his education at the Academy in 1863, Wagner embarked on his architectural career. Early on, however, he found few commissions for public projects, and he worked instead on a series of apartment houses, a number of which he financed himself as speculative ventures. Many of these buildings were executed in a "free Renaissance" style, and this new astringent and innovative classicism became the young Wagner's hallmark. By the late 1880s, Wagner was considered the preeminent builder of tenement houses in Vienna, but his attempts to secure more prestigious works remained mostly fruitless. Among the notable exceptions were his Orthodox Synagogue (1871–76) in Budapest and the Österreichische Länderbank (1882–84) in Vienna. The former was executed in a neo-Moorish idiom and the latter in Wagner's more characteristic Renaissance style, but in both buildings the outer historicist skin concealed what were—in material, constructional, and spatial terms—already remarkably modern buildings. Wagner, however, continued to experiment with more conventional ideas of monumentality and form, as his neobaroque *Artibus* project of 1880 powerfully demonstrates, and it was not until the early 1890s that he fully emerged in the guise of an architectural reformer.

Wagner's transformation followed in the wake of his successful entry into the Vienna city-planning competition held in 1893. Drawing on his own growing sense of the primacy of functionality, Wagner's proposal emphasized the creation of an extensive urban rail network as well as the regulation of the Danube Canal and the Wien River. Wagner's straightforward response to the problems of traffic and urban expansion drew widespread praise, and as a consequence, he was named chief architect of the municipal railway system in 1894. The work, which continued until 1901, not only required Wagner to design more than 30 stations but also involved the siting and design of a series of bridges, tunnels, and viaducts. Wagner's first stations, executed in brick and stucco with pronounced classical detailing, reflected traditional ideas of building "art." However, as construction progressed, he began to explore a more stripped and utilitarian idiom. After 1897, Wagner also investigated the possibilities of the new Jugendstil language, which he combined with elements of Renaissance and baroque classicism. In some instances, such as the twin stations on the Karlsplatz that he produced in collaboration with his younger protégé, Josef Maria Olbrich, Wagner's solutions pointed toward a new mode of building—a light iron skeleton framing thin slabs of marble—that anticipated the constructions of the 1920s and beyond. Yet other features of Wagner's designs reveal his continuing allegiance to the past: the private railway pavilion he designed for the imperial family at the Schönbrunn Palace—despite its ebullient iron *porte-cochère*—was still firmly rooted in the "style architecture" of the Ringstrasse era, and many of his other stations included features—swags, statuary, wreaths, and rustication—intended to disguise or aestheticize their structural details.

In 1894, shortly after beginning work on the city railway project, Wagner was appointed professor of architecture at the Academy of Fine Arts. Although the chair, previously occupied by the noted Ringstrasse architect Carl von Hasenauer, was reserved for a "convinced representative of classical Renaissance," Wagner in his inaugural address called for a new, "realist" approach to the problem of modern building:

> Our living conditions and methods of construction must be fully and completely expressed if architecture is not to be reduced to caricature. The realism of our time must pervade the developing work of art. It will not harm it, nor will any decline of art ensue as a consequence of it; rather it will breathe a new and pulsating life into forms, and in time conquer new fields that today are still devoid of art—for example that of engineering. (quoted in Mallgrave, 1993)

He sounded these same themes again in his book, *Modern Architecture,* which appeared the following year. Conceived as both textbook and manifesto, the work assailed the inability of 19th-century "style architecture" to meet the needs of modern urban life.

Wagner called instead for a visual language suited to the

Church of St. Leopold am Steinhof (1907)

Photo © Mary Ann Sullivan

new age, one that could fulfill the requirements of the expanding metropolis. Wagner's insistence on pragmatism, like his chosen motto for the *Stadtbahn* project (borrowed from Gottfried Semper), *artis sola domina necessitas* (Necessity is the only master of art), however, merely concealed his own lofty "artistic" ideals: he maintained that the mission of the architect was to find a means of reconciling the realistic and utilitarian with the forms of artistic expression and that it was only through this mediation that mere building could be elevated to *Baukunst* (building art).

Wagner sought to communicate these ideas not only through his works but also in his teachings. Between 1894 and 1912, he devoted a significant portion of his time and energy to his "Special class"—the so-called *Wagnerschule,* or Wagner School—at the Academy; and his students, who included Josef Hoffmann, Joze Plecnik, Jan Kotera, Pavel Janák, Rudolf Perco, Karl Ehn, and Hubert and Franz Gessner, among others, subsequently assumed a central position in the avant-garde in Central Europe. Despite Wagner's stated conviction that truthful and logical construction should constitute the basis for architecture's renewal, however, many of his students were more taken with his language of form, which emphasized the importance of masking or wrapping the internal structure in an outer aesthetic veil. This idea, adapted by Wagner from Semper's theory of *Bekleidung,* or "dressing," emphasized the use of poetic forms or symbols to represent themes that could not be expressed through structure alone. Such an approach stood in direct opposition to later concepts of modernism, which advocated clarity and rationality, yet it had a profound and lasting impact on a whole range of younger Central European architects and designers, who reshaped it to articulate a wide array of social, cultural, and economic messages.

In Wagner's own work, this tactic of *Bekleidung* assumed various guises. In 1898–99, in a pair of adjacent buildings on the Linke Wienzeile, it appeared in the form of a florid Jugendstil idiom, the ornament often reduced to two-dimensional graphics or low-relief appliqué. By the early years of the 20th century, however, Wagner had abandoned this language in favor of a stripped, utilitarian classicism, which he combined with geometric forms. His Postal Savings Bank (1904–06, 1910–12), for example, still observed the conventions of a rusticated base and elaborate cornice, but he added to it elements of the new rectilinear Jugendstil. Consistent with his belief in the necessity of adopting new forms of construction, Wagner employed reinforced concrete for the floors of this large office block and made extensive use of aluminum, which he exploited both for its structural qualities and for its aesthetic values. Yet the most dramatic feature of its exterior, the aluminum-headed pins that appear to affix the thin stone panels to the walls while reinforcing the impression of tectonic play, were as much symbolic as structural. Although the pins (which were actually iron but clad in lead with polished aluminum caps so that they would not discolor the marble) served a purpose—to support the underlying mortar—they were also intended to express solidity and stability and thus to reinforce the idea of the building's "dress."

If the Postal Savings Bank betokened a new *Nutzstil,* or utilitarian style, Wagner's unrealized designs for the Franz Josef-Stadtmuseum (city museum) suggested how past and new forms might be fused to fashion a modern monumentality. Wagner labored on the project for more than a decade, from 1900 to 1912, producing a number of variant designs. However, despite his efforts to forge a "modern way of building" that retained the monumental grandeur associated with 19th-century architecture, his building failed to find official or public acceptance—a telling reminder of how strongly Wagner's aesthetic, even in its most traditional form, ran counter to the contemporary taste.

Around 1905, Wagner produced two further examples of the stone-panel-and-aluminum-pin idiom he had announced in the Postal Savings Bank: the Church of St. Leopold am Steinhof (1905–07) and the Kaiserbad Control House (1904–05) on the Danube Canal. However, in his subsequent designs he returned to a highly simplified, functional language. This last phase of his work is perhaps best exemplified by the residential apartment building (1909–10) at Neustiftgasse 40, which, with its clear, blocklike form and regular fenestration, pointed firmly in the direction of a developing modularity.

This gesture toward a new practical aesthetic similarly informed the design of the housing blocks depicted in Wagner's Project for the Future Twenty-second District of Vienna, published in his work *Die Grossstadt* (1911; The Metropolis). The 23-page pamphlet laid out Wagner's mature ideas on city planning, describing in precise terms both an architectural and an economic solution to the problem of the expanding city. He argued that future growth could be financed through municipal control of public utilities and by permitting the city authorities to buy and sell properties. To enable the city to grow, he called for new urban districts of 100,000 to 150,000 inhabitants, with both dwellings and places of work in close proximity to allow residents to work and reside in the same area. Each district would have a formal "air center" for its public and cultural institutions surrounded by uniform apartment buildings. The basic street system would follow a grid, and radial arteries and circular belts of roads and rail would provide connections with the center and other districts. Monumentality would not be achieved by the individual residential blocks but would arise out of their regularity and repetition.

D*ie Grossstadt* was by turns both practical and utopian, but in its advocacy of rational approaches to the problem of the modern city, it was consistent with Wagner's fundamental belief that purpose should be a primary determinant of form. Wagner's vision of modernism, however, although emphasizing the principle of functionality, was considerably more complex and variegated. Despite his emphasis on the constructional and practical aspects of building, he sought at the same time to perpetuate the monumental and representational values of the old architecture as a means to maintain a link with the past. In addition, he remained committed to the ideals of architectural quality and art that, by the end of his life, were rapidly losing currency. Nonetheless, Wagner stands as one of the great early modernist form givers, and his influence reached far into the 20th century.

CHRISTOPHER LONG

Biography

Born in Penzing, Austria, 13 July 1841. Studied at the Technische Hochschule, Vienna 1857–59; attended the Bauakademie, Berlin 1860–61; studied with Eduard van der Nüll and August Sicard von Siccardsburg at the Akademie der Bildenden Künste, Vienna 1861–63. Worked in the studio of Ludwig Förster, Vienna; employed as a master builder for Theophilus Hanser, Vienna 1867. In private practice, Vienna from 1869; assistant to Josef Maria Olbrich 1894. Professor, Akademie der Bildenden Künste, Vienna from 1894; started the Wagnerschule. Founding member, Vienna Secession 1897. Died in Vienna, 11 April 1918.

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WANAMAKER STORE

Designed by Daniel H.Burnham, completed 1911 Philadelphia, Pennsylvania

The point-and-click mentality of on-line shopping and the average neighborhood mall of the late 20th century are worlds away from what was designed to be an elegant, social, and even educational experience in the first department stores. This spirit was manifest in Philadelphia's Wanamaker's Store. Its patron, John Wanamaker, was a clever businessman who helped to revolutionize retailing in the United States and, while making himself rich, gained the respect and loyalty of generations of Philadelphians who saw his building as more than a department store: Wanamaker's was a monument to the entrepreneurial spirit, deserved success, and benevolence of John Wanamaker.

In 1861 Wanamaker opened a men's apparel shop in Philadelphia with an idea that he could improve the current American

John Wanamaker Building, aerial view of the store showing the Running Track and Game Courts of the Meadowbrook Athletic "Field", Philadelphia, PA

Photo courtesy Friends of the Wanamaker Organ, Bryn Mawr, Pennsylvania

system based on haggling and narrow specialization; by 1876 the business was successful enough to fill an abandoned railroad depot, offering over two acres of floor area and a variety of goods, proving the effectiveness of Wanamaker's introduction of such French retailing principles as accommodating browsing, exchanges and returns, and clearly marking all goods with the same price for all. By the turn of the 20th century, Wanamaker had determined to build a new, even larger establishment. After acquiring a lot on Market Street in downtown Philadelphia adjacent to the Second Empire City Hall, he looked for an architect who could house and give proper expression to his flourishing business on this prestigious site. With dozens of large-scale buildings, high-rises, and planning projects to his credit, Chicago architect Daniel Hudson Burnham was certainly capable of an adequate solution for as big a building as Wanamaker proposed. Burnham's experience and success with this new building type, as with such clients as Marshall Field, the Gimbel Brothers, Edward Filene, and Selfridge of London, made him the acknowledged leader of department store architecture. In addition to his technical and aesthetic talents, Wanamaker must have admired an architect who shared his vision: Wanamaker observed of

John Wanamaker Building, interior Grand Court

Photo courtesy Friends of the Wanamaker Organ, Bryn Mawr, Pennsylvania

Burnham, "I think he never had from his boyhood a small idea in his head" (Appel, 1930).

Ground was broken in February 1902. Constructed across eight years, the new building was phased such that the older store emptied a section at a time into it without ever halting business; parts of the new store opened successively in 1905, 1908, and 1910. Its grand opening was held in 1911, Wanamaker's jubilee year in business. The dedication was celebrated in the highest style of any commercial building to date, its trappings indicative of the public character of this privately financed building and 30,000 people in attendance. Of special note was speaker William H.Taft; because U.S. presidents usually bestowed the decorum of their office only on occasions meant to improve or enhance the public welfare, the Wanamaker Store was interpreted on par with such progressive, civic-minded, and publicly oriented projects as the opening of railroads or the celebration of a historical event. Taft glorified the store as "one of the most important instrumentalities in modern life for the promotion of comfort among people" by bringing under one roof at low and fixed prices all of life's necessities (Appel, 1930). Wanamaker, too, lauded the societal importance of his store and compared it with great building projects of the past: unlike the Colosseum—an architectural masterpiece but an otherwise "empty shell"—he compared his store with the Cooper Union, the Carnegie Institute, and Girard College, each a gift of education from a businessman. At Wanamaker's, space was set aside for workers to complete high school degrees. More generally, customers with a world of goods at their fingertips could learn the geography and produce of different countries along with economic lessons; they also had access to free concerts and Wanamaker's own art collection, drawn from the Paris salons, which adorned the store.

The building's form was expressive of its cultured mission. Like many of his earlier office blocks and department stores (especially Marshall Field's, 1902, in Chicago), Burnham conceived the Wanamaker Store after the model of a Renaissance *palazzo* in plan and elevation. Hewn of Maine granite, the tripartite facades feature a three-story base with large squared openings glazed with broad plate-glass display windows. Above, seven nearly identical floors, articulated with paired windows between piers and topped with arched windows, express the building's repetitive steel structure in a pattern reminiscent of H.H. Richardson's Marshall Field Wholesale Store (1885). A classical cornice two stories tall caps the building. With another three additional stories below street level, the hulking mass commanded a full city block, its footprint measuring roughly 500 by 250 feet. Hailed as the most monumental commercial structure in the world, the $10 million store housed two million square feet of retailing space from which one could buy literally anything, including automobiles and airplanes.

A model of corporate efficiency, the store was the first in America to employ a pneumatic tube system, telephone service, and a ventilation fan system and to provide a restaurant and U.S. parcel post delivery. The display areas were spacious and well illuminated (power was furnished by Wanamaker's own power plant on Ludlow Street), arranged logically around a courtyard to provide ease of navigation through the huge store. Although the functionality of the floor area was of prime concern to Burnham and Wanamaker, both saw the building as more than a place to buy and sell. The building's focus is a centralized Grand Court rising 150 feet to its ceiling and surrounded by arcaded galleries opening from the first seven floors, whose ceiling heights range from 15 to 25 feet. Giant Ionic and Corinthian columns, a marble floor, and classical ornaments in plaster and Keene cement articulate the space in which Wanamaker deposited two souvenirs from the 1903 St. Louis World's Fair: a large bronze eagle sculpture that became a landmark in itself (Philadelphians have met under its beak for generations) and a great pipe organ, advertised as the second largest in the world, on which daily concerts were performed. The balcony at its base accommodated 100 musicians. In an attempt to make the retail experience elegant and uplifting, as well as to educate the public in music, concerts were also provided in the 1,500-seat Egyptian Room, which was adorned with columns based on those at Karnak, on sphinxes, and on other Egyptian motifs. A smaller auditorium also fitted with an organ, the mahogany-paneled Greek Room, seated 600 among sturdy Doric pilasters and columns. In keeping with the Gilded Age's interest in period rooms, the store also featured a Byzantine Hall, Empire Room, and Moorish Room for special goods, further conjoining cultural lessons with retail merchandising, the overall goal of Wanamaker's.

JHENNIFER A.AMUNDSON

Further Reading

Hendrickson offers a fine account of the social and business history of the department store in America. Brief architectural considerations of the Wanamaker Building are included in Tatum and in Hines. The most complete description of the building appears in the *Golden Book of the Wanamaker Stores,* a 500-page work that combines a history of Philadelphia and of the evolution of retail commerce in the United States with Wanamaker's philosophies on life and business.

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WAREHOUSE

Warehouses, buildings that provide storage for commercial gain, have had two primary functional mandates—the provision of storage space on floors with a high load capacity and the facilitation of the movement of goods and freight with materials-handling equipment—since the mid-19th century, when the building type and term became common. Nevertheless, warehouses underwent fundamental changes in form as well as in architectural presence during the 20th century.

General-purpose, cold-storage, bonded, and household-goods warehouses, as well as industry-specific facilities, were in use by the turn of the 20th century. At that time the typical warehouse was a loft structure of five stories in which goods were moved with platform elevators. The interior framing of these structures consisted of wood, cast-iron, and wrought-iron members combined to support heavy floor loads. Masonry wareouses were often divided by interior firewalls into a series of discrete spaces, and such divisions were sometimes expressed on their exteriors through piers and fenestration patterns. These warehouses had enough windows to light the interior without the introduction of the fire hazard of lanterns and to allow for conversion of the building to other uses; as electric lighting became more commonly used in warehouses, the number of window openings was reduced. Exterior, raised loading platforms sheltered by sheet-metal awnings and series of wide doorways articulated the street levels of warehouses.

A functional yet expressive tone of architectural styling for warehouses was set during the 19th century. The sturdy brick forms and detailing of the *Rundbogenstil,* with piers, arcades, corbeled brick cornices, and arched window openings, were often selected to express both a warehouse's stability and strength and its important role in commerce. In a series of articles that appeared in the *Architectural Record,* the critic Russell Sturgis drew attention to early 20th-century warehouse design that offered a similar clear expression of structure and monumentality and was not cluttered with any applied ornament. Many ware houses built during the first half of the 20th century exhibited architectural presence and expressed this aesthetic sensibility as utilitarian purpose tempered references to current styles.

During the first decades of the 20th century, warehouses reflected both the continued success of capitalism and advances in building arts as the warehouses became even larger and stronger and incorporated new materials-handling methods. The use of expensive steel beams was often limited to the framing of wide bays on the ground floor for the accommodation of rail and motor vehicles. Reinforced concrete, however, was widely adopted because it was strong and fire resistant. The United States Army Supply Base (1918) in Brooklyn, New York, designed by architect Cass Gilbert, consisted of a pair of reinforced-concrete loft buildings that flanked a covered rail siding commanded by a traveling crane. The facility was widely admired because of its materials-handling system as well as for the way in which Gilbert carefully modeled the stark concrete facades to convey great scale and strength. Another American project, the Starrett-Lehigh Building

(1930–31) in New York City, designed by Cory and Cory with Yasuo Matsui, associate architect, demonstrated the ultimate development of the multistory warehouse both in the vertical movement of goods and in the architectural expression of function. This structure covered an entire block and rose to a height of 19 stories. Its steel-framed central service and circulation core, which served as a "vertical street" to bring trucks to each warehouse floor, was articulated by soaring pilasters. More dominant in the design, however, were the flanking lofts. Their walls were slightly cantilevered beyond the exterior columns to permit horizontal bands of windows and rounded corners. With its interpretation of European architectural modernism of the day, the Starrett-Lehigh Building earned notice in the Museum of Modern Art's "Modern Architecture: International Exhibition" of 1932.

A new preference for the horizontal movement of goods, the relocation of warehousing operations to sites outside of urban cores, and a heightened desire to minimize warehousing costs led to dramatic changes for warehouses during the middle third of the century. Experimentation with platform trucks during the 1930s demonstrated the advantages of one-story facilities; after World War II, forklift trucks and pallets that "unitized" goods storage and shipment became the modern tools of warehousing. The warehouse design problem changed to become a matter of limiting initial costs and choosing the best size and shape of a one-story structure that would have masonry bearing walls and a lightweight flat roof. Ceiling heights of 20 feet or more and smooth floors were provided to accommodate forklift trucks and pallets. An office area with a public entry and fenestration was positioned to screen the rest of the building from the street or to occupy a corner of the building. Freight doors, truck docks, and railroad sidings became the only features of the other sides of these windowless warehouses. Brick and other siding materials enclosed bland, unstyled warehouses intended to blend in with nearby commercial and industrial structures.

During the late 20th century, warehousing operations and buildings continued to evolve in response to a just-in-time manufacturing philosophy and the development of distribution networks that used a smaller number of larger warehouses. Even more emphatically, the warehouse building became perceived as merely a means to protect the storage medium and materialshandling systems that were the important components of the operation. To serve Europe, Nike, Inc., developed a pair of side-by-side distribution centers (1994–95) near Meerhout, Belgium, that are representative of the quite large facilities developed during the 1990s. The structures enclose one million square feet and cover 23 acres as they accommodate high-bay storage that rises to a height of nearly 100 feet.

Yet even as most new warehouses became little-noticed background buildings in industrial developments and port areas, older urban warehouses were rehabilitated for new uses. Since the 1970s warehouses with style and versatile loft floors in Copenhagen, London, New York, and many other cities have provided space for people to live and work in lively mixed-use neighborhoods and waterfront areas.

BETSY HUNTER BRADLEY

Further Reading

Architectural historians and critics have seldom turned their attention to the warehouse. Some books on industrial architecture, such as Bradley, address both the functional and aesthetic aspects of warehouses. Works by engineers on facilities design (Harmon; Heragu) are useful to trace changes in warehousing practice and operation. Architectural periodicals remain the best source for warehouse design trends. American warehouses in historic districts and redevelopment areas have often been documented in local preservation agency reports, such as the New York City Landmarks Preservation Commission's SoHo and TriBeCa Historic District Designation Reports.

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WASHINGTON, D.C.

A discussion of Washington, D.C., architecture must begin with the city plan developed by Pierre Charles L'Enfant in 1791, for it established a strong context of geometry, scale, and hierarchy. L'Enfant's plan overlaid an orthogonal grid of streets with diagonal avenues. The narrower, orthogonal streets serve as utilitarian means of access, whereas the wide, tree-lined avenues connect open-space nodes. The heights of buildings along all Washington thoroughfares are limited by law so that no building can be taller than the Capitol.

L'Enfant's plan established a monumental federal precinct surrounded by smaller-scaled mercantile and residential precincts. The Capitol was placed on the highest hill within a Congress Garden, linked by Pennsylvania Avenue to the White House, set in the

President's Park. On the axis west from the Capitol to the Potomac River was the Grand Avenue, now the Mall, a vast open space lined with federal buildings. This area developed haphazardly until the Senate Park Commission Plan of 1901 established a clear master plan. Since 1972 the Pennsylvania Avenue Development Corporation has redesigned this avenue and controlled development along its north side.

