23
The Second Wave of International Style Architecture

The achievements of modern architecture in the first third of the twentieth century were a series of relatively isolated experiments: Prairie Style, Secession, Deutscher Werkbund, de Stijl, Expressionism, Bauhaus, and International Style. Of all these initiatives of modernism, the International Style was by far the most enduring; almost inevitably, it eventually became the most diluted.

Economic depression followed by World War II meant that there was little innovative large-scale architecture in America and Europe in the thirties and forties. When the first great wave of new buildings came, it was the International Style that dominated. The acceptance of International Style architecture in postwar America, where many key members of the prewar European avant-garde had settled, in turn led to its being reexported to other nations intent on modernization, as in Latin America, or reconstruction, as in Europe. By the mid-sixties, however, critics of the International Style were expressing their disenchantment with its dogmatic loyalty to functionalism and its technology-driven aesthetic. Opposition to International Style/Bauhaus style in the seventies took form in what began to be called Postmodernism (see chapter 25). Postmodernism's efforts to encompass the pluralism of a more completely global world, while simultaneously acknowledging the history and lessons of early styles and movements, resulted in hybrid styles that flew in the face of the reductive, rational purity of the International Style.

Architects in the second half of the twentieth century were able to develop new concepts of space, either employing new structural systems or using older methods, such as ferroconcrete, in new ways. Besides the skyscraper and other urban office buildings, some of the areas in which architects worked on an unprecedented scale included industrial plants and research centers; university campuses; religious structures; cultural centers, including museums, theaters, and concert halls; and airports. Four broad tendencies can be discerned in postwar architecture: the purist modernism of Gropius's or Mies van der Rohe's International Style; architecture that, in various different ways, modified this austerity with sculptural inflections (for example, the work of Saarinen or Kahn); Postmodernist architecture, such as Renzo Piano and Richard Rogers's Pompidou center; and the work of late modernists, such as Meier or Pei, who remained dedicated to an elegant expression of modernism in the Postmodern era.

The Avant-Garde Diaspora: Architecture in the 1930s

With the exception of new concepts still developing in the field of engineering, by 1930 many of the ideas of twentieth-century architecture had been stated in one form or another. The early thirties saw retrogressive styles making a comeback, particularly in communist and fascist countries such as Russia and Germany. In those countries and, to a lesser degree, in Italy, a ponderous Neoclassical style took the place of innovation. Even in France, despite the achievements of Le Corbusier, official buildings, such as the 1937 Museum of Modern Art in Paris, frequently reverted to a form of Neoclassicism. (In contrast, during this period and since, Finland and the Scandinavian countries—Sweden, Norway, and Denmark—made notable contributions to modern design in architecture, furniture, crafts, and industrial products.)

In the United States, modernist continental European architecture was not well received, certainly not in American schools of architecture, which were teaching in the Beaux-Arts tradition well into the second quarter of the twentieth century. In the thirties, things began to change after the 1931 exhibition, The International Style: Architecture Since 1922, organized by the architectural historian Henry-Russell Hitchcock and the architect Philip Johnson and held in the newly opened Museum of Modern Art in New York. The exhibition (and catalog, *The International Style*, written in 1932 by Johnson and Hitchcock) included examples of projects from fifteen countries. The term "International Style" was itself notable, for what had begun a decade earlier as the intimation of a

new spirit of restless originality had crystallized into a style that the show's curators had been able to identify in buildings from many countries around the world. By the mid-thirties, with the wider dissemination of the principles of the new architecture, even more countries had at least one or two buildings that were clearly influenced by the designs of such early International Style pioneers as Le Corbusier and Mies van der Rohe. The spread of the modern movement in the early thirties was furthered by private patronage and competitions, as well as by municipal and commercial bodies.

In the mid-thirties, the United States benefited from the immigration of many scientists, artists, and architects escaping from Nazi repression. Walter Gropius (see fig. 16.5) quit the Bauhaus in 1928 and moved to England in 1934, where he stayed for three years and collaborated with British International Style architect Maxwell Fry in the design of Impington Village College near Cambridge. In 1937, Gropius left for the United States, to become professor and then chairman of the Department of Architecture at Harvard University. Marcel Breuer (see fig. 16.1) also arrived in America in 1937, joining Gropius at Harvard. They remained in partnership until 1941, when Breuer established his own practice.