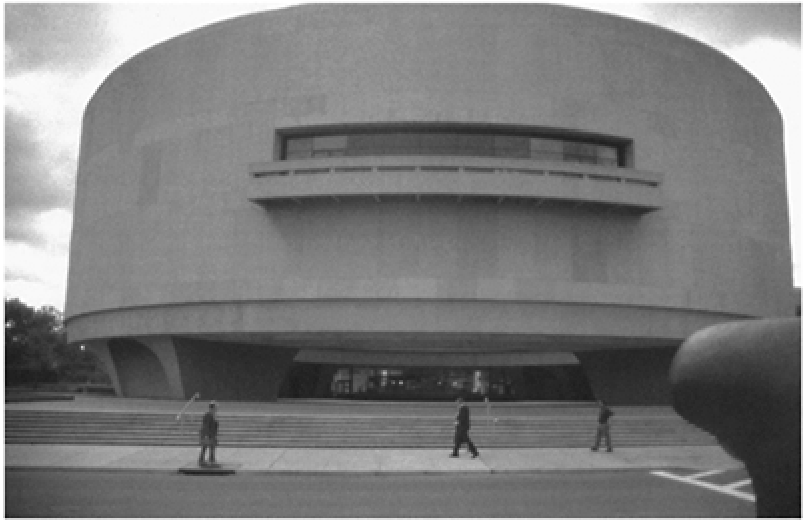
The context for architecture in the federal precinct was established early by the Capitol and the White House: neoclassical, light-colored stone, figural, symmetrical, and monumental. All the early buildings of the 20th century, the memorials and museums, were designed in this idiom. In the last half of the century, architects struggled with these contextual restrictions and found ways to vary the materials and alter the stylistic formula.

The context for architecture in the mercantile precinct changed the most during the 20th century from low-scale mixed use to high-density commercial. It is highly varied, with examples from all eras of the city's history. Metro, Washington's rapid transit and subway system, was opened in 1976 with handsome stations dominated by concrete barrel vaults consistently designed by Harry Weese and Associates of Chicago.

The first part of the 20th century, from 1900 to 1940, was a very active period of design and construction, primarily within the federal precinct. A great number of high-quality buildings were built as the federal government acted on the recommendations of the Senate Park Commission. The first act was to remove the train station from the Mall and to construct a new one west of the Capitol. The Beaux-Arts-inspired Union Station and Columbia Plaza were completed in 1908 as designed by the noted Chicago architect Daniel Burnham.

This was followed by development of the Mall, capitol square, and the federal triangle. The Lincoln Memorial (1922) by Henry Bacon, on axis with the Capitol, features the marble statue of Abraham Lincoln by Daniel Chester French. The Jefferson Memorial (1943) by John Russell Pope, on axis with the White House, features the enormous statue of Thomas Jefferson by Rudolph Evans. New buildings added to capitol square included the Supreme Court Building (1935) between twin buildings for the House and the Senate built in 1908. New buildings along the north side of the Mall were the National Museum of Natural History (1911) and the National Gallery of Art (1941). The federal triangle was developed as an ensemble of large neoclassical buildings featuring the National Archives (1935) by John Russell Pope. Defining the north side of the Mall west of the White House were Constitution Hall (1939), the Organization of American States (1910), the Federal Reserve Building (1937), the National Academy of Sciences (1924), and the American Pharmaceutical Association (1933). This series of white pavilions set within a verdant landscape and designed by very notable architects is probably the most handsome series of buildings along one avenue in Washington.

The most glorious building commenced during this era is the Washington National Cathedral (1907–90) by Henry Vaughn and George Bodley, the last Gothic cathedral structure to be built in the world.



Hirshhorn Museum (1974), designed by Gordon Bunshaft (Skidmore, Owings, and Merrill)

From 1945 to 1960, the country and city were recovering from the aftermath of World War II. Much good architecture was destroyed during the urban-renewal era of the 1950s for the sake of highways or real estate development. The historic preservation movement abated this destruction, but it still did occur many times, with only historic pieces of blocks and buildings saved and incorporated into new development. The replacement buildings usually were not noteworthy. Modern architecture was introduced to Washington during this period in the work of architects Joseph Abel, Charles Goodman, and Chloethiel Woodard Smith.

From 1960 to 2000, both the quality and the quantity of architecture in Washington increased substantially. Two early buildings from this period worth noting are the exquisite Pre-Columbian Museum (1963) at Dumbarton Oaks by Philip Johnson and the boldly curvilinear Watergate (1965) by Luigi Moretti.

During this era, the firms of Hartman-Cox and Keyes Condon Florance (KCF) developed an approach to developer architecture that was sympathetic to the Washington urban context while also exploring inventive design expressions. George Hartman and Warren Cox began their practice designing very modern buildings, such as the Euram Building (1971) on Dupont Circle and the National Permanent Building (1976) at 18th Street and Pennsylvania Avenue. They progressed to a number of contextual commercial projects that incorporated historic buildings, such as Sumner School (1986) and 1001 Pennsylvania Avenue, NW (1986). Their two best projects are One Franklin Square (1990) and Market Square (1990). The former, on Franklin Square, strongly defines the north side of this space and adds two pyramid-topped towers. The latter, on Pennsylvania Avenue across from the National Archives, is suitably neoclassical and incorporates the

Navy Memorial.

KCF began as Keyes Lethbridge Condon, designing the modern curvilinear housing of Columbia Plaza (1967). The firm then became Keyes Condon Florance, designing urbanistically appropriate buildings with strong street walls, such as Lafayette Square (1991). Many of their projects have been at street intersections that they exploit. A good example is at 2401 Pennsylvania Avenue, NW (1980), with its curved windows and balconies. The firm then changed partners to become Florance Eichbaum Esocoff King and designed the Art Deco office building at 1100 New York Avenue, incorporating the Greyhound bus station as an entry. Three other firms that have been developing a Washington style of abstract contextualism are Shalom Baranes Associates, David M. Schwarz, and Weinstein Associates.

The most influential out-of-town firm has been I.M. Pei and Partners, now Pei, Cobb, Freed and Partners. Their work began with urban-renewal projects in the southwest part of the city: Town Center Plaza (1962) and L'Enfant Plaza (1968). This was followed by the East Building of the National Gallery of Art (1978), a tour de force of monumental abstract forms encompassing an exhilarating atrium. The United States Holocaust Memorial Museum (1993), designed by James Ingo Freed, maintains a balance between monumentality and contextual resolution with a highly energized central space. Their latest project is the enormous Ronald Reagan Building (1998), which completes the federal triangle. Here, Freed's exterior is more influenced by the monumental neoclassical context, whereas the engaging interior public space is very modern in expression.

The international firm of Skidmore, Owings and Merrill (SOM) has had a strong influence on Washington architecture because it maintained a local office for many years under the direction of partner David Childs. During this period it produced some of the refined modern office buildings for which it is known. These include the Inter-American Development Bank at 1300 New York Avenue, NW (1983), with its spectacular atrium, and 1201 Pennsylvania Avenue, NW (1984), with its triangular atrium. The best-known and most controversial building by SOM is the circular concrete Hirshhorn Museum (1974) on the Mall, designed by partner Gordon Bunshaft.

Washington has also been the locus for numerous buildings by well-known architects from around the world. Although these buildings have usually challenged their context, they add an element of surprise attraction that enlivens the cityscape. The earliest of these projects is the Brutalist concrete Department of Housing and Urban Development (1968) by Marcel Breuer. Later projects include the boxlike, white-marble Kennedy Center for the Performing Arts (1971) by Edward Durell Stone; the stark steel Martin Luther King, Jr., Memorial Library (1972) by Mies van der Rohe; and the marble-and-glass cubes of the National Air and Space Museum (1976) by Hellmuth, Obata and Kassabaum.

Because Washington is the national capital, it has embassies that add another aspect of architectural interest, as they try to reflect the spirit of their country. The earliest of these is the British Embassy (1931) by Sir Edwin Lutyens, a quirky interpretation of an English country house. The Canadian Chancery (1989) by Arthur Erickson is in the most prominent location on Pennsylvania Avenue between the Capitol and the White House. It is a gray-marble building of varied forms with an open courtyard facing John Marshall Park. The recent Embassy of Finland (1994) by Heikkinen and Komonen has attracted much attention for its deference to the natural setting, utilizing transparent screens.

Washington is a city with architecture that abides by its civic role. The strong context was established at its founding by the L'Enfant plan and continues to be followed. The building masses form clearly defined streets and open spaces, and the materials and colors are contextually appropriate. There is a civility to the architecture that gives this city more design integrity than any other American city.

MICHAEL J.BEDNAR

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WISSA WASSEF, RAMSES 1911–74

Architect, Egypt (Africa)

Ramses Wissa Wassef was born into a prominent and cultured Francophile Coptic (Egyptian Christian) family in Cairo. His father was an influential member of the nationalist Wafd Party and one of the founders of the École des Beaux-Arts in Cairo, which opened, in the teeth of opposition from the office of the British consul-general in Egypt, in 1908. Wissa Wassef completed his education in France and studied architecture at the École des Beaux-Arts in Paris, where he received his diploma in 1935. His diploma project, "The Potter's House in Old Cairo," already revealed his interest in and knowledge of the traditional crafts of his homeland.

On returning to Egypt in 1936, Wissa Wassef was appointed professor of the art and history of architecture in the Department of Architecture of the School of Fine Arts, Cairo. The Department of Architecture at the School of Fine Arts, in Zamalek on Gezira Island between the two arms of the Nile near Cairo, was the first modern school of architecture to be founded in Egypt. Presently incorporated in the University of Helwan (Zamalek Campus), the school continues the arts-and-crafts tradition pioneered by Hassam Fathy and Wissa Wassef.

Wissa Wassef had followed Hassan Fathy as head of the Department of Architecture at the School of Fine Arts, and both men shared a passion for the traditional vernacular architecture of their native land. Field study visits into the rural areas of the Nile delta and of Lower and Upper Egypt were annual events for students of the School of Architecture under their direction; and for both men, the traditional architecture of Nubia, the southernmost region of Egypt above and around the Aswan Dam, became and remained a perennial source of inspiration. Wissa Wassef was primarily a teacher, fired by the desire to communicate his love and profound knowledge of architecture and of arts and crafts generally not only to his architecture students but also to children. He stated, "I had this vague conviction that every human being was born an artist, but that his gifts could be brought out only if artistic creation were encouraged by the practising of a craft from early childhood" (see de Stefano, n.d.).

In 1941 Wissa Wassef was commissioned by a social welfare organization to design a small primary school in the Coptic quarter of Old Cairo. This provided him with the opportunity to test his conviction, and he persuaded the management committee to let him teach weaving to the children after school. He chose weaving, a craft about which he knew very little, as the first craft to teach young children because he believed that the simple techniques could be easily learned and that the craft process would enable children to develop and express their innate creativity through producing colorful visual images. His pupils,

El-Dar Restaurant, view from the roof showing its mud-brick dome

children from the humblest homes, were producing work that gave them both great satisfaction and a potential source of income, and so within a few years he resolved to build his own school and craft training center where he could realize his vision of a cooperative of artist-craftsmen, living and working in the local community. His wife, Sophie Habib Gorgy, was a sculptor and shared his enthusiasm and his vision. In 1951, they purchased a small plot of land on the outskirts of the village of Harraniya, a few miles south of Giza on the west bank of the Nile, and began to build the school that was eventually to bear his name, the Ramses Wissa Wassef Arts Centre. He devoted the greater part of the rest of his life, especially after his retirement from the School of Fine Arts in 1969, to its completion.

Although primarily a teacher, Wissa Wassef was a sensitive and accomplished architect, and his built works are many and varied. Apart from the Arts Centre at Harraniya, his best-known works are the Mahmoud Mokhtar Sculpture Museum (1962–64) in Cairo, the Church of al-Mar'ashali in Zamalek, Cairo, and the Virgin Mary Church in Cairo. He designed and built several houses for private clients, including the Ina Magar Country Home (1969), Adam Hennen Residence (1968), the Mohi Houssin Residence (1970), and his own house in Agouza. In 1968, Wissa Wassef incorporated traditional Nubian structures in the design of El-Dar Restaurant in Giza, Egypt, that he built of mud brick with vault and dome technology.

In 1961, he was awarded a National Prize for the Arts for the stained-glass windows he designed and made for the National Festival Hall in Cairo and in 1964 a National Prize for the Arts for the design of the Mahmoud Mokhtar Sculpture Museum.

ANTHONY D.C.HYLAND

S*ee also* **Cairo, Egypt; Ramses Wissa Wassef Arts Centre, Giza, Egypt**

Biography

Born in Cairo, 9 November 1911; father was a lawyer and politician. Studied architecture, École des Beaux-Arts, Paris 1929–35; bachelor's degree 1935. Married Sophie Habib Gorgy, 1948:2 children. Bought land in Harraniya, near Giza, and built the Harraniya Arts Centre later the Ramses Wissa Wassef Arts Centre 1951–70. Professor of the art and the history of architecture, College of Fine Arts, Cairo 1936–69. The Ramses Wissa Wassef Arts Centre received the Aga Khan Award for Architecture in 1983. Died in Cairo 1974.

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Primary School, Church of St. Barbara, Old Cairo (Misr El-Adima), 1941

Harraniya Weaving (Craft) Village (with Hassan Fathy), Giza, Egypt, 1957

Mahmoud Mokhtar Sculpture Museum, Cairo, Egypt, 1964

Adam Hennen Residence, Giza, Egypt, 1968

El-Dar Restaurant, Giza, Egypt, 1968

Mohi Houssin Residence, Giza, Egypt, 1970

Harraniya Art Center (Ramses Wissa Wassef Arts Centre), Harraniya, Egypt, 1970

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WEISSENHOFSIEDLUNG, DEUTSCHER WERKBUND (STUTTGART, 1927)

Exhibition by various architects, 1927 Stuttgart, Germany

The Weissenhofsiedlung was one of the most significant architectural exhibitions of the 20th century. It brought together for the first time the work of some of the most influential and progressive European designers from the early decades of the century. The exposition, held in Stuttgart, Germany, in 1927, focused on "Die Wohnung" (the Dwelling). Initiated by the Deutscher Werkbund and financed by the city of Stuttgart, it presented current ideas in modern residential design. The central feature of the event was a development of 21 domestic buildings located on the Weissenhof hillside overlooking the city. Over a half million people visited the Siedlung during the summer of 1927.

The full-scale model housing development was only one part of the exhibition. Domestic products and furniture were displayed together in the exhibit "The Interior Design of the House," located at Gewerbeplatz in Stuttgart. The exhibit featured the Spiegelglashalle, a plate-glass hall designed by Lilly Reich and Ludwig Mies van der Rohe that consisted of wall planes of various glass materials—a predecessor to Mies's German Pavilion designed two years later for the Barcelona Exposition. The "International Exhibition of Modern Architecture: Designs and Models," held in the center of Stuttgart, contained plans, drawings, models, and photographs of foreign buildings that reflected the new architectural ideas promoted in the designs of the Siedlung. A third group of exhibits, located at a site adjacent to the Weissenhof estate, demonstrated the attributes of recently developed building materials and new methods of construction, including industrial prefabrication.

The initial underlying social goal of the exhibition was to present modern solutions to the urgent need for low- and middle-income housing. Event organizers sought to demonstrate ways to reduce housing costs and improve living conditions through the use of recently introduced building materials and construction methods. Many of the 17 architects involved in the Siedlung, however, ignored the basic economic objective of the show and created designs more appropriate for affluent families. Many of the individual housing units even contained maid's quarters.

Participating designers came from Austria, Holland, Switzerland, Belgium, and Germany. Organizers hired Mies van der Rohe as artistic director, and Richard Döcker served as technical director. Other architects who contributed designs for the development included Peter Behrens, Le Corbusier and his partner Pierre Jeanneret, Josef Frank, Walter Gropius, Ludwig Hilber-seimer, J.J.P. Oud, Hans Poelzig, Adolf Rading, Hans Scharoun, Adolf Schneck, Mart Stam, Bruno Taut, and Max Taut. A house designed by the Belgian architect Victor Bourgeois located adjacent to the development was also incorporated into the exhibition.

Most of the buildings in the Siedlung were situated on streets that curved along the Weissenhof hillside. The designs featured flat, unadorned facades; flat roofs; ribbon windows; and pipe railing. Although the basic, formal characteristics of the buildings suggested a great sense of unity among the designers, the unique nature of each of their architectural ideologies was apparent in the details. Individual designers focused on different aspects of modern housing. Mies van der Rohe designed a fourstory block of terrace apartments that served as the centerpiece of the exhibition. Inside, he showed how universal spaces could be adapted to meet individual needs. Le Corbusier illustrated his own ideas for the modern dwelling in two houses of reinforced concrete that he designed with Pierre Jeanneret. The architect realized the concept of his Citrohan House in the first residence, whereas the second house featured the five points of architecture discussed in his 1923 treatise *Towards a New Architecture*. Some designers, such as Gropius, Stam, and Max Taut, explored newly available building materials and ideas regarding prefabrication. Others, such as Scharoun, Poelzig, and Schneck, were more interested in producing functional layouts that could better meet the needs of the modern family. Although the facades of the Weissenhof buildings appear neutral in black-and-white photographs, in reality many of the walls were originally painted in shades of yellow, blue, and other colors. Bruno Taut, Max Taut, and Le Corbusier all incorporated intense colors in their designs. Bruno Taut, for example, specified different saturated hues for the individual walls of his small, single-family residence, leading one critic to describe the vivid colors as coming right out of a paint box.

The architecture of the Weissenhofsiedlung was strongly rejected by the National Socialists in Germany, who labeled it the “product of ‘cultural Bolshevists.’” The event was better received in European and American design journals. The success of the Siedlung led to a succession of similar housing exhibitions in Germany and elsewhere across Central Europe, including events in Prague, Brno, and Vienna. Progressive European architects used these exhibitions to present and debate their modern design ideologies. Their desire to further develop such dialogue led to the formation of CIAM (Congrès Internationaux d’Architecture Moderne) in 1929, which provided a platform for designers to discuss developing ideas in modern architecture. The formal unity of the designs included in the Siedlung contributed to the concept of an International Style in modern architecture that was heavily promoted five years later by Henry Russell Hitch-

House for Weissenhofsiedlung, designed by Le Corbusier, Stuttgart (1927)

Photo © Donald Corner and Jenny Young/GreatBuildings.com

cock and Philip Johnson in the "Modern Architecture—International Exposition" show held at the Museum of Modern Art in 1932. The exhibit and subsequent book featured several buildings from the Weissenhofsiedlung.

The site of the Weissenhof development was sold to the German state in 1938 for use by the military. Bombs destroyed houses located in the center of the estate in 1944. New houses replaced these and several other residences that were torn down after World War II. At the end of the century, only 11 of the original buildings remained standing. The Siedlung underwent an extensive restoration in the mid-1980s that was completed in time for a 60th anniversary celebration of the exhibition. Today the development continues to attract visitors interested in experiencing full-scale examples of progressive modern housing designs from the mid-1920s.

LISA D. SCHRENK

S*ee also* **Corbusier, Le (Jeanneret, Charles-Édouard) (France); Deutscher Werkbund; Gropius, Walter (Germany); Mies van der Rohe, Ludwig (Germany); Oud, J.J.P. (the Netherlands); Poelzig, Hans (Germany); Taut, Bruno (Germany)**

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WERKBUND EXHIBITION, COLOGNE (1914)

The Werkbund Exhibition held in Cologne, Germany, on the eve of World War I was the first major manifesto of the Deutscher Werkbund (DWB; German Work Association), an organization founded in 1907 by artists, architects, and industrialists to address the problem of form and design in the industrial age. The exhibit sought to show the world the Werkbund's successful attempt to ally the creative potential of art with the modern power of industry to create more aesthetically pleasing and higher-quality products and thereby raise German exports in an increasingly competitive world market. Architecturally, the exhibit gained nearly instant fame through a number of very innovative exhibit pavilions built by some of Germany's most distinguished architects as well as the theoretical "Werkbund Debate," which greatly influenced the future of modern German design and architecture after the war.

Much like a world's fair, the exhibition was a microcosm of prewar German culture, products, and know-how designed by more than 1000 Werkbund members. The vast exhibits contained "everything from couch cushions to city building," as a contemporary slogan proclaimed. The primary exhibits featured architecture and applied arts, but there were also displays on sport, women's fashion, religious art, colonial wares, worker housing, factories, cabaret, cinema, transportation, theater, garden design, funerary sculpture, and much more. A large amusement park was integrated into the exhibit to provide entertainment and eating establishments for the more than one million visitors who came. The city built advanced mass transit systems to ensure easy access to the fairgrounds from all over the world.

Although the city of Cologne previously had very few connections to the Werkbund, by agreeing to pay for the exhibit, and with its strategic location in the center of one of Germany's most industrialized regions and close to the French border, Cologne proved to be an ideal host for this exhibit of the pride of German industry. Intent on success, the organizers commissioned the famed architect and designer Peter Behrens to create the overall exhibit organization and hired only the biggest-name architects to design the various pavilions. The main festival hall by Behrens, the primary exhibit building by Theodor Fischer, several buildings by Hermann Muthesius, the Austrian Pavilion by Josef Hoffmann, as well as most of the other buildings at the fair were all designed in a spare form of German Neoclassicism, a formal vocabulary based on established traditions and conventions that regained popularity after the exuberant, individualist Art Nouveau style at the turn of the century. Other buildings were more purely classical or Renaissance in style, and a mock vernacular town was built in a stylized version of local brick architectural traditions to introduce visitors to regional culture.

There were, however, three major exceptions to these conservative designs. One of the first buildings that visitors saw on entering the fairgrounds that received much attention in the press was the small "Glass House" designed by Bruno Taut to display products of the German glass industry. It was intended as a poetic essay in glass block, colored glass, tile, mirrors, light, and water that were to show off the completely new aesthetic that could be achieved by a more intense use of glass in the building industry. A theater with an innovative, flexible stage configuration, designed by the Belgian designer Henri van de Velde, was equally popular. It featured bold geometric volumes, softened through some flowing curves in plan and in the main facade, as well as some sculptural reliefs by Hermann Obrist that recalled the Art Nouveau style of a few years earlier. Finally, toward the rear of the exhibit, Walter Gropius designed a model Werkbund factory and office building with a symmetrical brick facade inspired by American technology and the designs of Frank Lloyd Wright but flanked by two daring concrete spiral stairs cantilevered inside glass cylinders. The rear elevation of the same building featured a glass curtain wall that looked out over a large courtyard and exhibit hall crammed full of modern machines and engineering, including some Pullman car interiors by Gropius.

The contrast between the rather conventional, classicized designs and the more individualized, artistically daring buildings formed the backdrop to a very heated debate that erupted almost without warning at the exhibit. During his opening speech, Muthesius, the vice president of the Werkbund, outlined a series of ten programmatic points to direct the future of the Werkbund's efforts. He called for more standardized, typical, and conventionalized forms in architecture and industrial design to counter the rampant individualism and arbitrary forms that he perceived in the modern, industrialized consumer culture around him. On the basis of interpretations of the knotty word

Typisierung (meaning "type" or "standardize") used by Muthesius, many historians have given him credit for anticipating the standardization and machine aesthetic that were to become hallmarks of avant-garde design and International Style modern architecture after World War I in Germany. Stanford Anderson, however, has more perceptively argued that Muthesius intended to reinforce the conservative statement made by the classicism of his own buildings and that he surely spoke for many of the reform-minded architects present.

Others at the exhibit, however, disagreed completely with Muthesius and were outraged that he voiced these ideas as Werkbund policy. The next day, speaking for a group of younger architects, including Gropius and Taut, van de Velde proposed ten "countertheses" that insisted that the road to success for the Werkbund lay not in fostering standards, norms, or conventions but rather in the creative, individual artistic talents of designers in search of innovative forms and production techniques. Those historians who have seen Muthesius's remarks as an early call for standardization have criticized van de Velde's countertheses as a retreat to earlier, Romantic sensibilities about artistic genius espoused by Art Nouveau rather than as the more general recantation of stultifying norms that Anderson credits him with.

The intense debate between the Muthesius and van de Velde camps concerning the future of Werkbund policy raged on until the exhibition suddenly closed its doors on 1 August 1914, just as the German kaiser declared war on Russia and on nearby France and, with it, the beginning of World War I. Although discussion halted in the fervor of war, the legacy of the debate continued for decades. Blaming German industry for much of the devastation of the Great War and with the revolutionary zeal to replace everything that was old, established, and conservative after the war, the younger architects took over the Werkbund in 1919 and insisted on van de Velde's theses that individual artistic design was the key to modern design. Paradoxically, however, through the writings of critics such as Adolf Behne and Adolf Loos, the Werkbund, alongside the Bauhaus and modern architects and designers all over Germany, began to connect the search for new artistic forms with an increasingly rational, standardized, and industrially mass-produced aesthetic. The uniform International Style architecture that became the norm for most of the Western world just before and after World War II thus combined aspects of both the artistic and the standardized sides of the famous Werkbund debate initiated at the Cologne exhibit.

KAI K.GUTSCHOW

S*ee also* **Art Nouveau; Bauhaus; Bauhaus, Dessau; Hoffmann, Josef (Austria); International Style; Loos, Adolf (Austria); Muthesius, Hermann (Germany); Taut, Bruno (Germany); van de Velde, Henri (Belgium); Wright, Frank Lloyd (United States)**

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Muthesius's and van de Velde's theses. Campbell offers the most complete account of the Werkbund in English, though Schwartz's work offers a more intensive interpretation of the consumer and commodity culture inspired by the Werkbund. Anderson's article, part of a large body of work on the role of "convention" in modern architecture, revises the traditional interpretations of the Muthesius-van de Velde debate.

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WILLIAMS, AMANCIO (1913–89)

Architect, Argentina

Amancio Williams is considered one of the most significant architects in Argentina's history. His work is characterized by recurring modernist themes: the use of technology to generate lyrical forms, concern for hygienic and functional issues, and minimal application of ornament. The thematic schemes of Le Corbusier and the classicist tendency and attention to detail of Mies van der Rohe also influenced his projects. Williams's work addressed the concept of type or paradigmatic space. Over time these concepts were explored, refined, and often expressed through the building section. Aspects of modern life can be seen in his development typologies, such as the "Housing in Space" project, the large cultural complex, the office tower, the airport, the hospital, and the exhibit space. Williams's projects are identified and qualified through the integration of type, structure, architecture, and site.

From 1948 to 1951, Williams served as construction supervisor for Le Corbusier's Currutchet House project in La Plata, Argentina. Williams produced most of the construction documents for this house and supervised the project's structural and concrete work.

In his Housing in Space project (1943), Williams explored the relationship between site and climate. Williams's new approach toward creating a settlement is revealed in the manner in which the units are stepped to maximize light and ventilation, and a gentle curving roof offers broader views for all residents.

The House over the Brook (1945) in Mar del Plata synthesized many significant ideas for Williams. Designed for his father, a musician, it remains one of his few built projects. Williams described this house, which embodies his classicist attitudes, as "a form in space that cannot deny nature…concrete—its material—is exposed, and textured by mechanical and chemical procedures: form, structure and quality are thus here the same thing" (Frampton, p. 10). Two pillars support the bridgelike structure, and the curvature of the building responds to the landscape. The manner in which the house spans the brook is related to Maillart's bridge (1933) over the Schawanbach River. It exemplifies Williams's belief in the confluence of engineering and architecture. The interior displays his concern for detail and his poetic sensibility toward the use of materials.

Structural typology also plays a crucial role in Williams's proposal for the Airport of Buenos Aires (1945). The solution is logical in its simplicity. Located 8 kilometers from the city, the airport was proposed to sit on massive slabs resembling airplane wings and was supported by enormous pillars embedded into the shallow river. The proposal connected the airport with the city via a platform, beneath which hung all airport circulation and services.

The Suspended Office Building project (1946) was designed in collaboration with Janello, Janello and Butler. This suspended skyscraper, designed for a site in Buenos Aires, is the most paradigmatic among all Williams's projects. Four concrete columns support two beams from which hang a steel framework for 28 floors divided into three sectors. The first slab was suspended 18 meters above the entrance, thereby generating a covered open space for a densely populated area of the city. The interior had flexible partitions, a structural type that was developed decades later by Sir Norman Foster in the Hong Kong and Shanghai Bank Buildings.

In Williams's Hall for Visual Spectacle and Sound in Space (1953), the development of the typology is determined not by the location but rather by objective scientific study. Research that investigated the propagation of sound in space was used to shape the auditorium and optimize acoustics for all listeners. Rotating a vertical axis generated the shell; thus, it created a mushroomlike amphitheater capable of providing a variety of visual spectacles.

Since the late 1940s, Williams produced a series of projects that studied the relationships between program-function, sitestructure, and climate-city. Several of these, executed from 1951 to 1966, employed concrete building shells of minimum thickness. Others in the early 1960s rearticulated his strategies for the use of high roof structures. In both cases the structures consisted of thin building shells or roofs that were supported by large columns.

The shells in several projects acted as umbrellas that either grouped together or isolated spaces. They were carefully calculated to incorporate alternative functions to easily accommodate production processes and responded to differing contexts and programs. Among these proposals are the Hospitals in Corrientes, the proposals for Mbucuruyá and Curuzu-Cuatia (1948–53), the Gas Station (1955) in Avellaneda, the Industrial School (1960) in Olavarría, the House (1960) in Punta del Este, and the Bunge and Born Exhibition Stand (1966).

The series of projects employing high roof structures is part of Williams's research and innovative attitude toward design. In these cases individual shells are replaced with continuous large roof structures supported by few columns. Horizontal panels or glass membranes hang from the roof to offer protection from the climate and provide continuity with the existing context. The basic structural components generate ample space that can accommodate diverse programs and activities. Examples of this approach are the factory building proposal (1962) for Iggam, a small furniture shop (1962) in Buenos Aires, and a monument (1964) for the city of Berlin.

Many of Williams's later major projects were also unrealized. Among these is an urban proposal for a linear city of 300 kilometers in length by 6 kilometers in width. It is modeled after Le Corbusier's approach to urban design, with the buildings supported by *pilotis,* thereby reclaiming the ground space to promote greater contact with nature. An additional unrealized project is Williams's design for a 200-meter-high cross standing over the river (1988). It was to be situated on a large platform outside the port of Buenos Aires.

In 1981 the critic Kenneth Frampton wrote that Williams "was an enigmatic figure…a brilliant designer whose influence has been totally disproportionate to the extent of his own rather limited output" (Frampton, 1981). A renewed interest in architectural typology and Latin American architecture led to Williams's work being exhibited at Harvard University in 1987. The exhibit contributed to a greater understanding and deeper appreciation of Williams's contribution to modern architecture.

JOSE BERNARDI

S*ee also* **Argentina; Buenos Aires, Argentina; Corbusier, Le (Jeanneret, Charles-Édouard) (France); Foster, Norman (England); Maillart, Robert (Switzerland)**

Biography

Born in Buenos Aires, 19 February 1913, son of the composer Alberto Williams. Studied engineering and aviation before graduating as an architect from the University of Buenos Aires (1941); opened his architectural practice in Buenos Aires in 1942. His work was mostly experimental, and very few of his projects were ever built. Williams was one of the Argentinean members of CIAM (Congrès Internationaux d'Architecture Moderne). Died in Buenos Aires, 14 October 1989.

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House over the Brook, Mar del Plata, Argentina, 1945
Airport of Buenos Aires (project), 1945
Suspended Office Building (project), 1946
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WILLIAMS, E.OWEN 1890–1969

Architectural engineer, England

Considered to be one of the individuals responsible for the establishment of modern architecture, Sir (Evan) Owen Williams is best known as the civil engineer who introduced structural methods pioneered in Europe, notably by the Swiss engineer Robert Maillart, into Great Britain. Williams was one of a number of architects who were skeptical about the imitators and vulgarizers of the new modern architecture who lacked integrity. As early as 1932, he denounced "Facadism" as forgery.

Born in Tottenham, London, Williams studied at the University of London before working for Electric Tramways between 1905 and 1911. He served as chief aircraft designer for Wells Aviation until World War I, setting up an independent engineering practice in 1919. From about 1930 on, Williams dispensed with the collaboration of a consulting architect and produced his own designs, building up a successful practice specializing in industrial and commercial buildings using reinforced-concrete frame construction.

In 1924 Williams was appointed consulting engineer for the British Empire Exhibition, Wembley, in association with architect Sir John Simpson, with whom he collaborated on the design of Wembley Stadium (1925). Williams's reinforced-concrete design for the Dorchester Hotel (1930) in London was thought far too advanced, and Curtis Green was employed to devise a suitably restrained and elegant facade.

In the 1930s Williams designed a number of bridges in reinforced concrete, working mostly with the architect Maxwell Ayrton, but it was his design for the Boots Factory (1932) in Beeston, Nottingham, that was to be one of the most remarkable buildings of the Modern movement in Britain. New constructional techniques were employed on a more complete, vast, and uncompromising scale than in any other European building. Williams, an engineer with a sophisticated tectonic sensibility, showed how ideally fitted "mushroom" construction was for industrial buildings. The use of reinforced-concrete columns from which the concrete floor slabs spring outward in all directions created wider spans and allowed movement of goods around unobstructed voids. The floors are entirely supported by a row of these columns down each wing of the building, and the external walls, relieved of their load-bearing responsibilities, are glass clad from floor to ceiling. The central space was a sort of nave interrupted by cross galleries and top lit by a thin-glass, brick-and-concrete membrane roof. The effect was assertive and tough yet ennobling, a quality that understandably endeared it to the so-called New Brutalists of the 1950s.

The laboratory of a cement factory (1932) at Thurrock in Essex is a simple rectangular building. Reinforced-concrete benches, suitably clad, run round the walls with a shelf above, and the walls are opaque to this level, with glass above with slender concrete mullions. Powerful electric lamps were employed to provide an equivalent to daylight. The warehouse for Lilley and Skinner (1933) again used "mushroom" columns and slab construction. Long horizontal bands run between the windows, which wrap around the corners of the building. The Empire Swimming Pool (1934) at Wembley, the largest hall to be built in England to date, covered a space of 341 feet by 236.5 feet. The pool was constructed with a reinforced-concrete frame and used a grid system; the use of standardized units contributed to the speed of its eight-month construction. The Pioneer Health Centre (1935) in Peckham, London, was privately developed and financed and became famous as a pioneer social and health enterprise. Its founders believed that physical disorders were the result of environmental factors. The flexible space created in this rectangular three-story structure of reinforced concrete provided opportunities for various physical, social, and cultural activities. Members could meet and discuss their problems with trained staff who could give diagnoses and advice. The ultimate aim was not to cure conventional diseases but, rather, through preventive action, to sustain the health of the community. Various parts of the building were grouped around a central swimming pool, covered by a steeply pitched glass roof. The gymnasium was on the left, the theater on the right, and between them the children's covered playground with sliding glazing designed to make it an open-air space. On the first floor were spacious lounges with their shallow, bowed bays, cafeteria, and kitchen. The second floor housed medical rooms, a library, a study, and rest rooms. Unfortunately, because of a lack of support, the center closed in March 1950.

Williams was consulting engineer for Ellis and Clarke, who designed the Daily Express Buildings in Fleet Street, London (1932), Manchester (1939), and Glasgow. His other work included Dollis Hill Synagogue (1938) in London and a proposal (1935) for a new Wateroo Bridge. Postwar work includes all bridges on the M1 motorway and the maintenance headquarters at Heathrow Airport in London.

HILARY GRAINGER

See *also* **Airport and Aviation Building; Brutalism; Reinforced Concrete**

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WILLIAMS, PAUL REVERE 1894–1980

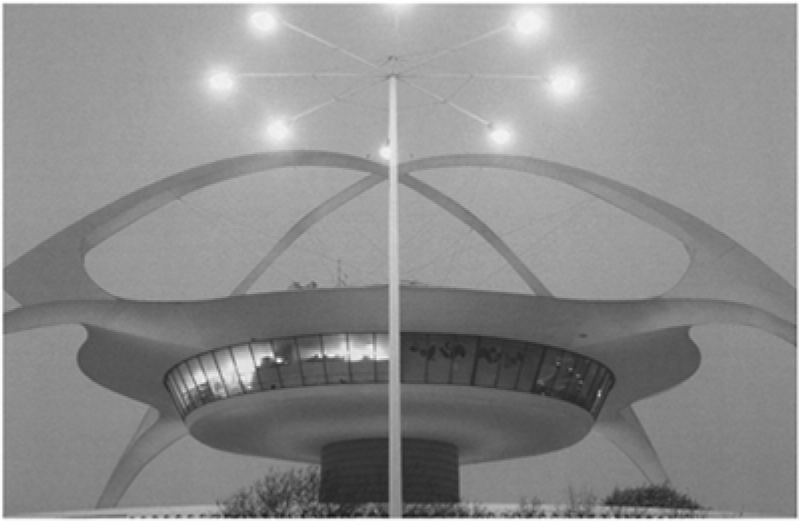
Architect, United States

A native of Los Angeles, Paul Revere Williams designed some of the most distinctive residences and public structures known throughout the United States during a long and distinguished career. His achievements paralleled the growth of Los Angeles, where his eclectic practice varied from designing homes for the city's elite, including famous figures of the entertainment industry, to important institutional and commercial landmarks. These accomplishments reflect his mastery for adapting a multitude of revival and modern styles to the culture of southern California's Mediterranean climate. His success is also notable considering that Williams was the first African American architect licensed in California (1921) and the first to be accepted as a member of the American Institute of Architects (AIA) (1923). His recognition as a master designer, member of numerous civic and government bodies, and mentor to generations of minority architects led to his induction as the first African American Fellow of the AIA (1957).

On graduation from the University of Southern California, Williams worked for another noted Los Angeles architect, John C.Austin (1920–22), expanding his knowledge while working on major civic structures, including the 5000-seat Shrine Auditorium (1922) and numerous public schools. His association with Austin led to a collaboration on many future projects and a lifelong friendship. Recognizing his diverse skills as a city planner, Williams was appointed to Los Angeles's first planning com-mission (1920), beginning service on what would amount to more than a dozen public bodies during his 60-year career at the local, state, and federal levels. By 1923 Williams opened his own practice, Paul R.Williams and Associates, Architects, in the fashionable Stock Exchange Building at the core of a booming Los Angeles. His first projects were for politician and developer Senator Frank J.Flint for his new development of Flintridge in the hills overlooking Pasadena.

Williams adapted to the cultural racial biases of his times, including restrictions against his living in most of the communities where he designed homes. Nonetheless, he designed many cultural institutions and businesses for the booming African American community at or below cost to improve opportunity and activities in his community of south-central Los Angeles. These included many neighborhood YMCAs (1925–27) and churches, including the Second Baptist Church (1924). His client roster included Hollywood royalty and elite of the booming region. So great were his talents in diminishing the boundaries to success that he would create sketches for Anglo clients upside down, sitting opposite so as not to come into close contact with them. This so impressed many skeptics that he rarely lost a commission because of the color of his skin.

Prejudices aside, Williams was able to design comfortable surroundings that evoked a sense of grandeur while maintaining



Theme Building at Los Angeles International Airport, by Paul Revere Williams
© Joseph Sohm; Chromo Sohm Inc./CORBIS

a human scale. Past experience with master architects taught Williams a deep respect for the varied revival-style structures that were in vogue throughout his practice. This, in turn, influenced the fashion-conscious of Hollywood to seek out his design sensibilities.

Following World War II, Williams embraced modernism like most of his contemporaries, but with a style and grace that evoked the balanced classical compositions of the prewar period. This can best be seen in his addition to the Beverly Hills Hotel (1947–51), the Los Angeles County Courthouse and Hall of Administration (1955), and the Frank Sinatra residence (1956). The postwar years also saw expansion with allied offices in Bogota, Colombia, and Washington, D.C. The number of commissions for public and commercial structures following World War II eclipsed his prewar residential commissions, with his offices swelling to more than 60 draftsmen. It was during this period that one of his greatest landmarks was designed in association with Pereira and Luckman and Welton Becket Associates: the Los Angeles International Airport Theme Building (1961–65).

After a prosperous career, Williams spent his final years lecturing around the world about dedication to one's desires and the obstacles that must be overcome to achieve them. He continued his practice until the mid-1970s, taking on projects that more closely resembled those from his practice during the first two decades of his career. Williams understood more keenly than most design professionals that many outside influences affected how and what is built. His dedication to improving design went well beyond the drafting room tables.

JEFFREY B.SAMUDIO

Biography

Born Los Angeles, 18 February 1894, son of poor recent immigrants from the southern United States, orphaned at an early age. Attended Los Angeles Polytechnic High School; attended the Los Angeles School of Art and the Beaux-Arts School of Design Atelier 1912–16; winner of the Beaux-Arts Medal and First Prize for a Neighborhood Center in Pasadena, California. Attended the University of Southern California School of Engineering, specializing in structural design and engineering 1916–19. Married Della Mae Givens 27 June 1917. Member of the first Los Angeles Planning Commission 1920–28; certified as an architect, state of California 1921. Established firm of Paul R. Williams, Architect 1922; became member of the Southern California Chapter of the American Institute of Architects 1923; appointed to the National Monuments Committee by President Calvin Coolidge 1929; appointed to the first Los Angeles Housing Commission 1933–41. Won first AIA award for design of the Music Corporation of America corporate offices (1937), Beverly Hills, in 1939; received honorary doctorate of science degree, Lincoln University, Missouri. Enlisted as a navy architect during World War II 1942–45. First major public buildings 1940–41, Long Beach Naval Station; followed after the war with major additions to the Los Angeles General Hospital 1947; also that year he was appointed to the board, serving as vice president, then director of Broadway Federal Savings and Loan, the oldest federal savings and loan headed by African Americans west of the Mississippi. Appointed by governor, and later chief justice of the Supreme Court, Earl Warren, to the California Housing Commission 1949–55. Received honorary doctor of architecture degree, Howard University (presented by President Truman); appointed to the National Commission on Housing by President Eisenhower 1953. Retired from practice following his commission to design a sorority house at his alma mater, USC 1973. Died in Los Angeles, 23 January 1980.

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WILLIAMS, TOD (1943–) AND BILLIE TSIEN (1949–)

Architects, United States

The architecture of Tod Williams and Billie Tsien has been characterized as one that is preoccupied with the craft of making. Working together in practice in New York, these two architects have developed particular interests in the inherent qualities of materials that they have combined with investigations of the details of the physical and philosophical nature of construction. They have explored these interests through a range of projects that originated in designs for exhibitions and performance and that have subsequently developed to embrace more conventional architectural commissions that have included houses, educational facilities, and civic buildings.

After studying architecture at Princeton University and working for Richard Meier for six years, Tod Williams opened his own office in 1974. Billie Tsien's first degree was in fine arts, and she went on to study architecture at the University of California, Los Angeles, before joining Williams. Together they have developed a practice that has been significantly influenced by their backgrounds in architecture and fine art. However, theirs is also a practice that reflects a collaborative effort that grows out of their relationship as a married couple, and they have frequently spoken of their interest in "bringing together the issues of life and architecture."

In their early work, Williams and Tsien experimented with materials in the designs for installations at the Museum of the Chinese in the Americas in New York and elsewhere. They used unconventional materials and also reconsidered how familiar materials could be used in unfamiliar ways. For an exhibition of Noguchi's Akari lanterns, they used obsidian with lit fiberglass screens, and a project that was developed with the Elisa Monte Dance Company in New York advanced the ideas of large screens to create a dynamic backdrop for the staging of dance productions.

These investigations informed their subsequent architectural work. The design for new galleries at the Phoenix Art Museum explored the use of glass and metal and of different aggregates in the making of the concrete for the building. The systems of construction were also developed to define paths of movement that organize the new galleries and link them into an existing building. This consideration of the path as an organizing element in architecture and also as a place of meeting and social interaction has become increasingly influential in their work. In the planning of the Neurosciences Institute in La Jolla, California, a theoretical and clinical research campus for the study of the brain, Williams and Tsien designed places of informal meeting that are integrated with spaces for work by creating a series of paths that become meandering walks through the building. These paths also integrate the institute into a surrounding natural landscape framed by the Santa Rosa Mountains.