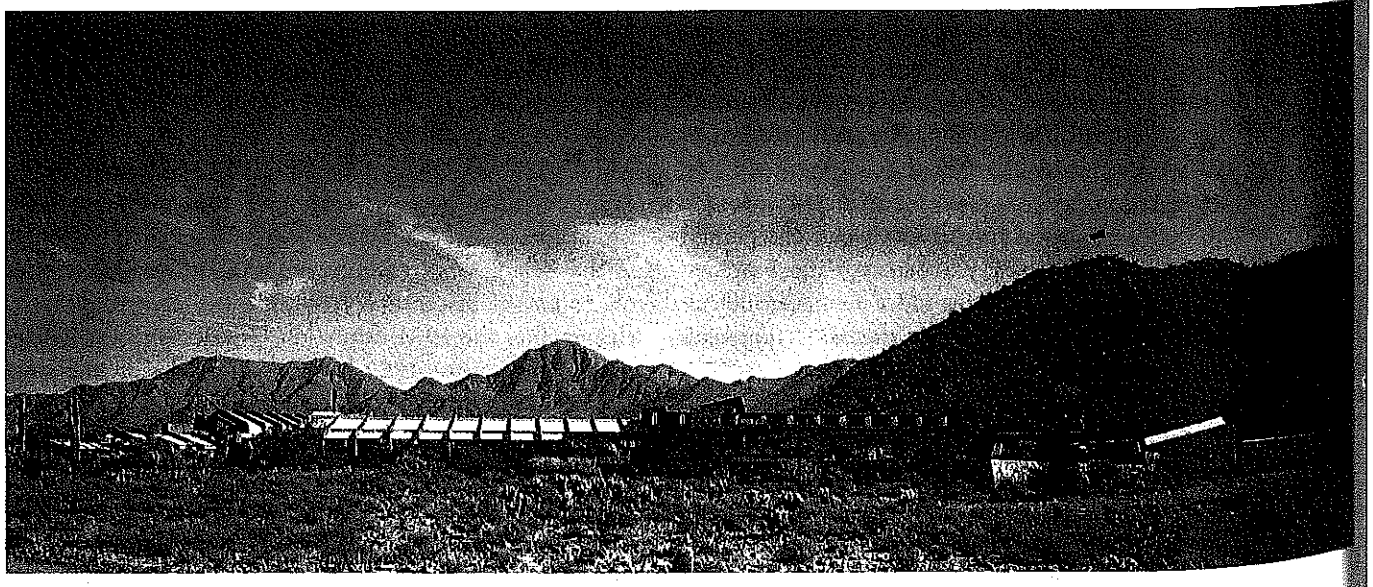
Also in 1937, László Moholy-Nagy (see figs. 17.1–17.3) had been invited to Chicago to form a New Bauhaus. In the same year, Josef Albers (see figs. 17.8, 17.9) arrived in America to teach design and painting, first at Black Mountain College in North Carolina, and then at Yale University. In 1938, Mies van der Rohe (see fig. 16.7), who had arrived in the United States the year before, was invited to the Illinois Institute of Technology (then the Armour Institute) in Chicago. José Luis Sert, a socialist architect committed to the integration of architecture and social planning, emigrated from Spain to the United States in 1939 and in 1958 became dean of the Harvard Graduate School of Design in Cambridge, Massachusetts. So it was largely as a result of Gropius's and Mies's efforts, as well as those of a few other distinguished émigrés, that architectural schools were transformed over the next twenty years and American architecture entered genuinely into the age of modern architectural experiment. In the same way, Moholy-Nagy, Albers, and others had a powerful effect on industrial, product, and graphic design in the United States.

"The Quiet Unbroken Wave": The Later Work of Wright and Le Corbusier

Throughout the early thirties, **Frank Lloyd Wright** (1867–1959) (see chapter 16) continued to critique modernism and the International Style through his writings and new building designs. While he was aware of Art Deco revivalism, which had a tremendous influence in the United States, as well as the extreme austerity of the International Style in Europe, his sympathies lay elsewhere. In a manner parallel to the late style of Wright, that of **Le Corbusier** (1887–1965) was characterized by the exploration of free, organic forms and the statement of the materials of construction.

Wright

Despite his focus on the circular theme in the 1936–39 Johnson Building in Racine, Wisconsin (see fig. 16.17), Wright did not desert the rectangle or the triangle. Taliesin West is the winter headquarters that he began to build for himself and the Taliesin Fellowship in 1937 near Phoenix, Arizona, which, characteristically, was still being built and rebuilt at the time of Wright's death in 1959. It is in plan and elevation a series of interlocked triangles. The architect's most dramatic assimilation of buildings into a natural



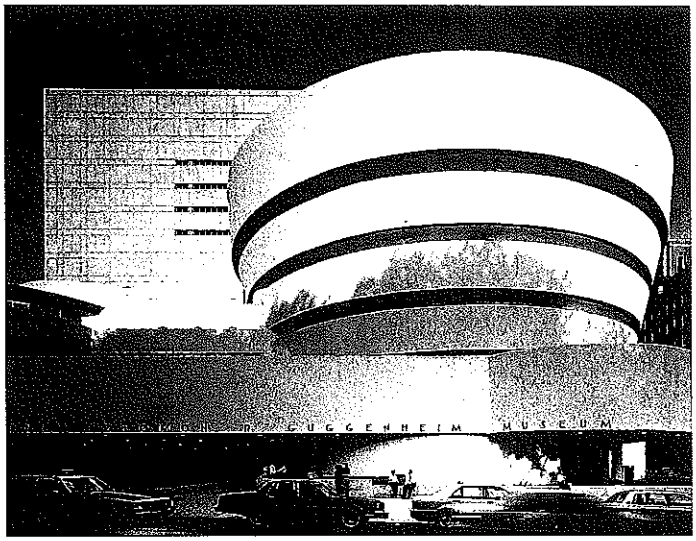
23.1 Frank Lloyd Wright, Taliesin West, Scottsdale, Arizona, 1937–38.

environment, it becomes an outgrowth of the desert and mountain landscape (fig. **23.1**).