In the development and design of the Cranbrook Estate in Michigan, the architect Eliel Saarinen, together with his client George Booth, established a strong relationship among landscape, art, and architecture. It was a relationship that was also reflected in the organization of a curriculum that sought to connect the mental and the physical through the integration of academic and athletic activities there. Increases in enrollment at Cranbrook prompted the need for new and improved facilities, and Williams and Tsien were commissioned to prepare a plan for new buildings there to provide gymnasiums, exercise rooms, and a swimming pool. Their design developed ideas of movement and path embodied in their earlier designs for academic buildings in California, at Princeton, and at the University of Virginia. The coeducational natatorium at Cranbrook has been planned to connect to existing buildings, and large occuli and doors enable the building to be opened up during spring and summer. These devices successfully connect the building to the landscapes of the Cranbrook Estate. The first building in this phased development, which was completed in 1999, is one of the most successful new educational buildings in the United States.

Commissions to design houses for sites in New York City, Long Island, and Phoenix have enabled Williams and Tsien to explore these issues of materiality, path, and the integration of building with site at another scale. These explorations are particularly successful in the houses in Phoenix and Long Island, which were completed in 1997 and 1999, respectively.

In 1998 Williams and Tsien received a commission to design the Museum of Folk Art in New York. This project develops these ideas within the confines of a restricted site on Fifty-third Street. Of necessity the scheme organizes the galleries as a series of spaces that are linked vertically. An elevator is itself designed as a gallery. Internally, a series of shafts are also cut through the building to link spaces and define the paths that connect them with natural light. The facade on the 40-foot-wide street front-age, proposed as a folded plane of white bronze panels, is mainly solid. Not only does the fold give the museum a greater presence on the street, but the material was selected to reflect the dynamism of changing light throughout the day. This new museum opened in 2001.

In its preoccupation with materials and the details of fabrication, the work of Williams and Tsien recalls that of Charles and Ray Eames. By working closely together, they have been able to develop interests in the craft of making architecture and shaping space to a level that articulates an important alternative to corporate practice and the overwhelmingly generic buildings that frequently result from industrial production.

BRIAN CARTER

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WILSON, (SIR) COLIN ST. JOHN 1922

Architect, England

Colin Wilson, with his firm of Colin St. John Wilson and Partners, founded in 1971, is responsible for the largest and most expensive (£511 million) architectural commission in Britain—the British Library—which on its completion in 1998 had been some 36 years in the making. Wilson faced hostility and ridicule during the design and construction, but his courage and confidence finally brought vindication—today the British Library enjoys immense popularity and prestige. While this monumental building constitutes Wilson's chief constructed architectural legacy, as an educator and persuasive author, Wilson has had an effect on architecture that transcends his numerically modest built output. He has been a very important voice for those who care about integrity more than fashion and who believe that architecture should serve human needs over time, be embellished by use, served in and provide a frame in which human actions are made manifest.

Educated at Cambridge University and University College, London, after wartime naval service, Wilson served in the Housing Division of the London County Council (LCC) between 1950 and 1955, when public housing was the most important task on the architectural agenda in a Britain still recovering from wartime damages. After a year with the developer John De Vere Hunt, Wilson moved to Cambridge at the invitation of Leslie Martin, principal architect at the LCC before his appointment in 1956 as professor at the School of Architecture, to teach and to associate with him on architectural projects.

Initially, Wilson had been captivated by Le Corbusier, especially his sculptural post war Brutalist work. Thus, Wilson's extension to the Architecture School at Cambridge has the textured roughness of Le Corbusier's Unite d'Habitation (Marseilles, 1946–52) and the Maisons Jaoul (Paris, 1952–56). Ultimately, however, Alvar Aalto would be much more influential. Wilson often quotes the Finnish master's observation about modern architecture of the heroic period, made when Aalto received the RIBA Medal in 1957: "Like all revolutions it starts with enthusiasm and stops with some sort of Dictatorship" (*Architectural Reflections,* p. 84). Thus, Wilson began to seek an alternative tradition for modern architecture, which he found in the work of other Scandinavians like Sigurd Lewerentz and Gunnar Asplund, as well as German organicists like Hugo Här-ing and Hans Scharoun. Aalto's immediate effect can be recognized in Harvey Court at Gonville and Caius College, Cambridge, in the dominant materials of brick (rather than the prevailing *béton brut*), natural wood, and copper; in the arrangement of a raised courtyard (as at the Town Hall, Säynatsalo, 1950–52) with a pyramidal skylight admitting light to below; and in the way the stairs are expressed (both devices also recalling Aalto's Baker House at the Massachusetts Institute of Technology, 1946–49). Although at Harvey Court the image of La Tourette also lingered, increasingly it was Aalto and the German Expressionists who excited Wilson's admiration. Thus, the fan shape of the William Stone Building at Peterhouse College (1960–64) brings to mind one of Aalto's favorite motifs.

In his designs and his writings, Wilson vigorously combats the leading tendency of the 1980s and 1990s to view architecture as autonomous and as a discipline, a mode of abstract thinking, that exists outside the practice of making buildings and creating space. Wilson has also set himself against "inauthenticity," which he has found both in the modernism of the International Style and in Postmodernism. Probity is a revered quality, and Wilson seeks an ethical dimension that is hardly new; its sources can be found in A.W. N. Pugin and John Ruskin no less than H.P. Berlage or Aalto—all intellectual forebears.

Nourished on a diet of astute English critics of widely varied opinions, including Ruskin, Geoffrey Scott, and Adrian Stokes, Wilson is passionate about architecture without being narrowminded or doctrinaire. He is also a bibliophile, and it is appropriate that he should have become a specialist in redefining the program of the contemporary library. Thus, with Martin he designed three libraries for Oxford University (1959–64), with Long he worked on the National Libraries Feasibility Study as well as the libraries for the Bishops' School and for Queen Mary College, and he acted as consultant for the Harold Washington Library in Chicago by Hammond Beeby Babka.

At the same time, Wilson is also profoundly involved in the visual arts as painter, draftsman, and sculptor; as museum trustee; and as collector. He has been the intimate friend, and often mentor, of many artists: Peter Blake, Eduardo Paolozzi, R.J. Kitaj, Howard Hodgkin, Richard Hamilton, and William Turnbull, among others; his extensive collection of their work has been promised to the Pallant House Gallery in Chichester, for which he designed an extension.

In 1994 Wilson suggested that Long and their associate Rolfe Kentish establish a new partnership to supplement the existing firm, and he subsequently has involved himself with projects by Long and Kentish. Although many laurels have come his way since the opening of the British Library—for example, a knighthood and an exhibition at the British Pavilion of the Venice Biennale (1996), as well as numerous invitations to teach and lecture—Wilson is still deeply engaged in shaping architectural practice to embody his deeply felt principles.

HELEN SEARING

S*ee also* **Aalto, Alvar (Finland); Asplund, Erik Gunnar (Sweden); Banham, Reyner (United States); British Library, London; Congrès Internationaux d'Architecture Moderne (CIAM, 1927–); Corbusier, Le (Jeanneret, Charles-Édouard) (France); Häring, Hugo (Germany); International Style; Loos, Adolf (Austria); Scharoun, Hans (Germany); Unite d'Habitation, Marseilles**

Biography

Born Cheltenham, England, 14 March 1922. Corpus Christi College, Cambridge 1940–42; master's degree 1942. Bartlett School of Architecture, University of London 1946–49; diploma of architecture 1949. Royal Naval Volunteer Reserve 1942–46. Housing Division, Architects' Department, London County Council 1950–55; development office of John De Vere Hunt 1955–56. Private partnership with Leslie Martin 1956–70. Senior partner, Colin St. John Wilson and Partners, London, since 1971. Partner, Long and Kentish, since 1994. Instructor, School of Architecture, Cambridge University 1956–59; professor and head of School of Architecture, Cambridge 1975–1989. Visiting critic Yale University School of Architecture 1960, 1964, 1983, 1985, 2000; William Henry Bishop Visiting Professor jointly with M.J. Long 2002; Bemis Visiting Professor of Architecture, MIT 1970–72. Trustee Tate Gallery 1973–80; National Gallery, London 1977–80.

Selected Works

Own Practice

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City Center Project for Team X Meeting (with Peter Carter), 1956
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Pair of houses (one the Wilson house), Grantchester Road, Cambridge, 1964
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Civic and Social Center, St. John's Gardens, Liverpool (with M.J. Long), 1970

With Sir Leslie Martin

Housing, St. Pancras, London, 1957
Harvey Court Residential Building, Gonville and Caius College, Cambridge, 1962
William Stone Residential Building, Peterhouse College, Cambridge, 1962
Three Libraries, Oxford University, 1964
Library, British Museum, Bloomsbury, London, 1964

Colin St. John Wilson and Partners

New Extension, British Museum, London (1st project, 1970; 2nd project, constructed, 1973–79), 1979
Bishop Wilson Memorial Library, Bishops' School, Springfield, Essex, 1984
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WOOD

The dramatic technological, environmental, political, and economic changes that occurred during the 20th century irrevocably changed the way in which wood is used in all types of building. Three major themes can be discerned: improved technology and accelerating scientific research have resulted in novel uses for wood as well as in structural and decorative substitutes for wood; improved transportation, rising demand, and freer trade have created large, new worldwide markets for all types of timber and wood fiber; and, despite constantly shifting styles, steady change in construction technology has reduced wood's relevance to architecture.

The immense investment of energy, time, and wealth in scientific research by governments, businesses, and universities throughout the 20th century bore fruit in practically every field of endeavor, and wood, despite its seemingly elemental nature, was not neglected. The fundamental innovations of the 20th century were to devise new ways to break wood down into its boards, strips, strands, fibers, and even molecules and to concoct new and better ways to reattach these components. Another breakthrough, although of questionable environmental merit, was the gradual development of improved techniques for planting, growing, and harvesting trees. These innovations had the net result of increasing both the usefulness and the value of wood in society. They also permitted, for the first time, many physical weaknesses of wood to be significantly ameliorated.

Except for scarce "old growth" timber, which can be up to 10 feet in diameter and over 100 feet in length, trees produce lumber that is not very long, very straight, or very stable. Premodern carpentry accommodated the slender, flexible, environmentally sensitive nature of wood by devising intricate, laborintensive methods of combining small pieces of wood to create architectural surfaces and structural frames. Carpenters in the 20th century, by contrast, were able to use many new wood products that are, in theory, infinitely wide, flat, long, stiff, uniform, and stable. The most famous example of this is plywood, actually a trade name for a Douglas fir product that was first exhibited at the

Lewis and Clark Centennial Exposition of 1905. Plywood is best known because, by the middle of the 20th century, it was being used for everything from furniture designed by Frank Lloyd Wright to P.T. boats, but it is just one of many different types of composite wood panels made up of layers of wood veneer glued together. Because the layers of veneer are laid at cross angles to one another, plywood warps, shrinks, and cracks very little. Although it is sold today primarily in panels four feet wide by eight feet long, it can theoretically be manufactured to any dimension and in virtually any thickness. Many types of veneer panel were being manufactured in limited quantities during the 19th century, but the growing usefulness of composite wood panels in the 20th century depended primarily on the increasing strength, durability, and water resistance of the adhesives.

Composite panels could also be made from straw, wood, sugarcane, or practically any other kind of vegetable fiber. Such products as Masonite, Homasote, Celotex, Insulite, and Presdwood were developed and produced throughout the 20th century and offered builders some of the same advantages as plywood, namely, perfect uniformity of size and strength, extreme economy, and tremendous structural efficiency. Because these products had limited insulating quality—and also because they were cheap, easy to produce, and manufactured from agricultural or lumber waste products—they were in extremely high demand during World War II. As the Masonite Man boasted in a wartime advertisement:

> Many a U.S. fighting man, from the north pole to the tropics, lives and works in a Quonset Hut, lined entirely with Masonite Presdwood. The entire lining for a Hut is shipped easily in one compact crate…painted and ready to install. These Masonite Presdwood walls resist both the frigid blasts of the Arctic and the heat, humidity and insects of the equator.

Another product that achieved popularity and importance in the 20th century was the "glue-lam" timber. The first recorded use of glued laminated arches was in Basel, Switzerland, in 1893. In 1901 the first patent was awarded to Otto Hetzer of Weimar, Germany. Thereafter, glued laminated arches were known in Europe as the Hetzer construction method. In the United States, the first glued laminated timbers were manufactured by Max C. Hanisch, Sr., a German immigrant and the founder of the Unit Structures Corporation of Peshtigo, Wisconsin, in 1934. The principle of the glue-laminated beam was probably first employed by Bronze Age fletchers who manufactured bows of extreme flexibility and power by gluing thin strips of animal horn together. In the case of the glue-lam timber, however, scientists in the 20th century developed efficient ways to laminate small, dry boards together to create, in theory, infinitely long, deep timbers of uniform cross section and stable composition. Gluelam timbers could also be bent into any shape, increasing the variety of architectural effects that could be achieved.

In the past several decades, numerous variations on these two themes have been developed in an effort to reduce costs, preserve timber, increase efficiency, and raise profits. Oriented strand board, Para-lam timbers, pre-primed plywood siding, and trussjoists, to list just four among hundreds of brand-new products, utilize super-strong new waterproof adhesives and small, thin, dry boards or even mill scraps. The advantage of all this innovation has been constantly increasing speed of construction, vastly increased efficiency in the use of diminishing timber resources, ever lighter-weight structures, and lower building costs. The drawback to all these new products is greater fire hazard, slimmer margins of engineering safety, shorter life spans, and a reliance on an increasing number of synthetic glues and preservative chemicals.

Throughout the 20th century, but particularly after World War II, many nations and regions began to export formerly untapped timber resources, and many developing nations established strong new wood-manufacturing industries. Increased trade in the 20th century had two major effects: the largest Western economies were benefited from the increased availability of foreign wood species, were formerly tiny, insular economies were being affected by international trends in construction, timber harvesting, and manufacturing.

The international timber trade is at least as old as recorded history. In biblical times the ceiling of Solomon's temple was reputedly framed of cedar beams imported from Lebanon. During the Middle Ages, most of the highest-quality oak boards used in England for doors and furniture were brought by ship from the Baltic. One result of growing trade in the 20th century, however, was the availability of larger and comparatively less expensive quantities of foreign timber than ever before. The species might be exotic, such as teak from Myanmar or mahogany from Brazil, valued by shipbuilders, cabinetmakers, and other specialty secondary industries, or they might simply be inexpensive softwood for framing, such as the huge quantities of fir, spruce, hemlock, and pine pouring onto the world market from Canada, Russia, and other Baltic countries. Naturally, this increased trade was largely a result of rising demand. Annual world demand for all types of wood is expected to rise in 2010 to approximately 2.7 billion cubic meters, according to the United Nations. This is approximately 15 percent higher than the world's production capacity in 1997.

Increased international trade also increased pressure in many markets to standardize or to adopt new techniques. In Japan, for example, where carpentry is a ferociously defended traditional craft, pressures were mounting to incorporate Westernstyle framing because of its low cost and its efficient earthquake resistance. This was contrary both to popular opinion in Japan, where traditionally framed structures are believed to flex and bend with earth tremors, and to carpenters' preferred methods of work. Nevertheless, the effectiveness of Western-style framing was demonstrated during the Kobe earthquake of 1995. Following the terrible devastation, engineers in Japan noted that modern American-style plywood boxes had proven quite durable, whereas many traditionally framed postwar buildings had performed poorly. American-style platform framing, however, relies on standardized kiln-dried lumber and plywood, which American lumber companies are eager to begin exporting to Japan in larger quantities. Japanese carpenters and lumber companies, on the other hand, would much prefer to import select American logs and process the lumber themselves, thereby preserving jobs and, they believe, increasing quality. The serious consideration in Japan of the adoption of Western-style framing, Western lumber dimensions, and offshore labor exemplifies the power of international trends to change even the most entrenched traditional local uses of wood in construction. Such shifts have occurred throughout the world.

Probably the most interesting—and misleading—force that influenced wood's use in the 20th century was the fluctuating popularity of many different fads, trends, styles, and practitioners of architecture. These influences are difficult to disentangle from simultaneous technological, economic, and political changes and indeed were usually precipitated by the more powerful shifts of the world at large.

One of the most notable shifts of the early 20th century was a worldwide move away from romantic, historicizing styles of building to the International Style. In the United States, this meant that Richardsonian Romanesque, Neoclassical, Craftsman, Edwardian, Art Nouveau, and a host of other styles of building were slowly overcome by the machinery of the building itself. This shift was not merely stylistic. As Henry-Russell Hitchcock noted as early as 1928, “Indeed a client, while he may ask for a Tudor or a Georgian or even a Maya design, is unlikely to permit any serious sacrifice of *le comfort moderne* to the exigencies of a past style” (Hitchcock, 1928).

In retrospect, it was inevitable that as the building became filled with more and more lighting, heating, cooling, communication, and transportation equipment, not to mention a strong new steel skeleton, it would divide into at least three parts: guts, bones, and skin. The inconsistency of having fresh, young, vigorous guts and bones sealed in a leathery old skin from a previous millennium slowly became more objectionable until advocates of the International Style proposed a solution: the entire building ought to be a new, up-to-date machine for living.

Naturally, this shift had a powerful influence on how wood was used in architecture. Where the Greene brothers, Charles Rennie Mackintosh, and Victor Horta glorified the skill of the craftsman, the physical beauty of architectural materials, and the expense and complexity of fabricating architecture, the International Style celebrated the economy, simplicity, and directness of mass-produced materials and components. Metals, glass, concrete, plastics, and rubber became the preferred palette of leading architects from the 1930s on. Wood was acceptable if it was served up in flat, straight, square, uniform, repetitive chunks—in other words, if it imitated the stripped-down, mass-produced aesthetic of the other parts of the machine. Frank Lloyd Wright expressed the disgust that many modern architects felt toward traditional wooden embellishments very clearly when he wrote:

> Wood, therefore, has more human outrage done upon it than man has ever done, even upon himself…. In his search for novelty, wood in his hands has been joined and glued, braced and screwed, boxed and nailed, turned and tortured, scroll sawed, beaded, fluted, suitably furbelowed and flounced at the carpenter’s party—enough to please even him. By the aid of “modern” machines the carpenter-artist got it into Eastlake composites of trim and furniture, into Usonian jigger porches and corner-towers eventuating into candle snuffer domes or what would you have?; got it all over Queen Anne houses outside and inside—the triumph of his industrial ingenuity—until carpentry and millwork became synonymous with butchery and botchwork. (Wright, 1928)

According to Wright, the machine itself was not to blame—it could easily produce the smooth, rectangular, geometrically pure pieces that he and many other modernists desired and put to use in Wright’s Prairie-style houses and many other buildings. Naturally, therefore, the scientific and technological advances in the use of wood during the early 20th century appealed to modern architects, and they made excellent use of new materials and techniques.

What is not obvious, perhaps even to the architects and critics of the Modern movement themselves, is that some of the bestknown and most contentious commentators of the 20th century were merely running a few steps ahead of the pack, ten moist fingers to the wind. Far more influential—and ultimately irresistible in its power—was the tide of economics and technology that swept everything architectural in its wake. Rising labor costs, decreasing quality of timber resources, sudden enormous wartime demands, the growth and monopolization of wood industries, and, most important, the growing dominance of mechanical systems have been far more influential than any style or architect despite what some might say about Alvar Aalto's plywood chairs or Tadao Ando's rustic wall treatments. According to Kenneth Frampton, two-thirds of the total budget of any large building built in the 1990s is expended on mechanical and electrical provisions of one kind or another, from airconditioning to piped information.

This observation has many implications. First, combined with the fact that most large buildings today are framed in steel, it means that high-status architecture utilizes very little wood and consequently has practically no influence on the lumber industry. Custom-furnishings manufacturers provide the entire (small) package of fittings, furnishings, trim, and moldings. Wherever possible in their design, they will substitute a cheaper synthetic material, such as plastic laminate or metal. Where wood is absolutely required, it will usually be a thin veneer over a particleboard backing. Second, because most "vernacular" structures—everything from tract homes to taco stands—are designed with absolute economy and relatively short life expectancies, lumber manufacturers are in cutthroat competition to produce the cheapest possible structural components—and these vernacular wood-framed buildings, designed by builders and engineers, make up nearly 86 percent of all American structures and a growing percentage of new structures worldwide. The innovations of the lumber industry, consequently, will rarely reflect the stylistic or philosophical attitudes of architects, and because architects have little reason to be interested in the lumber industry anyway, only contractors, engineers, and environmentalists will be left to argue over how scarce timber resources ought to be used, protected, or augmented. In short, wood has moved out of the purview of the most influential architects.

The main difficulty in an analysis of any topic as broad as the 20th-century use of wood is to distinguish causes from effects. Scientists and engineers in the 20th century created marvelous new uses for wood and surprising new ways to reconfigure wood. Large new supplies of timber came onto the world market from all corners of the world; and, most noticeably to those of us who are architects and historians of architecture, there were extremely novel and exciting new applications for wood devised in the 20th century. No one who has visited one of Alvar Aalto's buildings can fail to be impressed by his sensitive handling of a material as mundane as birch plywood, and no one who has stood in a modern church sanctuary vaulted by glue-lam beams can fail to be impressed by their warmth, clarity, and dramatic effect. However, wood is rarely a major component in high-status architecture. Wood's flexibility, warmth, beauty, and dynamic vitality are used by leading architects only as special effects. Instead of being revered as the essential, expensive, natural material that it once was, it has become another cheap mass-produced commodity sold by the truckload to weekend do-it-yourselfers and tract home builders. Scientific technology, which facilitated so many exciting changes in wood's use throughout the 20th century, eventually brought forth other materials and systems. Those new systems, namely, electrical, plumbing, insulating, heating, communication, and transportation, have assumed prominence in construction projects of all types, and they, far more than any structural or decorative material, will continue to be primary architectural influences throughout the 21st century.

A.GORDON MACKAY

S*ee also* **Aalto, Alvar (Finland); Ando, Tadao (Japan); Craftsman Style; Greene, Henry M. and Charles S. (United States); Hitchcock, Henry-Russell (United States); Horta, Victor (Belgium); Mackintosh, Charles Rennie (Scotland); Wright, Frank Lloyd (United States)**

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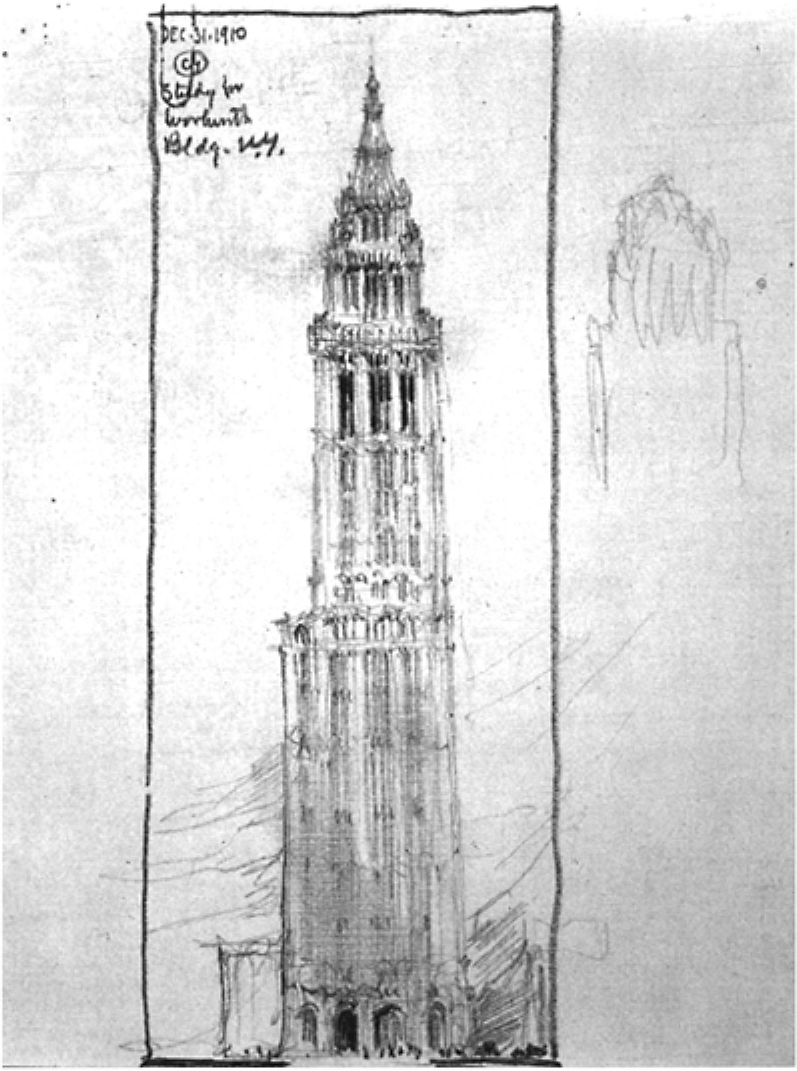
WOOLWORTH BUILDING, NEW YORK CITY

Designed by Cass Gilbert; completed 1913

The Woolworth Building in New York was designed by the architect Cass Gilbert during 1910–13. Frank Woolworth, the founder of the popular F.W.Woolworth Company, undertook the project in 1910, after having expanded his business from a single store in Lancaster, Pennsylvania, established in 1879 to a chain of 318 stores. That year, he selected a site at Broadway and Park Place, across from the Brooklyn Bridge and Fronting City Hall Park. For the purposes of financing his skyscraper, Woolworth formed a limited partnership, the Broadway-Park Place Company, with Irving National Exchange Bank.

Woolworth chose Gilbert as the project's architect after Gilbert designed the Broadway Chambers (1896–1900) and the West Street buildings (1905–07), achieving renown for his skyscrapers. Gilbert's West Street Building, his first "skyscraper Gothic" design, featured rational verticals inspired by Louis Sullivan's Bayard Building and a pinnacled, picturesque crown.

Woolworth selected the Victoria Tower at the Houses of Parliament in London, a perpendicular Gothic tower, as the model for his skyscraper. Gilbert's objective, however, was to create a "civic" or "commercial" identity for the headquarters of the F.W.Woolworth Company. This he based on his study of the secular Gothic *hotels des villes,* cloth halls, and belfries of medieval Flanders. Woolworth also envisioned his project as a "giant signboard." In November 1911, he merged his chain with those of competitors to create the F.W. Woolworth Company,



Graphite sketch for elevation of Woolworth Building, by Cass Gilbert

Woolworth Building, New York (1913)

with a new total of 597 stores; his new retailing empire stretched from England across the Atlantic to the American shores of the Pacific.

The Woolworth Building's final design, which Gilbert completed in January 1911, had Gothic verticals showing a heightened energy and rhythm. An ingenious system of portal arch wind bracing, designed by the project's structural engineer, Gunvald Aus, made possible the exterior's soaring, attenuated, and diaphanous qualities. Flamboyant Gothic canopies, the gables of the crown, the tower's recessing stages, and the culminating tourelles—all of which were modeled in ivory-colored terracotta—enhanced the design's picturesqueness in the city. Gilbert used accenting blues, greens, and yellows to suggest depth and shadows in the elevations and to relate the tower to the surroundings of clouds and sky.

Woolworth, who chose to build in an already overbuilt market for office space, devised strategies for advertising the Woolworth Building to prospective tenants. He and his press agent, Hugh McAtemney, exploited the skyscraper's design and construction as the "world's highest" in an aggressive program of publicity. They had President Woodrow Wilson push a telegraphic button in Washington, D.C., on 24 April 1913, staging the skyscraper's opening as a great lighting spectacle. In January 1915 Woolworth installed a permanent lighting scheme that he hailed as a "standing advertisement." Woolworth also developed the tower as a sensational pinnacle observatory, which drew up to 1000 visitors a day and became an important landmark in the tourist's itinerary of the city.

The Woolworth Building's lobby-arcade, designed as an entrance to both the F.W.Woolworth Company and Irving National Bank, was one of the most opulent and colorful in the city. A cross between a Romanesque cathedral nave and the early Christian mausoleum of Galla Placidia, it featured C. Paul Jennewein's murals "Labor" and "Commerce." The interior's semipublic spaces, among them Irving National Bank's "Elizabethan" banking hall, the "medieval German" Rathskeller, and Woolworth's own Napoleonic "Empire style" executive offices on the 24th story, enriched the experience of office work with environments of fantasy that evoked the treasures of Europe. Offices for tenants were unusually light filled, and some had ceilings 20 feet high. Tenant conveniences included 18 stores in the lobby-arcade, direct access to two adjacent subway lines, and 26 high-speed electric elevators outfitted with Ellithorpe air cushions. Woolworth and McAtemney touted the skyscraper as "the highest, safest, and most perfectly appointed office structure in the world *(Real Estate Record,* p. 587).

The Woolworth Building was christened the "Cathedral of Commerce" by the Reverend S.Parkes Cadman in 1916, and during the vibrant economy of the 1920s, it was viewed at home and abroad as a symbol of America's optimism, progress, and material success. After the Depression, however, it became a lightning rod for modernist historians, who chided its Gothic ornament as out of step with the times. It was named a national historical landmark in 1983 and subsequently underwent two restorations, the first by the Ehrenkrantz Group in 1978–80 and the second by Beyer Blinder Belle, Architects and Planners, in 1998–99.

GAIL FENSKE

S*ee also* **Gilbert, Cass (United States); New York, New York, United States; Skyscraper**

Further Reading

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WORLD TRADE CENTER, NEW YORK CITY

Designed by Minoru Yamasaki; completed 1976, destroyed 11 September 2001

The design and building of the World Trade Center complex (1966–76) comprised a unique architectural vision, the application of innovative technology, and public interest. Conceived of as a public project in 1960 by the Port Authority Commissions of New York and New Jersey, the World Trade Center was intended to unite private and public interests in trade and commerce in one major building complex. Among the goals were bringing together government agencies and international trade businesses, rehabilitating the appearance of the lower Manhattan financial district, and attracting new businesses to the blighted downtown neighborhood by adding more modern office space. The building site, encompassing 16 acres located on the far west side of Manhattan along the Hudson River, was chosen as a prominent place for an important architectural statement. The convergence of major transportation routes from northern Manhattan, Brooklyn, and New Jersey was also a consideration for conceiving a central trade center. The selection of Minoru Yamasaki, a Michigan-based architect with no experience in designing skyscrapers, over other major figures in International Style design offered a distinctive vision of modern architecture to the landscape of lower Manhattan. The Port Authority's mandate for more than ten million square feet of space required the additional assistance of Emery Roth, a noted builder of many large-scale commercial and residential projects in New York City.

Minoru Yamasaki, born in 1912 in Seattle, presented an architectural style that showed a preference for subtly ornamented modern structures set within open plaza spaces. After several experimental models, Yamasaki presented a design for a World Trade Complex that included a pair of giant towers, surrounded by three smaller buildings: a hotel, the first in lower Manhattan since 1836; a large above-ground plaza; and a subterranean shopping and transportation concourse. A below-ground parking garage was the site of a terrorist attack in 1993, foreshadowing the devastating destruction of the two towers by terrorist attacks on 11 September 2001.

The plaza and underground spaces reflected Yamasaki's concern for the functional needs of people in an urban setting and were intended to serve as a contemplative open space for public respite from the noise and congestion of the narrow, crowded streets of lower Manhattan. The placement of the twin towers at angles to one another offset the importance of the plaza and drew attention to the buildings themselves. Encased in new Alcoa aluminum and rising more than 110 stories to 1368 feet, to become the tallest buildings in New York City since the Empire State Building, the towers were intended to be seen from a distance as gleaming monoliths, symbolic of the power of New York commerce.

Closer views of the twin-tower complex, particularly from street level, show that the steel-encased piers commenced on the open ground floor area as expansive, glass-filled spaces that narrowed into Gothic arches and rose to the top of the structure. The subtle Gothic design imposed on the exterior and visible in lower interior lobby areas related to Yamasaki's personal aesthetic interest in architectural elements, most notably the arch, borrowed from notable buildings of the past—in this case from Venetian architecture. In his incorporation of historic details, Yamasaki transformed the meaning and interpretation of the modern glass skyscraper, popularized in the International Style. As a result the appearance of the World Trade Center stood out from other notable skyscrapers built in lower Manhattan in the same period, including the Chase Manhattan Bank (1960) and the Marine Midland Bank (1967) buildings, both designed by Skidmore, Owings and Merrill, the architects and promoters of glass skyscraper architecture in New York City.

The construction of the World Trade Center, which commenced in 1966, contained many feats of modern engineering. The excavation of the site alone required innovative planning and the implementation of new technologies. The prime waterfront property, actually landfill extending about 600 feet from the original shoreline, required that the foundations for the two towers be dug to a very deep level to reach the bedrock of Manhattan Island. The depth of the digging, to 75 feet, or about six stories below the bottom of the adjacent Hudson River, also caused the underground train service to be temporarily elevated,

World Trade Center towers under construction, 27 March 1972

Photograph by T.Sheehan © Museum of the City of New York and The Port Authority of New York

but it was not disrupted at any point during construction. A slurry wall system, previously used for the construction of subway tunnels, was implemented to anchor the concrete foundations to heavy steel plates that were bolted into the bedrock. The dirt dug for the foundations led to the creation of a new neighborhood along the riverbank that became another notable new neighborhood: Battery Park City.

The construction of the twin towers also required engineering ingenuity. The structural engineering firm Skilling, Helle, Christiansen, Robertson coordinated the buildings to be built from the inside out, starting at the elevator cores. Through tests conducted on models of the towers in wind tunnels, a shock-absorbing damping system was devised to minimize the swaying of the tall buildings in high-wind conditions.

The elevator system was sectionalized into three separate banks. Express elevators were designed to reach sky lobbies constructed at various intervals, where passengers would then board another set of local elevators to reach the intervening floors. The result was greater efficiency in terms of both the movement of people and the opening up of more valuable floor space for office rental. The exterior walls were constructed with prefabricated panels combining two horizontal windows and three vertical windows, producing a uniform pattern of fifty-eight 22-inchwide windows spread across each facade and separated by spandrels and columns. Prefabrication was also introduced in the floor framing. The exterior walls were also designed to be load bearing. With the assistance of Skilling, Helle, Christiansen, Robertson, a bracing system of vierendrel trusses, consisting of horizontal and vertical members, was incorporated into the exterior wall design, applying a nontraditional kind of stabilizing system that appeared to be lighter and did not diminish usable interior space.

With more than 30 million visitors reported to have made the vertical journey to the observation deck on the 107th floor of the second tower, the World Trade Center more than fulfilled Yamasaki's expressed confidence that the monoliths would be experienced as some of the most significant and loved New York City buildings. The numbers of visitors and tourists alike who continue to be drawn to the site in downtown New York City, which is still undergoing repair and reconstruction as of 2003, indicates the symbolic and iconic resonance the World Trade Center buildings maintained for a quarter of a century.

EVIE T. JOSELOW

S*ee also* **Empire State Building, New York City; International Style; New York (NY), United States; Skidmore, Owings and Merrill (United States); Skyscraper; Yamasaki, Minoru (United States)**

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WRIGHT, FRANK LLOYD 1867–1959

Architect and designer, United States

Frank Lloyd Wright remains America's most original, influential, and significant architect. His works are more popular today, more than a century after he began his practice in 1893 and more than 40 years after his death, than they were at any time during his lifetime. During his 72-year career, Wright designed more than 600 built works and 600 unbuilt projects, employing an astonishing range of forms and methods, yet he always described his life's work as being one singular effort, emphasizing the fundamental and unchanging ordering principles that consistently determined his work from beginning to end.

The first of these fundamental ordering principles, and by far the most important, was the primacy of the space of inhabitation, which he called "the space within." Wright's concepts for architectural space evolved first in his designs for interior spaces and were only later projected or expressed in the exterior forms. For Wright, the spatial composition must be determined by the experience of the inhabitants and not by some preconceived formal order. The second principle was that space is given its essential character through its construction. Wright believed that the way a space is experienced is directly related to the way it is constructed and that the architect must work with "the nature of materials." The third principle was that architecture takes place in nature, where interior and exterior space are woven together to make an integral whole. The relationship between architecture and the landscape was of fundamental importance to Wright, and he believed that the design of a building should start with the ground from which it was to grow. Wright designed buildings not simply as freestanding forms but as contributing elements in the larger order of both the landscape and the city.

Wright was raised in a household where the rigorously structured study of natural forms, the Unitarian faith, the ideas of American Transcendental philosophy, and the Froebel kindergarten training methods were all powerfully present. These complementary systems of thought had in common the belief that the material and spiritual worlds could not be separated but were in fact one and the same. Emerson had written that "all form is an effect of character," and Wright came to believe that every physical form had spiritual and moral meaning. Wright's development as an architect involved the evolution of this moral imperative through the search for a more principled relation to historical form, for a monumentality appropriate to the young American nation, and for a systematic yet personal process of architectural design.

Wright's education as an architect took place in Chicago from 1888 until 1893, when he apprenticed for his mentor, Louis Sullivan. In his public lectures at this time, Sullivan was calling attention to the absence of an appropriate American architecture but also warning against efforts to speed its arrival by transplanting European historical styles onto the American continent. Rejecting imported Beaux-Arts classicism, Sullivan held that any truly organic American architecture would develop only on a regional basis, with variations dependent on local climate, landscape, building methods, and materials. Wright, who would later fulfill this prophecy of Sullivan's, assisted Sullivan in his search for alternatives to what they believed to be the exhausted European classical tradition, analyzing the patterns from Islamic, Oriental, and Celtic sources presented by Owen Jones in *The Grammar of Ornament*.

In 1893, the year Wright started his own practice, he saw the efforts of Sullivan's Chicago School style overwhelmed by the classical architecture dictated for the World's Columbian Exposition of 1893 in Chicago. This academic classicism, as defined by the Beaux-Arts School in Paris, was canonically uniform, explicitly noncontextual, and intended to be the same around the world—the first true "International Style." For Wright, it was this universal applicability, as something that had nothing to do with the particular character of a place, that would always be unacceptable and that led him to later oppose International Style modernism as forcefully as he now opposed BeauxArts classicism.

Yet, even as Wright attacked the Beaux-Arts as a superficial style, he was directly engaging its source, integrating the formal order underlying the architecture of classical antiquity into his work of the Prairie period (1895–1915). In the first comprehensive national publication of his work in 1908, "In the Cause of Architecture," written when he was 40 years old, Wright challenged the academic classicists' exclusive control over historical form. He argued that his designs, with their symmetry, axial planning, and hierarchical ordering from earth to sky, but without any classical forms, demonstrated a more principled manner of relating and remaining true to the architectural forms inherited from history. Although Wright characterized the appearance of his buildings as radical in comparison with the prevalent classicism, he noted that his designs were the result of reverential yet rigorous analyses of the great architecture of the past.

While this battle raged in the professional publications, Wright was in fact well on his way to winning the war by establishing a truly American architecture, one based on his perfection of a particularly American building type, the single-family suburban house. By 1910, when his designs were first extensively published in Europe, Wright had completed more than 150 built works, the vast majority of them houses. The prairie house was first defined in Wright's two prototypes published in *Ladies' Home Journal* in 1901 and built out in the Ward Willits House (1902), the Thomas Hardy House (1905), the Robert Evans House (1908), and the Avery Coonley House (1908). The Frederick Robie House (1909) was Wright's greatest urban residential design, engaging its compressed site to create a dynamic sequence of interlocking spaces, culminating in the famous living room and dining room, joined by their common ceiling, which passes through the open center of the fireplace. The Darwin Martin House (1904), five structures comprising a series of interpenetrating cruciform spaces woven into the landscape, was Wright's greatest suburban residential design, its plan an astonishingly resolved masterpiece of formal composition and the inhabitation of its exquisitely articulated interior spaces a comforting yet profoundly meaningful experience.

In Wright's prairie house, the solid fireplace mass anchored the center while the space opened out in all directions at eye level, the outriding walls and overhanging eaves acting to layer the house into the earth, giving the suburban site a geometric order so that the house and the landscape were inextricably bound to each other. Wright's prairie houses combined the formal order of symmetrical planning with the dynamism of interpenetrating spaces to produce the open, multifunctioning interiors, integrated with surrounding nature, that have since become the most popular characteristic of modern domestic architecture. Wright's prairie houses crystallized a uniquely American interpretation of the dwelling place, allowing the inhabitant to experience both comfort and inspiration, shelter and outlook, freedom and order.

In addition to the reinvention of the American house, Wright's Prairie period also produced new forms for public architecture. At the time Wright left Sullivan's office, an appropriate monumental form for American public architecture had not yet emerged. The legacy of the steel-framed office tower, which Wright had received from Sullivan and the Chicago School, had proved totally incapable of giving monumental form to the architecture of the public realm. As a manifestation of the economic determinism of scale and massing, the universal planning grid, and the production of uniform interior spaces to be "styled" later by tenants, the Chicago frame skyscraper was a projection of private commercial interests at a scale heretofore given only to public buildings yet without any of the essential qualities necessary for monumentality.

Wright understood monumentality to originate in the fundamental uniqueness of each place, regardless of its scale within the city. This understanding was reflected in Wright's work only a year after leaving Sullivan's office with his project for the Monolithic Concrete Bank (1894), a diminutive single-room edifice that nevertheless had the powerful presence of an Egyptian temple. In his repeatedly revised designs for the All Souls Church, later renamed the Abraham Lincoln Center (1897–1905), Wright transformed the spatial uniformity of Sullivan's skyscrapers into a monumental form that precisely articulated on the exterior the diverse functional spaces of the interior.

Wright achieved his fully developed vision of an appropriate monumentality for public buildings with his design and construction of the Larkin Building (1904) and Unity Temple (1906). The plans of these two buildings were simple rectangles, with mezzanines surrounding and overlooking a central multistory space, lit by high clerestory windows and continuous skylights and allowing no views out at eye level. On the exterior these buildings were closed and solid and possessed a severity of form unlike anything else of their time, seeming to relate more to the stark rectilinearity of ancient monuments.

For Wright the monumentality appropriate to American public spaces would inevitably take the form of an introverted compound, seen from the outside as a grouping of powerful independent masses bound together by mutual purpose. Entry occurred between these masses, leading to a low, dark, horizontal, rotating movement sequence that compressed and then released the occupant into the tall, light, hidden, vertical central space. The singularity of the central space, and the manner in which it fused form, structure, material, and experience, were profoundly monumental. The entire spatial and ornamental program for Wright's public buildings, from plans and massing to furniture and carpet patterns, was given order through developments of the square and cube, which Wright considered to be the most perfect of geometries. Wright intended that his public buildings be experienced as sacred spaces, whatever their function, their introspective interiors flooded from above with transcendent light to create a morally edifying effect for those inhabiting the public place.

Wright went through a personal and professional crisis in 1909, closing his Oak Park office, abandoning his family, and taking up residence in Italy. There, he and a select group of draftsmen prepared drawings for publication by the Wasmuth Company, a German publishing house that was to issue a set of drawings of Wright's work in 1910 and a book of photographs of Wright's built works in 1911 that together were to exercise considerable influence in Europe. That year, Wright returned to the United States and began construction on his home and studio, called Taliesin (1911), outside Spring Green, Wisconsin. Like his favorite of the prairie houses, the Coonley House, Taliesin was organized around an exterior garden courtyard, framing but not completely enclosing the brow of the hill on which it was built. This courtyard house type was developed by Wright in response to commissions, such as those for the unbuilt Henry Ford (1909) and Harold McCormick (1907) Houses and the Aline Barnsdall "Hollyhock" House (1917–20), built around the brow of Olive Hill in Los Angeles, which called for far larger compositions than what could be organized within the pyramidal massing of the prototypical prairie house.

During this same period, from 1909 to 1920, Wright designed a series of public buildings that focused on interior garden courtyards. In contrast to his courtyard houses, which were inevitably asymmetrical and informal in plan, these public courtyard buildings were rigorously symmetrical, illustrating Wright's use of symmetry to distinguish between the public and the private realms. The Midway Gardens (1913), an indoor and outdoor garden for music and dining, is perhaps Wright's most completely resolved total work of art, for here he designed not only the architecture but also the band shell, interiors, furniture, dishes, sculpture, decorations, and landscaping. The Imperial Hotel (1914–22), a commission that required Wright to live in Japan during its construction, was a composition of monumental grandeur, unlike anything else in Wright's opus. This massive building was designed by Wright to float on a field of structural piers sunk into the unstable soil, an innovative seismic precaution almost immediately tested when the Imperial Hotel survived the devastating 1923 Tokyo earthquake.

Wright engaged new materials with almost every design, yet reinforced concrete proved to be the most consistently challenging to him. Despite his early success with reinforced concrete in Unity Temple, Wright remained critical of concrete's lack of inherent order and its ability to be formed into any shape at the whim of the designer; unlike all other construction materials, concrete did not exhibit a "nature" that would determine its appropriate use. In 1906, the same year that construction began on Unity Temple, Wright designed what he later called "the first block house," developing the concrete-block system of construction that he would realize 17 years later. The Alice Millard House (1923), the John Storer House (1923), the Charles Ennis House (1923), and the Samuel Freeman House (1923), all built in Los Angeles, were constructed using concrete blocks cast in custom-designed forms. In these houses, Wright succeeded in finding a means of expression suitable to reinforced concrete, the modular order imparted to the concrete blocks giving character to this previously formless material.

In 1932, during the Great Depression in the United States, Wright was already 65 years old, having written his autobiography while building only two houses since 1923. It is thus understandable that both the American public and the architectural establishment assumed that Wright had retired from active practice. However, Wright was already laying the foundations for the most remarkable resurgence in architectural history, and he would go on to construct almost twice as many designs in the next 27 years as he had built in the preceding 40. Pivotal in this resurgence were the publication of Wright's *Autobiography,* which brought new clients, and Wright's opening of the Taliesin Fellowship, an apprenticeship school and office housed in the new Drafting Room (1932) addition to Hillside School (1902) at Taliesin, which provided both the architectural and the farming workforce. The astonishing works that Wright designed in 1934–37 effectively reestablished his dominance of the American architectural profession. With their publication in the January 1938 issue of *Architectural Forum* and *Time* magazine, Wright was again hailed as the greatest living architect.

The Edgar Kaufmann House (1937), called Fallingwater, together with his own winter home and studio, Taliesin West (1938), exemplified Wright's belief that architecture is born of its place and thus can never be the product of an "International Style," as European modernism was represented in 1932 at the Museum of Modern Art. Fallingwater, built above a mountain stream in southwestern Pennsylvania, is Wright's greatest "natural" house, a place where man can truly be at home in nature. Taliesin West, built in the desert outside Scottsdale, Arizona, celebrated both the ephemerality of life, with its canvas roofs that had to be replaced seasonally, and the permanence of place, with its boulders cast into the concrete walls, still showing the carvings of the original Native American inhabitants of this land-scape.

The Johnson Wax Building (1939) is Wright's great "cathedral of work," with its innovative thin-shell concrete columns standing in small brass shoes that delicately touch the floor of the central top-lit workroom, clad in streamlined brick and lit by tube glass laid up like bricks in clerestories and skylights. Like his own Drafting Room at Taliesin, employees work here in a room that feels as if it is in the forest, among the column trees, in the light filtering down through the skylight leaves. Although dedicated to work and not worship, the central room of the Johnson Wax Building illustrates the way in which Wright celebrated everyday rituals and functions by housing them in sacred spaces. It is without question one of the greatest spaces in architectural history.

Broadacre City (1934) was Wright's visionary proposal for a pattern of land development that sought to establish an ordered pattern of cultivation and inhabitation for the enormous scale of the Jeffersonian grid while providing every household a place in nature. A complete plan for the future expansion of America's communities, it had public, commercial, and religious structures woven into its underlying fabric of single-family houses, giving the suburb an appropriate and precise spatial and social order. The Herbert Jacobs House (1937) was the first of Wright's "Usonian" houses, small and affordable homes for the rapidly growing American middle class that were to be placed on oneacre sites to form the basic pattern of Broadacre City. In the last 20 years of his life, Wright designed hundreds of these Usonian houses for various climates and construction types, each one a masterpiece of spatial generosity within remarkably small total floor areas. Broadacre City was Wright's counterproposal to the traditional city, to the isolation of agrarian life, and to the sprawling spread of the developer's speculative suburb.

The last ten years of Wright's life were incredibly productive, with hundreds of designs emerging from Taliesin for virtually every conceivable building type. Among the best of this last period was the Solomon Guggenheim Museum (1943–59), built facing Central Park in New York City. A glorious expression of the plastic formal possibilities of reinforced concrete, the Guggenheim Museum also explored dynamic spatial and experiential territory, suspending the art and its spectators in a continuously spiraling volume that opens toward the sky. The Beth Sholom Synagogue (1954), with its seating within a folded concrete base anchored to the earth and its roof a translucent tent scaled to the heavens, is a powerful summary of man's condition as both permanent dweller and perpetual wanderer. Finally, the Marin County Civic Center (1957–66), a series of horizontal planes bridging between the low hills, although unfinished at his death, is perhaps Wright's most brilliant site design.

Despite the extraordinary public commissions of his last years, it could be argued that Wright's greatest accomplishment remained his designs for hundreds of modest, inexpensive, yet spatially rich and experientially powerful Usonian houses. In a surprisingly humble definition, Wright had early on stated his belief that architecture was the background or framework for the daily life that takes place within it. Wright's system of design was measured, scaled, and calibrated precisely by the human body and its experience, and although the geometric rigor of Wright's planning is well known, the esteem in which he held the concepts of use and comfort is not widely understood. The intellectual and formal order of Wright's designs was balanced by the physical and spiritual engagement of the inhabitant: For Wright, architecture was understood to be the shared discipline of principled place making. It could be argued that Wright's achievement was virtually unmatched in the 20th century, which produced a rich assortment of new architectural forms but few systematic conceptions that link spatial form and order to human occupation and experience.

ROBERT McCARTER

Biography

Born in Richland Center, Wisconsin, 8 June 1867. Attended the School of Engineering, University of Wisconsin, Madison 1885–87. Married 1) Catherine Lee Tobin 1889 (separated 1909; divorced): 6 children; lived with Mrs. Mamah Bortwich Cheney 1909–1914 (died in Taliesin fire); married 2) Miriam Noel 1915 (separated 1924; died 1927); married 3) Olgivanna Lazovich 1925:1 child; sons Lloyd and John became architects, son David joined a firm manufacturing concrete blocks like those used by Wright. Junior draftsman for Allen D.Conover, Madison 1885–87; junior draftsman for Lyman Silsbee, Chicago 1887; assistant architect, 1888–89, head of planning and design department, 1889–93, Adler and Sullivan, Chicago. Partnership with Cecil Corwin, Chicago 1893–96; private practice in Oak Park, Illinois 1896–97 and Chicago 1897–1909; traveled in Europe and stayed in Fiesole, Italy 1909–11. Built first Taliesin house and studio and resumed practice, Spring Green, Wisconsin 1911; reopened Chicago office 1912; Taliesin partially destroyed by fire and rebuilt as Taliesin II 1914; established an office in Tokyo in conjunction with work on the Imperial Hotel 1915–20; compiled the Spaulding Collection of Japanese Prints while in Japan; worked on the first concrete "texture block" houses, California 1921–24; Taliesin II partially destroyed by fire and rebuilt as Taliesin

III 1925; worked in La Jolla, California 1928; established his southwestern headquarters, Ocatillo, in Chandler, Arizona 1928–29; founded the Wright Foundation Fellowship at Taliesin 1932 with annual winter transfers of fellowship activities from Wisconsin to Chandler, Arizona 1933–38 and Scottsdale, Arizona after 1938; worked on major theoretical studies for Broadacre City from 1933; built Taliesin West, near Scottsdale, Arizona 1938; continued to practice in Wisconsin and Arizona until 1959; his students formed Taliesin Associated Architects to complete works after his death. Honorary member, Académie Royale des Beaux-Arts, Brussels 1927; honorary member, Akademie Royal der Künste, Berlin 1929; honorary member, National Academy of Brazil 1932; honorary member, Royal Institute of British Architects 1941; honorary member, National Academy of Architects, Uruguay 1942; honorary member, National Academy of Architects, Mexico 1943; honorary member, National Academy of Finland 1946; member, National Institute of Arts and Letters 1949; honorary member, Royal Academy of Fine Arts, Stockholm 1953. Royal Gold Medal, Royal Institute of British Architects 1941; Gold Medal, American Institute of Architects 1949. Died in Phoenix, Arizona, 9 April 1959.

Selected Works

Frank Lloyd Wright House and Studio, Oak Park, Illinois, 1889–1911

Charnley House, Astor Street, Chicago (with Louis Sullivan), 1891

Monolithic Concrete Bank, Chicago, 1894

Hillside Home School Buildings, near Spring Green, Wisconsin, 1902

Willits House, Highland Park, Illinois, 1902

Martin House, Buffalo, 1904

Larkin Company Administration Building (destroyed), Buffalo, 1904

All Souls Church (now Abraham Lincoln Center), Chicago, 1905

Hardy House, Racine, Wisconsin, 1905

Unity Temple, Oak Park, Illinois, 1906

McCormick House (unbuilt), 1907

Evans House, Chicago, 1908

Coonley House and Annexes, Riverside, Illinois, 1908–12 Robie House, South Woodlawn, Chicago, 1909

Ford House (unbuilt), 1909

Taliesin, near Spring Green, Wisconsin, 1911; remodeled 1914, 1925

Midway Gardens (destroyed), Chicago, 1913

Barnsdall House and Annexes, Los Angeles, 1917–20

Imperial Hotel, Tokyo, 1922

Millard House (La Miniatura), Pasadena, 1923

Storer House, Los Angeles, 1923

Ennis House, Los Angeles, 1923

Freeman House, Los Angeles, 1923

Taliesin Fellowship Complex, near Spring Green, Wisconsin, 1932

Broadacre City model and exhibition plans, 1934

Jacobs House I, Madison, 1937
Kaufmann House (Fallingwater), Bear Run, Pennsylvania, 1937
Taliesin West, near Scottsdale, Arizona, 1938
S.C.Johnson and Son Company Administration Building and Annexes, Racine, Wisconsin, 1939
S.C.Johnson Research Tower, Racine, Wisconsin, 1944
Beth Sholom Synagogue, Elkins Park, Pennsylvania, 1954
Solomon R. Guggenheim Museum, New York, 1959
Marin County Civic Center, San Raphael, California, 1966

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Experimenting with Human Lives, 1923
The Life Work of the American Architect Frank Lloyd Wright, 1925
Modern Architecture, 1931
Two Lectures on Architecture, 1931
An Autobiography, 1932
The Disappearing City, 1932; revised edition as *When Democracy Builds,* 1945; as *The Living City,* 1958
Architecture and Modern Life (with Baker Brownell), 1937
An Organic Architecture: The Architecture of Democracy, 1939
Frank Lloyd Wright on Architecture: Selected Writings 1894–1940, edited by Frederick Gutheim, 1941
Genius and the Mobocracy, 1949
The Future of Architecture, 1953
The Natural House, 1954
An American Architecture, edited by Edgar Kaufmann, 1955
The Story of the Tower, 1956
A Testament, 1957
Drawings for a Living Architecture, 1959
The Solomon R. Guggenheim Museum, 1960
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The Drawings of Frank Lloyd Wright, edited by Arthur Drexler, 1962
Buildings, Plans and Designs, 1963
Frank Lloyd Wright: His Life, His Work, His Words, edited by Olgivanna Lloyd Wright, 1966
Architectural Essays from the Chicago School, 1967
Frank Lloyd Wright: The Early Work, 1968
In the Cause of Architecture: Essays by Frank Lloyd Wright for the Architectural Review 1908–1952, edited by Frederick Gutheim, 1975
Letters to Apprentices: Frank Lloyd Wright, edited by Bruce Brooks Pfeiffer, 1982
Letters to Architects: Frank Lloyd Wright, edited by Bruce Brooks Pfeiffer, 1984

The Guggenheim Correspondence, edited by Bruce Brooks Pfeiffer, 1986

Frank Lloyd Wright: Letters to Clients, edited by Bruce Brooks Pfeiffer, 1986

Studies and Executed Buildings by Frank Lloyd Wright, edited by Vincent Scully, 1986

Modern Architecture: Being the Kahn Lectures for 1930, 1990

Further Reading

Three comprehensive monographs exist on Wright. The earliest, Hitchcock, although not including the work of Wright's last two decades, is the only monograph written with Wright's direct involvement and approval. Levine 1996 and McCarter 1997 vary dramatically in approach, with the former placing Wright in the larger context of art-historical interpretations, whereas the latter documents the experience of inhabiting the spaces of Wright's built works. Both of these monographs benefit from access to Wright's archival material after its organization and selected publication by Bruce Brooks Pfeiffer, documented in Futagawa 1984–88 (12 vols.). Wright's own writings, including his *An Autobiography,* are collected in Wright 1992–95 (5 vols.). A comprehensive catalog of all Wright's built work is contained in Storrer. Several essay collections offer appropriately varied views of Wright, including Riley 1994, McCarter 1991, and Bolon, Nelson, and Seidel 1988. Finally, a number of excellent single-building or building-type studies exist, such as Sergeant 1976, which, due to their narrow focus, allow a sufficiently extended analysis to capture the richness of Wright's individual designs.

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WU LIANGYONG 1922

Architect, China

Wu Liangyong was born in 1922 in Nanjing. He received his Bachelor of Architecture degree from the National Central University in Chongqing in 1944 and completed his Master of Architecture and Urban Design degree under Eliel Saarinen at Cranbrook Academy in Cranbrook, Michigan, in 1949. On his return to China in 1950, he joined the faculty of the Department of Architecture at Tsinghua University, a major school in China for technical and engineering studies.

Wu has been recognized as a leading architectural designer and urban planner in China, especially since the 1970s. He played a major role in the replanning and design of Tiananmen Square, located in the center of Beijing. Surrounding the square are the National Congress Hall and the National Museum of History. In 1976 Wu worked with a team of five senior architects to win the competition for the design of the National Library of China. In the projects he has designed, he strives to combine traditional spirit in architecture with modern construction to create a new form of Chinese contemporary architecture.

Wu's most well-known project in urban and architectural preservation is the New Courtyard House Complex (1987) at Juer Hutong, located in northeastern Beijing. Facing the challenges of rapid economic growth, the single-story courtyard houses, which were the major housing form for the old city of Beijing, had been in danger of disappearing entirely from the city to make room for high-rise apartments. Wu and his design and research group selected a typical neighborhood in the eastern district of Beijing as an experimental project. It bears the main features of a multicourtyard system of housing with multiple—usually three—stories in the structures to accommodate more residents. The salvation of this traditional housing form turned out to be a success. The Juer Hutong project won the World Habitat Award from the United Nations in 1993 and the Gold Medal in Architecture from the Architects' Regional Council in 1992.

Wu worked as a designer and planner for several cities in China: Beijing, Handan, Beidaihe, Baoding, and Tangshan in the north; Beihai, Guilin, and Liuzhou in the south; Jiuquan in the west; and Suzhou and Wuxi in the east. Zhangjiagang is a newly planned city, and Wu worked there in 1993. He focused on Beijing for research in city design and planning; he is on the committee for capital planning as a consultant for the municipal government, helping in the strategic planning of the city. He vation for the city. also participates in policy making and research on historic preser

As an educator in architecture, Wu led the School of Architecture at Tsinghua University as the dean from 1977 to 1983. He was invited by the eminent architectural scholar Liang Sicheng to participate in the founding of the school in 1946. Wu has since then been one of the school's most influential professors. He has formed two research centers at Tsinghua: the Institute of Architecture and Urban Studies and the Center for Human Settlements. He serves as the director of both; many design and research projects were completed by the centers under his directorship. The Institute of Confucianism in Qufu, Confucius's hometown, is one of the most recent projects that they have completed.

Wu's teaching covers studio instruction and lectures on theory and history of cities. His *A Brief History of Ancient Chinese City Planning* (1986) is the first English-language book on the topic ever published by a scholar of mainland China. Wu used this book as a main reference when he taught at Gesamthochschule in Kassel, Germany. His teaching extended to the seminar courses in Beijing for mayors. Wu was awarded the Jean Tschumi Prize by the UIA (Union Internationate des Architect) in 1996 for his renowned contributions in architectural education.

A *Theory of Integral Architecture* (2001) advanced Wu's ideas in China for dealing with design issues in a global perspective. His book A *General Theory of Architecture* (1990, Beijing; 1992, Taipei) discusses human settlements, world urbanism, China's responses to the challenges of environmental changes, and architectural regionalism, among many other topics. Wu proposes that architectural studies in China should employ "holistic thinking" and "cross-disciplinary research." In that sense architectural and urban studies in China should be combined closely in a system but should remain general: architecture and its humanistic presence of time and space, architecture and its geographical presence of time and space, architecture as the presence of culture and tradition, technical essence in architecture, and finally, architecture as a cultural expression for its aesthetic forms. Wu uses diagrammatic charts to illustrate his theory, and he concludes that the general theory is a new subject that he calls a "science of human settlement." He further distinguishes his theory as a "new regionalism."

China opened the door to the world after the Cultural Revolution that took place between 1966 and 1976, and it resumed its international connections to the architectural world in the mid-1970s. Wu has performed a major role in representing China's architectural professionals in world organizations and conferences. In addition to his busy schedule as visiting professor and research fellow in the United States and Europe, he served as a vice president of UIA (1987–90) and the president of the World Society of Ekistics. He is an honorary fellow of the American Institute of Architects and an honorary fellow of the Royal Institute of British Architects, among other professional memberships. Most recently, in the summer of 1999, he co-chaired the Beijing conference of UIA and drafted the UIA Beijing Charter.

YUNSHENG HUANG

Biography

Born in Nanjing, Jiangsu Province, China, 7 May 1922. Attended National Central University, Chongqing (bachelor's degree 1944), and Cranbrook Academy, Cranbrook, Michigan (master's degree 1949). Married Yao Tongzhen, a landscape architect. Taught part-time at Lawrence Institute of Technology, Detroit, Michigan, 1949–50; then lifelong professor at the School of Architecture, Tsinghua University, Beijing 1951–; visiting scholar, Cambridge University 1995; visiting professor, University of Hong Kong 1983; visiting professor, University of California, Berkeley, 1988; and other universities. Has exhibited artwork in China, Australia, the United States, and Germany.

Selected Works

Automobile Body Design Building, GM Technical Research Center, Detroit, Michigan, 1950

New East Wing of the Beijing Hotel, 1973

"Beijing 2000" Urban Design Plan, Shichahai District, Beijing, 1979

New Courtyard House Complex at Juer Hutong, Beijing, 1987

Extension of the National Museum of History, Beijing, 1994

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WURSTER, WILLIAM 1895–1973

Architect, United States

William Wurster was a chief exponent of the "Bay Region School" of architecture in the United States. His development as an architect coincided with the years of the Great Depression (1929–35) and his maturation with the years 1935–42, preceding World War II. Wurster's architecture, like that of his contemporaries Pietro Belluschi, Harwell Hamilton Harris, and O'Neil Ford, exemplified a form of rooted and indigenous modernism that flourished in the United States before the internationalist orientation of the 1950s. Wurster and his contemporaries believed that architecture, whether designed for the Northwest, the Pacific coast, or the Southwest, should visibly express the identity of a region.

Between 1913 and 1918, Wurster visited works by well-known Bay Region architects, among them Bernard Maybeck,

Saxon Pope House, Orinda, California (1940)

Ezra Stoller © Esto

Ernest Coxhead, and Willis Polk. Wurster especially appreciated Maybeck's Christian Science Church, which synthesized BeauxArts ornamental exuberance with experimental building techniques and the Arts and Crafts ideals of simplicity, authenticity, and naturalism. Wurster traveled to Paris in 1922 and from there departed on sketching tours throughout Europe during 1922–23. Italy and Spain were key destinations: Their vernacular traditions and rural landscapes held significance for California. After his return William Adams Delano assisted Wurster with the financing of his own office in Berkeley in 1924 and with introductions to some of Wurster's most important early clients.

Wurster launched his career with the Gregory Farmhouse (1927–28) near Santa Cruz. Designed for Mrs. Warren (Sadie) Gregory, whom Wurster met through a friend of Delano's, the Farmhouse was widely published and functioned as a clear visual statement of Wurster's architectural principles. First, both Wurster and his client envisioned an architectural character of crafted simplicity and calculated understatement. Wurster, who was committed to the "cleanliness" of wood carpentry and inspired by the vernacular structures in California's gold-mining towns and early Monterey, conceived and detailed a composition that was both ranchlike and modern yet conscientiously devoid of any particular style. Finally, Wurster devised numerous strategies for integrating the house with its country setting. Each individual room, for instance, opened onto a *corredor,* or terrace, some of which served as "outdoor rooms," and the house's L-shaped plan framed a central courtyard, recalling at once European manor houses, Italian villas, and the Spanish-influenced adobe houses of old Monterey.

During the years following the Gregory commission, Wurster continued to refine his modern regionalist approach. In the early 1930s he designed 13 houses for Pasatiempo, a country club and residential community near Monterey Bay, among them the MacKenzie-Field House (1931). Wurster's Pasatiempo houses, which he viewed as antidotes to an overmechanized urban life, showed that he continued to develop his vernacular-inspired architectural vocabulary, simple yet refined techniques of wood construction, integration of indoor and outdoor spaces, and sensitivity to the natural surroundings. The Voss House (1931) in the countryside of Big Sur, with a profile embedded in the landscape, kitchen "cave," and direct confrontation of the ocean vista, epitomized Wurster's search for a modern architecture that embodied the California yearning for the simple yet "good" life in the open.

By the mid-1930s Wurster's practice was well established. As his regionalist sensibility matured, his houses also became more consistently modernist and abstract. Wurster's Clark House (1937) in Aptos, which had cubic volumes and flush planar surfaces, and his Saxton Pope House (1940) in Orinda, with powerful geometries and construction in concrete block and corrugated steel, exemplified his new, starker approach. These houses suggested a greater affinity with the European avant-garde, at the time promoted by the Museum of Modern Art as the "International Style." Wurster, however, argued that "modern" was a point of view and not a style. In 1937 Wurster made his second European journey, with the objective of seeing the modern architecture of Scandinavia and, in particular, the work of Alvar Aalto. Wurster valued Aalto's "humanist" approach; that is, his integration of architecture with the natural surroundings and his attention to vernacular resources and to the sensuality of craftsmanship in wood. After Wurster discovered Aalto's own house on the outskirts of Helsinki, the two architects visited Aalto's Savoy Restaurant, Sunila Pulp Mill, and Paimio Sanatorium; they discussed their shared philosophical viewpoints and established a friendship that lasted throughout their lives.

During the 1930s, Wurster became increasingly involved with the problem of low-cost housing. His designs for individual minimum dwellings, such as his "Unit Steel House" (1937) for the Soule Steel Company, along with housing communities such as Valencia Gardens (1939) in San Francisco, a 246-unit project, demonstrated his command of a range of housing scales. In 1939 Wurster met Catherine Bauer, whose *Modern Housing* (1934) had become the seminal work on the subject. They married in 1940, and Bauer's emphasis on the virtues of large-scale projects and rationalized construction techniques, along with her study of garden communities such as Radburn, influenced Wurster's approach to designing communities for war workers in the early 1940s. Among these were his Carquinez Heights (1941) in Vallejo. In this project and others, such as Chabot Terrace (1942) in Vallejo and Parker Homes (1943) in Sacramento, Wurster aspired to integrate current thinking on standardized housing with his own long-standing commitment to the client and to the environmental specifics of landscape, climate, and views.

GAIL FENSKE

S*ee also* **Aalto, Alvar (Finland); Maybeck, Bernard R. (United States)**

Biography

Born in Stockton, California, 20 October 1895. Studied at the University of California, Berkeley 1912–13; worked in a surveyor's office 1913–14; studied naval architecture and marine engineering at the University of California 1914–16; went to sea as an engineer 1916–18; finished studies at the University of California 1919–20; bachelor's degree in architecture 1920; traveled in Europe 1922–23. Married Catherine Bauer 1940 (died 1964): 1 child. Assistant in the office of E.B.Brown, Stockton 1910; worked for the firm of John Reid, Jr., San Francisco 1920; employed by the Filtration Division, City of Sacramento, California, under architect Charles Dean 1921–22; worked for the firm of Delano and Aldrich, New York 1923–24; returned to California to design a filtration plant for East Bay Water Company 1924–25. In private practice, San Francisco 1926–43; partner, with Theodore Bernardi and Donn Emmons, Wurster, Bernardi, and Emmons, San Francisco from 1945. Fellow, Harvard Graduate School of Design 1943–44; dean, School of Architecture and Planning, Massachusetts Institute of Technology, Cambridge 1944–50; dean, College of Architecture, 1950–59, dean, College of Environmental Design, 1959–63, dean emeritus, 1963–73, University of California, Berkeley. Chairman, Architects Advisory Committee, United States National Housing Agency 1942; chairman, 1949–50, California State, Member, 1959–67, National Capitol Park and Planning Commission; member, Architectural Advisory Panel, Office for Foreign Buildings, United States State Department 1958–63. Fellow, American Institute of Architects; fellow, American Academy of Arts and Sciences; fellow, Royal Academy of Fine Arts, Copenhagen; member, Akademie der Künste, Berlin; honorary corresponding member, Royal Institute of British Architects; affiliate, American Institute of Planners. Gold Medal, American Institute of Architects 1969. Died in Berkeley, 19 September 1973.

Selected Works

Gregory Farmhouse, Santa Cruz, California, 1928
MacKenzie-Field House, Monterey Bay, California, 1931
Voss House, Big Sur, California, 1931
Clark House, Aptos, California, 1937
"Unit Steel House" (project), Soule Steel Company, 1937
Housing Development, Valencia Gardens, San Francisco, 1939
Saxton Pope House, Orinda, California, 1940
Carquinez Heights, Vallejo, California, 1941
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Y

YAAMA MOSQUE, TAHOUA, NIGER

Designed by Falké Barmou, completed 1982

The Yaama Mosque is a mud-brick building, but it is one that is strikingly different from the Dyula-type mosques found in Mali. This is an example of a building built in a local style but whose growth over time shows a desire for monumentality in size, form, and the complexity of its decoration. It also emphasizes that there can be monuments within a vernacular style of architecture.

A mud-brick and tamped-earth building, the mosque was designed by mason and farmer Falké Barmou in a semidesert region of Niger. Twenty years in the making, this Friday mosque was completed in 1982. The client and the construction team was the community of Yaama.

The mosque is squarish in plan. The initial building was a hypostyle hall, a field of closely spaced heavy columns whose visual weight lends the building's interior a somber air. The building was initially roofed with a simple post-and-lintel system. In 1975 Barmou took advantage of the need to fix a leaking roof to replace the ceiling with a livelier vaulted system. Barmou had traveled to Dakar and to Mecca and thus was exposed to, and incorporated into his work, many building techniques.

Frequently referred to simply as "Hausa," Labelle Prussin feels that a more accurate term is "Fulani-Hausa." Her term acknowledges the dual influences of the nomadic Fulani, a Fulbe-speaking people who migrated into the region, which today lies in northern Nigeria and Niger. The Hausa were the sedentary people native to the area.

Barmou used one of the most significant features of Hausa architecture: arches, vaults, and domes made of bundled and bent reeds covered with a mud-and-straw mortar. On top of these groin vaults, sticks are laid in a basket-weave pattern. When he replaced the roof, Barmou also removed a central column that created a central space over which he added a dome. This imposition of a central dome into the hypostyle hall shows the interconnectedness of mosque architecture with multidomed Byzantine Christian churches, such as St. Mark's in Venice.

This vaulted-and-domed construction system demonstrates the continuity into a permanent kind of architecture of tech niques derived from less-exalted kinds of architecture, such as tents and straw huts. With temporary structures a material (fabric, hides, or straw) is laid over a framework. Prussin writes, "The Fulani-Hausa dome can be construed as a visual synthesis of several contradictory aspirations into a unified image:

mobility, identity with Islam, and sedentarization" (Prussin, 1986).

The largest element in the project is the hypostyle prayer hall. As is customary with mosques, a mihrab, or prayer niche, occupies the middle of the *qibla* wall (*qibla* denotes the direction toward Mecca). As there is a central row of columns, in the Yaama Mosque the mihrab is slightly off center so that it lies at the end of a visual axis. A low perimeter wall creates an enclosed compound that can be used as an overflow area for prayers.

Some mosques (e.g. Djenné and Niono) are rectangular in plan, and the entry is in the center of one of the long sides. This allows rows of worshipers to extend laterally as far as possible. Other mosques are square in plan, something that Prussin argues relates to the Islamic magic square. The magic square is an arrangement of numbers in a graphic pattern found in a variety of Islamic arts. A typical example is a three-by-three nine-house square. Both the overall plan of Yaama and the square-based dome are similar in form to the Islamic magic square.

The roof is made of bundles of sticks that are visible on the interior although skim coated with mud on the exterior. This kind of architecture, built of local materials and using local craftsmen, was sustainable before the term *sustainability* achieved its current popularity. This building was literally built by the community.

There are four corner towers, all different in form. The towers are divided into vertical zones with setbacks. An initial simplicity has been augmented over time by an increasing desire to add detail and monumentality, particularly considering the towers. Over time, there has been an increasing concern for aesthetics and decoration.

None of the four towers, however, functions as a minaret. A minaret, the tower from which worshipers are called to prayer, is not an essential part of a mosque. Minarets are frequently significant vertical elements in the design of Ottoman and Middle Eastern mosques.

The selection of the Yaama Mosque for an Aga Khan Award in 1986 provoked a controversy within the Islamic architectural community. One of six winners, it was controversial, but not because of any perceived failings of this particular mosque. By excluding projects such as airports and skyscrapers, dissenting members of the judging panel felt that the overall message sent by the Aga Khan Awards was overtly nostalgic and traditional. Islamic architecture did not, they argued, have to be antiWestern, antimodern, and antitechnology.

The Yaama Mosque reconciles local tradition and a modern Islam with a grace and ease that were lacking in the Aga Khan Award debacle. At once restrained and massive, delicate and decorative, this project shows the creative energy that still exists within traditional African building techniques.

MARK HINCHMAN

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YAMASAKI, MINORU 1912–86

Architect, United States

Driven by the sincere belief that architecture should make daily life more beautiful and emotionally fulfilling, JapaneseAmerican architect Minoru Yamasaki developed a highly ornamental architecture that drew on his world travels for inspiration. Although other architects (notably Edward Durell Stone and Philip Johnson) also explored the combination of modernist forms and materials with historicist motifs and elements, Yamasaki's ornamental eclecticism (drawing from a variety of sources, from mosques to Gothic cathedrals) set him apart from his contemporaries. Although the sheer size of Yamasaki's best-known work, the World Trade Center Towers (1976) in New York overwhelmed its neo-Gothic ornament, the majority of his architecture reflected an interest in human scale and lightness of materials.

This approach pervades the McGregor Memorial Conference Center (1958) at Wayne State University in Detroit, which Yamasaki adorned with triangular arches and inverted pyramidal canopies over a glass atrium, all surrounded by a series of fountains and platforms. Although derived from his genuine desire to harmonize architecture with humanity, this preoccupation with ornament and surface effects has led many critics to deride his work as self-indulgent, formalist, and overly decorative. Regardless of these criticisms, Yamasaki enjoyed considerable suc cess with a public weary of the anonymity of glass-and-steel modernism constructed in the second half of the 20th century.

The 33 orange brick blocks of Yamasaki's Pruitt Igoe Houses (1952–55) in St. Louis seem an unlikely beginning for an architect committed to an architecture of serenity and delight (Yamasaki even excluded the project from his autobiography). The award-winning design for low-income public housing was praised for its modernist features (including window-lined galleries intended to serve as outdoor socializing areas, reminiscent of Le Corbusier) and cost-efficient design. However, in reality, the housing project was a spectacular failure, plagued by crime, low occupancy, vandalism, and ill-functioning services. The buildings' demolition in 1972 received worldwide coverage and was seen as representing the ultimate failure of the social engineering and functionalist rhetoric of modernism.

Even with the initially positive reception of the Pruitt Igoe housing project, Yamasaki would depart radically from such doctrinaire modernism for the rest of his career. Contemporary to the design of Pruitt Igoe, Yamasaki, Hellmuth, and Leinweber received the commission for a new airport for the city of St. Louis. Intended to serve the demands of air travel while functioning as a monumental entrance to the city, the soaring concrete groin vaults of Lambert Airport (1956) recalled the grandeur of American railroad depots in the early 20th century, such as New York's Grand Central Station. The sweeping and elegant concrete vaults of the Terminal Building established Yamasaki's international reputation and introduced a new idiom for airport design (further refined and developed in the works of Eero Saarinen).

Following the success of Lambert Airport, Yamasaki increasingly incorporated overt Gothic-, Islamic-, and Japanese-inspired ornament into his architecture. The elaborately patterned aluminum screen walls at the Reynolds Metals Regional Sales Office (1959) in Southfield, Michigan, demonstrate his interest in exotic patterns, whereas the concrete ogee arches and canopies of the Dhahran Air Terminal (1961) in Dhahran, Saudi Arabia, attempted to harmonize with the surroundings. Among his most elaborate works was the enormously popular Federal Science Pavilion (1962) at the Seattle World's Fair, which consisted of a series of lacy canopies with parabolic arches, rendered in a kind of space-age neo-Gothic style.

Yamasaki's particular blend of ornament and modernist structure ensured him a prominent place in the architecture of the United States and throughout the world. His architecture was chosen to represent the United States with the U.S. Pavilion (1959) at the World Agricultural Fair in New Delhi. Additionally, Yamasaki was invited to design the Founders Hall (1983) in Shinji Shumeikai, Shiga prefecture, Japan. Overall, Yamasaki was one of a few architects who dared to question the modernist mantra "Less is more." Through his inventive combination of historicist motifs and elements, Yamasaki created an architecture that addressed far more than its overt functions, striving to make modern architecture enjoyable to a broad spectrum of the public.

MATTHEW S.ROBINSON

See also **Johnson, Philip (United States); Ornament; Pruitt Igoe Housing, St. Louis, Missouri; Skyscraper; Stone, Edward Durell (United States); World Trade Center, New York City**

Japan Center, San Francisco (1968)

Photo © Mary Ann Sullivan

Biography

Born in Seattle, Washington, 1 December 1912. Studied at the University of Washington, Seattle 1930–34; bachelor's degree in architecture 1934; attended New York University 1934–35. Worked as a designer for Githens and Keally, New York 1935–37; designer for Shreve, Lamb and Harmon, New York 1937–43; designer for the firm of Harrison and Fouilhoux, New York 1943–44; designer for Raymond Loewy Associates, New York 1944–45; chief architectural designer, Smith, Hinchman and Grylls, Detroit, Michigan 1945–49. Principal, Minoru Yamasaki and Associates, Troy, Michigan from 1949; partnership with Joseph Leinweber, Yamasaki, Leinweber and Associates, Detroit 1949–55; partnership with Leinweber and George Hellmuth, Leinweber, Yamasaki and Hellmuth, St. Louis, Missouri 1949–55. Instructor at New York University 1935–36 and Columbia University, New York 1943–45. Fellow, American Institute of Architects 1960; fellow, American Academy of Arts and Sciences 1960. Died in Detroit, 6 February 1986.

Selected Works

Pruitt Igoe Housing Project (destroyed), St. Louis, Missouri, 1955 Terminal Building, Lambert Airport, St. Louis, Missouri, 1956 McGregor Memorial Community Conference Center, Wayne State University, Detroit, Michigan, 1958

Reynolds Metals Regional Sales Office, Southfield, Michigan, 1959 U.S.Pavilion, World Agricultural Fair, New Delhi, 1959 Dhahran Air Terminal, Dhahran, Saudi Arabia, 1961 Federal Science Pavilion, World's Fair, Seattle, Washington, 1962 Japan Center, San Francisco, Calfornia, 1968 World Trade Center, New York City (with Emery Roth and Sons; destroyed), 1976

Rainier Square Bank Tower (architectural design and detailing only), Seattle, Washington, 1977

Saudi Arabian Monetary Agency Headquarters, Riyadh, 1982

Founders Hall, Shinji Shumeikai, Shiga prefecture, Japan, 1983

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A *Life in Architecture,* 1979

Further Reading

Unfortunately, there is a relative dearth of information concerning the life and architecture of Minoru Yamasaki. The primary source for information about Yamasaki is his autobiography, *A Life in Architecture* (1979), which offers insight into his practice and philosophy of architec-ture. Articles by Veronese, Huxtable, and a host of others position Yamasaki in the context of the late 1950s and early 1960s. Yamasaki enjoyed a degree of prominence in the American press, appearing on the cover of *Time* magazine in 1963; the accompanying article, "The Road to Xanadu," balances a sympathetic appraisal of his architecture with more critical statements by his fellow architects. Other than some ongoing commentary surrounding the World Trade Center Towers, Yamasaki is infrequently discussed by critics and historians.

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"The Road to Xanadu," *Time* (18 January 1963)

Veronese, Giulia, "Minoru Yamasaki, Edward Durell Stone," *Zodiac,* 8 (1961)

YUGOSLAVIA

Although Yugoslavia existed as an official state through much of the 20th century, its architecture has been commonly presented through separate, regional surveys rather than general overviews. On the basis of the major political events of the century, three phases can be considered distinctive in terms of architectural analysis: the period before the creation of Yugoslavia in 1918, the interwar period of the kingdom of Yugoslavia, and the period after World War II, when the country was officially the Socialist Federal

Republic of Yugoslavia.

Constituted on territory shared through the centuries by two quite different empires, the Habsburg and the Ottoman, Yugoslavia had unequal potential for the development of modernity in its eastern and western regions. However, the modern age was brought to the whole country from the same source: the Central European metropolis. Being in Austro-Hungarian territory at the turn of the century, buildings in Slovenia, Croatia, and Bosnia-Herzegovina were designed either by foreign builders or by domestic architects educated at leading schools of the empire. On the other hand, Serbia and Montenegro, emancipated from the Ottoman government in the mid-19th century, passed through an intense transformation, catching up with the trends of contemporary Europe. The first Serbian architects to bring modern architectural features to the kingdom of Serbia (independent from 1878) were educated in Vienna, similar to their fellows from the western regions.

The turning point in Slovenian architecture was the earthquake of 1895, after which the cultural capital of Slovenia, Ljubljana, was rebuilt following the plans of Camillo Sitte and Max Fabiani. Besides shaping the modern urban structure of Ljubljana, Max Fabiani (1865–1962) brought the Viennese Secession to Slovenia, designing many public and residential buildings, such as Hribar House (1905), Bamberg Palace (1906–07), and the girls' school Mladika (1906–07).

The first decades of 20th-century architecture in Croatia are associated with the name of Viktor Kovacic (1874–1924), a student of Otto Wagner, who initiated an enthusiastic struggle against "dogmatic historicism." Joining a group of young artists and writers, the founders of the Zagreb magazine *Zivot* (Life), Kovacic published a manifesto titled "Modern Architecture" in its first issue of 1900. Whereas his projects such as Frank House (1910) and the Church of St. Blaz (1913) vary the recognizable idiom of the Wagnerschule, other chief examples of the Croatian Secession, such as Ignjat Fischer's Sanatorium (1908) and Rudolf Lubinsky's University Library (1913), both in Zagreb, pres ent a closer interpretation of the Viennese "geometric" forerunner.

After the Austrian occupation of Bosnia-Herzegovina of 1878, the favored style for new public buildings, chosen to present the distinctiveness of the mixed population, was the pseudo-Moorish. Richly decorated edifices in Sarajevo, such as Wittek and Ivekovic's City Hall (1892–96, almost destroyed in the civil war, 1992–95) or the Evangelistic Church (1899), designed by the leading architect of the time, Karlo Parzik (1857–1942), exemplify the popular within-the-empire trend of compiling "exotic," pseudo-Moorish and neo-Byzantine elements with the forms of Western Medieval Revival. With exceptions such as Jan Kotera's Slavija Bank (1910–11) in Sarajevo, whose pure geometric forms anticipated his "revolutionary" Urbánek's Mozarteum Building in Prague, characteristic Secessionist buildings in Bosnia-Herzegovina were a mixture of eclectic features and new decorative motifs, as on the Post Office in Sarajevo (1907–13, severely damaged in the civil war, 1992–95), designed by Josip Vancas (1859–1932).

Before the establishment of an architectural program at Belgrade Technical Faculty in 1897, the first generation of Serbian architects earned their degrees from universities in Vienna, Munich, Berlin, Karlsruhe, and Zurich, bringing back both the academic traditions as well as the new, turn-of-the-century tendencies. The Secession appeared in

Serbia in two different manners, one of which came as a synthesis of the eclectic method and modern architectural elements (e.g., large continuous glass screens, characteristic railings, and floral decoration) that can be seen on Svetozar Jovanovic's Officers Union (1908) in Belgrade. The other Secessionist manner, represented in the work of Branko Tanazevic (1876–1945), such as the Telephone Exchange (1907–08) and the Ministry of Education (1912–13), both in Belgrade, was closely related to the turn-of-the-century National Romanticism of the Central European countries that introduced modern, stylized folk motifs as the new forms of expression. This mode of Serbian Secession was a further step in the creation of a "true" national idiom, already announced in the academic neo-Byzantine designs of the earlier generation of Theophil von Hansen's pupils.

After the formation of the Kingdom of Serbs, Croats, and Slovenes in 1918 (in 1929 renamed the Kingdom of Yugoslavia), building was intensive in the strongest economic centers, Ljubljana and Zagreb, and especially brisk in Belgrade, the capital of the entire country. The significant event was the foundation of architectural schools at the Technical Faculty of Ljubljana, led by Joze Plecnik (1872–1957) and Ivan Vurnik (1884–1971); at the Technical Faculty of Zagreb, guided by Viktor Kovacic and Edo Schön (1877–1949); and at the Academy of Fine Arts, also in Zagreb, conceived by the radically modern Drago Ibler (1894–1964). At the same time, the architectural faculty at the Technical University of Belgrade was strengthened by a generation of professors who faithfully continued academic traditions. The architectural character of the three national capitals of the Kingdom of Serbs, Croats, and Slovenes (Belgrade, Zagreb, and Ljubljana) reflected their different cultural climates and political aspirations. Whereas Belgrade's desire to grow into the capital of a major nation was promoted by the forms of "late academicism" and the architectural face of Ljubljana was changed with enthusiasm to demonstrate Slo-vene national character, Zagreb became the only strong center of the architectural avant-garde of that time.

Different methods of dealing with historical vocabulary dominated the architectural production of Yugoslavia during the interwar period. In addition to Belgrade, where academic historicism determined the architectural scene during the 1920s and resulted in noteworthy projects, such as those by Nikola Nestorovic (1868–1957), including the University Library (1919–26, with Dragutin Djordjevic) and the Technical Faculty (1925–31, with Branko Tanazevic), the eclectic method was also employed by architects from the other regions. The Mortgage Bank (1923) in Zagreb, designed by one of the most remarkable Croatian modernists, Hugo Ehrlich (1879–1936), who became well known as Adolf Loos's collaborator on the Villa Karma, on Lake Geneva, confirms that the strict line between the eclecticist and the modernist cannot be drawn. For the academic tradition, the writings of Belgrade architect Milutin Borisavljevic (Miloutine Borissavliévitch, 1889–1970) were the only theoretical statements from interwar Yugoslavia to receive a world reputation.

The Wagnerschule associates, Joze Plecnik and Viktor Kovacic, originated recognizable modes of modern expression without denying historical references. Plecnik's achievements in Ljubljana, Zale Cemetery (1939–40) and the National University Library (1936–40), as well as Kovacic's works in Zagreb, among them his masterpiece, the Stock Exchange (1922–27), can be considered distinguished examples of European modernism in general.

A specific modern idiom of treating the past through the transformation of folk motifs—a National Romantic variant of the Art Deco—arose in Yugoslav regions, as among the majority of "small" European nations, from an attempt to create a unique national style. A colorful facade of the Trade Union Bank (1922) in Ljubljana, decorated with painted motifs reminiscent of peasant fabrics, informs Ivan Vurnik's vivid approach of generating a Slovene national style. In Serbia, an established agenda of shaping a national style found its passionate devotee in Momir Korunovic (1883–1969). His most famous buildings, Post Office No. 2 (1927–28) and the Postal Ministry (1927–30), demonstrate his method of mixing motifs from folk art with elements from Serbian medieval architecture.

Zagreb was the only Yugoslav center to accept the avant-garde ideas of European functionalism. Most of the leading Croatian architects of the time were either educated in the avant-garde European schools or worked with some of the most famous European architects: Loos, Behrens, Poelzig, and Le Corbusier. Peter Behrens's involvement with the reconstruction of the Elsafluid Building in 1927 had a special impact on Zagreb's architectural scene. Two architectural groups, Zemlja and Radna Grupa Zagreb (RGZ), became leading generators of the new climate, working both on new, radical designs and on architectural publications and exhibitions. The members of RGZ took an active role in CIAM (Congrès Internationaux d'Architecture Moderne) of 1933 in Athens, opposing, with their own proposals, the charter advanced by Le Corbusier.

One of the rare examples of Belgrade functionalism is the Union Bank (1929–30), the masterpiece of Croatian architect Hugo Ehrlich. In contrast to the "monumental modernism" of the 1930s, which was gladly received by Serbian architects, functionalism found only a few followers: Djordje Tabakovic (1897–1971) in Novi Sad; Nikola Dobrovic (1897–1967), who built mainly outside Serbia; and Milan Zlokovic (1898–1965), whose University Children's Clinic (1933–40) in Belgrade is the main avant-garde accomplishment. Works of Dragisa Brasovan (1887–1965), among them the Government Building (1930–39) of the Danube Region in Novi Sad and the Air Force Headquarters (1935, damaged in the NATO bombing of 1999) in Zemun, offer key examples of the monumental Modern idiom, created through a refined juxtaposition of Expressionism and "purified" Neoclassicism. The Albania Palace (1938–40) in Belgrade, designed by a team of architects from Zagreb and Belgrade, and especially the Yugoslavian Pavilion at the Paris International Exhibition of 1937, by Croatian architect Josip Seissel (1904–87), are outstanding examples of this "monumental manner.

After World War II, the political system in Yugoslavia was radically changed. First associated with the politics of the Eastern bloc, "Tito's socialism" shifted its course, breaking with Stalinist politics. Because of the immense loans taken from the West from the 1950s until the late 1970s, the potential for a high standard of architectural productions was better than in other Eastern European countries. Being socialistic in content and capitalistic in form, Yugoslavian architecture of the post-World War II period dealt with a series of "socialistic" programs, such as collective housing, community centers, houses of culture, and partisan memorials (best represented through the work of Bogdan Bogdanovic), trying to keep abreast with current architectural trends in Western Europe. The urban planning associated with the controlled economy found its best expression in radical plans for new city districts, among which the one for New

Belgrade was the most ambitious.

One of the rare examples of designs from the late 1940s, when Soviet models were still recommended, is the Federal Executive Government Building (1947–61) in Belgrade, begun according to a project by a group of architects from Zagreb, although its "Eastern" monumental features modified into the International Style during the construction as a result of the political shift. During the 1950s and early 1960s, the International Style dominated architectural production. Le Corbusier's vocabulary occurred in works of his assistants, Juraj Neidhardt from Sarajevo and the Slovene Edvard Ravnikar, but emerged more obviously in Milorad Macura's Military Printing House (1953) in Belgrade and Drago Galic's Apartment Block (1953–56) in Zagreb. The "constructional aesthetic" of Pier Luigi Nervi found its reinterpretations in Vladimir Turina's Dinamo Stadium (1954) in Zagreb as well as in Milorad Pantovic's new Belgrade Fair (1956–57). A new, more individualistic and expressive trend of the international architecture appeared at the very end of the 1950s with Vjenceslav Richter's Pavilion for Expo '58 in Brussels, Nikola Dobrovic's Secretariat of National Defense (1957–63, severely damaged in the NATO bombing of 1999), and Ivan Antic's Museum of Contemporary Art (1960–65, with Ivanka Raspopovic), the latter two in Belgrade. The most striking architectural events in Yugoslavia of the time were the last meeting of CIAM, held in Dubrovnik in 1956, and Kenzo Tange's engagement with the reconstruction of the Macedonian capital, Skopje, after the earthquake of 1963.

Yugoslav architects accepted the diversity of the late 1960s and 1970s following the manners of Brutalism, late modern Expressionism, structuralism, regionalism, High-Tech, and so on. Different Brutalist expressions can be summarized through a couple of remarkable examples, such as those in Skopje after the earthquake, including Alfred Roth's Elementary School (1967), Janko Konstantinov's Telecommunication Center (1971–74), and Marko Music's University Complex (1974), as well as through others, in smaller Yugoslavian cities, including Svetlana Radevic's Hotel Podgorica (1965–67) in the Montenegrin capital of Podgorica, Milan Sosteric's Bakery (1971) in Makarska, Mladen Vodicka's City Library (1976) in Karlovac, and the Military High School (1975) in Ljubljana, designed by the group Studio 7. Application of the High-Tech vocabulary found its best interpretations in Stojan Maksimovic's Center Sava (1977–79) in Belgrade, Milan Mihelic's Telephone Exchange (1978) in Ljubljana, Boris Magas's Stadium Poljud (1979) in Split, and Stanko Kristl's City Hospital (1979) in Izola. Designs of Bosnian architect Zlatko Ugljen include the National Theater (1978, with Jahiel Finci) in Zenica, Hotel Ruza (1978) in Mostar, and the White Mosque (1980) in Visoko, for which he received the Aga Khan Award of 1983 and which represents one the most respected works of the time.

Various Postmodern modes of the late 1970s and 1980s were welcome among architects of different generations. The leading designs of the new wave, related to the trends introduced by Aldo Rossi, Richard Meier, James Stirling, and the Berlin IBA, are associated with the names of Milos Bonca, the group Kras, Penezic and Rogina, Branko Siladjin, and Petar Vulovic. As a consequence of the civil war and the breakup of the country in the last decade of the 20th century, a possible summary of Yugoslavian architecture of the 1990s includes more examples of destruction than of construction.

TANJA DAMLJANOVIC

Further Reading

With the exception of the post-World War II period, general surveys of the architecture of Yugoslavia hardly exist. Architectural monographs dealing with the most influential figures from specific former-Yugoslav regions serve as the best point of departure.

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Mambriani, Alberto, *L'architettura moderna nei Paesi Balcanici,* Bologna: Cappelli Editore, 1969

Manevic, Zoran, et al., *Arhitektura XX vijeka* (Architecture of the 20th Century), Belgrade: Prosveta, 1986

Music, Marjan, "The Architecture of the Twentieth Century," in *Art Treasures of Yugoslavia,* edited by Oto Bihalji-Merin, New York: Abrams, 1969

Straus, Ivan, *Arhitektura Jugoslavije, 1945–1990* [Architecture in Yugoslavia, 1945–1990], Sarajevo: Svjetlost, 1991

Z

ZEVI, BRUNO 1918–2000

Architectural historian, Italy

Bruno Zevi's formation as Italy's foremost architectural historian in the immediate postwar period is closely linked with his early political activity. Born into a distinguished Jewish family, Zevi studied at the Faculty of Architecture in Rome before the introduction of the Fascist racial laws induced him to move to London. Zevi then left Europe for the United States, studying at Columbia University in New York and Harvard University's Graduate School of Design, then under the directorship of Walter Gropius, earning a bachelor's degree in 1942.

A significant amount of Zevi's time abroad was spent in antiFascist activities, such as radio transmissions and the publication in Boston of the Carlo Rosselli—inspired *Quaderni italiani* (Italian Notebooks). The network of contacts he developed on such occasions brought him in touch with some influential Italian intellectuals, notably the art historians Carlo Ludovico Ragghianti and Lionello Venturi; hence the openness of Zevi's cultural background and some of the peculiarities of his later intellectual engagement.

After returning to Rome in 1944, Zevi became critically engaged in a cultural battle for a renewal of Italian architecture. *Towards an Organic Architecture,* his first book, was published in 1945. The title echoed Le Corbusier's *Vers Une Architecture,* but the additional adjective, "organic," hinted at the need to enrich the functionalist theories on which the many branches of European architectural research in the 1920s and 1930s had been based. The book was essentially a comparison of two worlds: Europe and the United States. In both, Zevi argued, recent developments in modern architecture had paved the way for a "humanisation" of the new language, a general tendency best illustrated by the domestic buildings of Frank Lloyd Wright and the work of Alvar Aalto and other Scandinavian architects. Italy was implicitly invited to follow the same route, and in 1945 Zevi founded the Association for Organic Architecture (APAO). For a time the association's local branches were a focal point for some of the architects who hoped to play a leading role in the country's reconstruction.

Three years later his *How to Look at Architecture* was the result of a more ambitious approach that reflected Zevi's familiarity with Benedetto Croce's writing on aesthetics and his grow ing interest in the Vienna School of art history. Despite the long discussions about the peculiarities of architecture compared with other forms of artistic expression, the book was mainly a reflection on the purpose and methodology of architectural history. Zevi showed how the tools of modern architectural criticism (in particular a notion of "space" partly inspired by an analysis of Wright's buildings) could serve as the basis for a new approach to the whole history of Western architecture. In his view, the gap that existed between modern architectural design and academic architectural history needed to be bridged to forge a link between the study of classical and medieval buildings and the daily battle for a better built world.

In line with this principle, in 1948 Zevi began to teach architectural history at the universities in Venice (1948–63) and Rome (1948–51, 1963–79) and became more actively involved in the daily debates in the Italian architectural press. His ponderous *History of Modern Architecture,* originally published in 1950 as a completely rewritten version of his 1945 book, still stands as his most important work as a historian. It was the first comprehensive historical narrative about the origins and the development of the Modern movement to be published in Italy and one of the most original and sympathetic European studies on the subject to appear in the postwar period. Substantially revised in 1975 and 1996, the book was crucial in deciding the fortunes of architectural history as a discipline in the Italian academic world, a secondary effect well documented by the biographies of scholars such as Leonardo Benevolo and Manfredo Tafuri.

The core themes of *History* are still central to most of Zevi's subsequent studies, such as the ones on De Stijl architecture (1953) and Erich Mendelsohn (1970). Other essays from the 1950s and 1960s further extended the chronological boundaries of his research, focusing on a group of Renaissance architects, including Ferrara's "planner" Biagio Rossetti (1960) and Michelangelo Buonarroti. However, Zevi's prescriptive, operational approach to history increasingly began to show its limitations. His original sensitivity toward the visual analysis of buildings became constricted within an oversimplified, barely evolving conceptual framework based on a handful of binary opposites: classicism versus anticlassicism, symmetry versus asymmetry, spatial (and political) freedom versus dictatorship. It is therefore not surprising that Zevi's most acclaimed and challenging book after *History* was not a historical one but rather an essay about the methodology of architectural design: the brilliant *The Modern Language of Architecture,* published in 1973.

After Zevi's involvement with the Partito d'Azione (Party of Action) between 1944 and 1947, he still occasionally became involved in politics and was elected to Parliament as a member of the Radical Party in 1987. In the late 1990s, renewed interest in his work gave him the opportunity to become editor of a second series of architectural studies (Turin: Testo e Immagine, 1996–), following the one he had edited for Dedalo Editions (73 titles between 1978 and 1985). He also worked on a few historical overviews, the last of which was published in 1998 with the title *Counterhistory and History of Architecture.*

FILIPPO DE PIERI

S*ee also* **Fascist Architecture; Tafuri, Manfredo (Italy); Wright, Frank Lloyd (United States)**

Biography

Born in Rome, 22 January 1918. Studied at Faculty of Architecture, Rome, 1936–39;

Architectural Association's School of Architecture, London, 1939; Columbia University, New York City, 1939–40; Harvard University, Cambridge, Massachusetts, 1940–42. Married Tullia Calabi, 1940. Moved to London, 1943–44; worked for the Office of Chief Engineer of the European Headquarters of the U.S. Army (February-July 1944). Returned to Rome, July 1944. Worked for the United States Information Service (USIS), 1945–46; founded the Associazione per l'architettura organica (APAO), 1945–50. Co-editor of the review *Metron,* 1945–55. Professional partnership with the architects Luigi Piccinato, Enrico Tedeschi, Cino Calcaprina, Silvio Radiconcini, 1946. Taught at the Faculty of Architecture in Venice, 1948–63. General Secretary of the Istituto Nazionale di Urbanistica (INU), 1951 -69. Editor of the review L'architettura-cronache *e storia* (1955–2000); architectural critic of the magazine *L'Espresso* (1955–2000). Professional partnership with Errico Ascione and Vittorio Gigliotti, 1961. Taught architectural history at the Faculty of Architecture in Rome, 1963–79 (resignation). Honorary Fellow of the American Institute of Architects (1968); president of the Comité International des Critiques d'Architecture (CICA), 1978-. Editor of the series Universale di Architettura, Bari: Dedalo Libri (1978–85). Elected to the Chamber of Deputies in the ranks of the Radical Party, 1987. Degree *honoris causa,* Technion, Haifa, Israel, 1990. Honorary Fellow of the Royal Architectural Institute of Canada, 1990. Died in Rome, 9 January 2000.

Selected Publications

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ZONNESTRAAL SANATORIUM 1926–31

Hilversum, Netherlands

Thought to be a symbol of the solidarity of the Dutch workingclass movement at the turn of the century, the Zonnestraal Sana-torium in Hilversum is considered one of the most complex and influential buildings of its time. Deemed one of the major works by its designer, Johannes (Jan) Duiker (1890–1935), the Sanatorium has long been associated with the Modern architectural movement in the Netherlands.

An independent and innovative architect, Duiker studied at Delft University of Technology with Bernhard Bijvoet (1889–1979), with whom he later became partners. Together they worked in the office of their former professor, Henri Evers, architect of the Rotterdam City Hall. Much of Duiker's early influence can be attributed to Evers, Hendrik Petrus Berlage and the Amsterdam School, and the American architect Frank Lloyd Wright. Duiker garnered later influence from the developing International Style and the Nieuwe Bouwen movement while employing new building materials and methods in the integration of architecture and science. It is believed that Duiker was also somewhat influenced by the De Stijl movement; however, he was more a proponent of the "nonaesthetic" Modern architecture and not the movement's "decorative facade architecture," feeling that it only concealed inferior floor plans. As a result, he became the movement's principal antagonist, further illustrated by his lack of exposure in their periodical, choosing rather to subscribe to the philosophies of the functionalist De 8, later known as the De 8 and Opbouw group.

Choosing functionality over aesthetic appearances, Duiker produced his own functionalist idiom, which became stronger and more expressive as his design philosophy developed. His quest for an ideal structural form created a dichotomy between simplistic and complex avant-garde architecture that was influential enough to have inspired Ludwig Mies van der Rohe's Tuberculosis Sanatorium (1929–33) at Paimio, Finland. Duiker's unfortunate early death at the age of 45 meant that his design repertoire was not as extensive as that of his peers. This and the demolition of much of what he did design are perhaps the reasons for his apparent international obscurity. As a result, his remaining architecture has suffered from indifference and neglect.

After winning the competition for elderly housing in Alkmaar (1917), the socially conscious Duiker and Bijvoet desired to improve the quality of lower-income health facility construction. Through associations with Berlage, Duiker and Bijvoet were retained by the Koperen Stelen Fonds (KSF) foundation—a group of diamond workers organized in 1905 whose motto was "renewed vitality"—to design a convalescent facility for their tuberculosis-infected colleagues. Through fund-raising efforts by the foundation and by Delft professor Henri ter Meulen, in 1919 the KSF purchased the Pampahoeve, a country estate west of Hilversum. Designs were temporarily postponed, however, after the diamond industry collapse in 1920.

Duiker, collaborating with structural engineer Jan Gerko Wiebenga, utilized the newest structural technology, creating a cantilever system that produced a buoyant and rhythmically tectonic architecture. Resting on concrete blocks, the skeletal structure of the buildings consists of a three-meter (ten-foot) grid with structural columns every nine meters. Concrete was generously used in the floor slabs and the prefabricated paneled walls that were installed between steel I sections at each floor. Although still in its infancy, reinforced concrete and the prefabricated-concrete building systems played a monumental role in the development of the Sanatorium as well as the rest of Duiker's architecture.

The Zonnestraal Sanatorium consists of three large buildings: the main building, the Henri ter Meulen Pavilion, and the Dresselhuys Pavilion, along with various smaller outbuildings. The main building was begun in 1928 and was used to house the general facilities of the complex. The functions were grouped together by their practical relationships, dividing the boiler house/bathroom, the kitchen, the medical facility, and the infirmary into four distinct linear sections. The cruciform-shaped upper floor spans three of the four lower buildings, creating a unified mass.

Flanking the main building are two independent pavilions. Also functionally distinct, each consists of a square central form connecting two long wings that flare out at different angles to provide maximum sunlight to the southern-exposed patient rooms and terraces. The Henri ter Meulen Pavilion was constructed in 1928, along with the skeleton of the Dresselhuys Pavilion, completed in 1931. Nowhere in the complex is Duiker's coalescence of structure, form, and space so evident as in the pavilions. Structurally identical to the main building, the rhythmic grid system provides the convalescent living spaces.

Between the years of 1919 and 1932, many outbuildings were constructed as part of the complex. Dormitory huts were built in 1929 for patients who were at the end of their convalescence, allowing them to transition out of the hospital setting. For economic and occupational therapy reasons, the convalescents themselves constructed a number of these buildings. Following the trends of the Amsterdam School, the first eight small utilitarian buildings, constructed in 1919–20, were timber-floored load-bearing brick structures. When construction resumed in 1924, Duiker's conversion to concrete was evident.

Most other buildings went unrealized. The most unusual was the Adamas diamond-polishing works (1928), designed to prepare the healed convalescents for their return to society. Construction, however, went no further than the reinforced-concrete skeleton. Its notable feature was the unusual roof, consisting of alternating asymmetrical sawtooth projections.

Unfortunately, the Sanatorium's insufficiently prepared steel framing and structural members proved unsuitable for the Dutch climate. After World War II, the complex was expanded, but without any regard to Duiker's original design concept. Along with an apparent lack of interest in his architecture, by the 1970s the complex was in serious decline. Recently restored, however, it is now listed as a national monument. The Zonnestraal Sanatorium was the culmination of Duiker and Bijvoet's utopian yet avant-garde design philosophy. By using the latest structural technology, both the architects and the buildings were significantly innovative for their time.

ELISABETH BAKKER-JOHNSON

S*ee also* **Amsterdam School; Berlage, Hendrik Petrus; Concrete; De Stijl; Duiker, Johannes; Modernism; Wright, Frank Lloyd**

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ZUMTHOR, PETER 1943

Architect, Switzerland

Switzerland today represents one of the most important centers of modern architectural thought and practice, and Peter Zumthor has been among the major architects representing the country since the 1980s. Zumthor presents in his work not only beautiful form and masterly construction but the sensitive control of material and space achieved only by gaining intimate knowledge of all these factors.

Trained as a cabinetmaker, Zumthor studied design instead of architecture at Basel's school of arts and crafts. He has concentrated on adapting the rural form and materials of his headquarters, the Swiss canton of Graubuden, and he has built a small but captivating oeuvre almost exclusively in his adopted home since his arrival there in 1967. Zumthor has said that he "creates spaces with soul" that become part of the everyday and stand in opposition to the "general artificiality of the world" (*Peter Zumthor, Works,* 1998). He argues his case to great effect in all of his projects, including the Sogn Benedegt Chapel, a shingled, leaf-shaped church perched high in the misty Surselva Mountains. A weathered, earthy, and private place, the form is derived from the lemniscate, an algebraic figure-8-shaped curve that when proportionately shortened also determines the section. A delicate band of windows ringing the top of the building ensures steady natural light. The chapel is an artful combination of rationality and poetry existing in an almost dreamlike setting. The architect's atelier in Haldenstein draws on the contrast between softly finished local wood and brushed steel details to highlight the beauty in each. The humble building, though sited in the middle of town, lends no notion to its purpose. The modern addition to a traditional farmhouse in Versam, Switzerland, is an example of Zumthor's seamless straddling of old and new, tradition and modernization, and his dedication to rooting buildings to the landscape. The architect was able to match almost perfectly the wood of the original building and made a modern addition for a family without interrupting the spirit of the old house.

The much publicized and much photographed thermal baths in Vals revisit the importance and sheer pleasure of bathing known in ancient Roman baths. The entire structure looks almost prehistoric, as if it emerged from the ground, and is con structed entirely of whole slabs of locally quarried, gray gneiss laid one on top of another, to a great monolithic effect. The beauty of the spa is awe-inspiring, as is its perfection in plan and construction. The sensuality of the color, the water, the sounds echoed in the chamber of the bath seem all but mathematically engineered by the architect—a stunning feat matched by few, if any, other of his projects.

If the spa at Vals is all subterranean mystery, then Zumthor's first non-Swiss site, the Kunsthaus in Bregenz, Austria, is all light and transparency. Nestled beside a lake, the glass box of a modern art museum goes from white to blue to glowing yellow during the course of day to night. The light skin of the building allows but a peek into the frame and at the silhouettes of the staircases between galleries. The glass panels of the museum's skin are not perforated and hang on a system of metal brackets held in place by large, modified clamps. Lighting is controlled by the amount of natural light entering the building at any given time through the massive glass skin of the structure. The interior floors and walls of the gallery levels are concrete and uniquely climate controlled by the circulation of water to the gallery floors and walls from an underground stream.

Zumthor's plan for the Swiss Pavilion at the Hannover Expo 2000 was meant to echo a lumberyard in its use of piles of timber in parallel walls and the notion that the lumber will be sold after the close of the exposition. The multidimensional use of the space speaks to all the senses: lines of poetry are projected on the walls, and small troupes of dancers and musicians perform in the space, making it a living, beating organism.

The architect has succeeded by trying the "obvious but difficult solutions" first. Those solutions make architecture the medium it is: construction, materials, earth and sky, structure. He handles each with respect to create structures true to their surroundings, reflective of their culture, and representative of an architect craftsman who blends invention and sensitivity, intuition and intelligence.

EUGENIA BELL

Biography

Peter Zumthor was born in 1943 near Basel, Switzerland. The son of a furniture manufacturer, he was trained as a cabinetmaker. He enrolled at the Pratt Institute in New York as a visiting student in architecture and design in 1966, and opened his own architecture practice in Haldenstein, Graubunden, in 1979. He has taught at the Academy of Architecture in Mendrisio, Switzerland, the University of Zurich, and the Southern California Institute of Architecture.

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