Wright also used primary forms for his great unbuilt project, Broadacre City, and for his Usonian houses—innovative low-cost homes for middle-income families. He completed a number of buildings based on the circle, the climax of which is the Solomon R. Guggenheim Museum (see fig. 23.2). First conceived in 1943, it was not completed until 1959, after Wright's death. The Guggenheim Museum, sited on Fifth Avenue across from Central Park, is the only building that this leading American architect was ever commissioned to do in New York City, and it was many years before he could obtain the necessary building permits for so revolutionary a structure. As designed by Wright, it consisted of two parts: the main exhibition hall and a small administration wing (known as the monitor building), both circular in shape. A smooth, unbroken white band that stretches across the museum's Fifth Avenue façade connects the two sections, giving the appearance of seamless unity. The gallery proper is a continuous spiral ramp around an open central well. The building radiates outward toward the top, the ramps broadening as the building rises, in order to provide ample light and space. A skylight dome on graceful ribs provides natural, general lighting, and continuous strip-lighting around the ramps provides additional illumination. Permanent fins divide the exhibition areas of the ramps into equal bays, where the art is shown. Wright believed that architecture should essentially involve movement, not just be a fixed enclosure of space, and the Guggenheim's spiral form was the ultimate expression of his effort to get beyond the box. Explaining his concept to a skeptical public, Wright noted that his design provided "a greater repose, the atmosphere of the quiet unbroken wave: no meeting of the eye with abrupt changes of form."

As a museum, the Guggenheim offers easy and efficient circulation in one continuous spiral, in contrast to the traditional museum with galleries consisting of interconnected, rectangular rooms. Some of Wright's detractors have criticized the design of the Guggenheim's slanting walls and ramps for competing too strongly for the viewer's attention with the artwork. On the other hand, supporters argue that this museum succeeds in what few others even attempt: to be more than a passive site for curatorial activities and to actively engage the viewer's experience of the art, which can be seen across the rotunda as well as at close range.

In 1982, the architectural firm of Gwathmey Siegel was commissioned to renovate the museum in order to accommodate the need for expanded gallery, storage, and administrative space. The architects were required to bring the aging building into line with the latest museum technology, and to create an addition that would include gallery spaces capable of accommodating large-scale contemporary art. Work on the museum involved two distinct challenges: a restoration of the building to some semblance of Wright's intentions, and an expansion plan that involved alterations of the original structure.

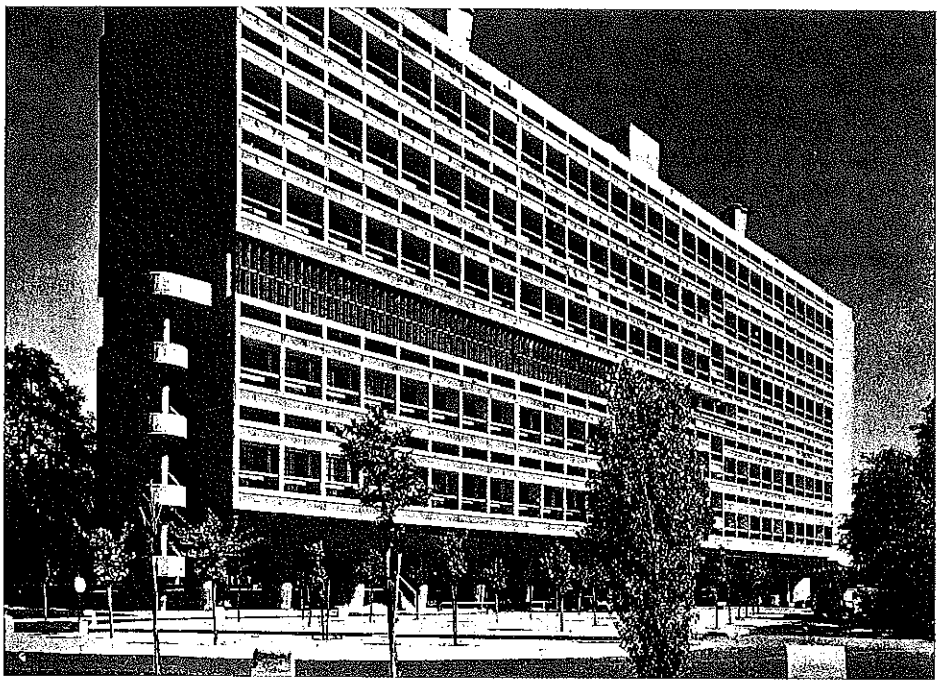


23.2 Frank Lloyd Wright, Solomon R. Guggenheim Museum, New York, 1957–59. Addition 1989–1992.

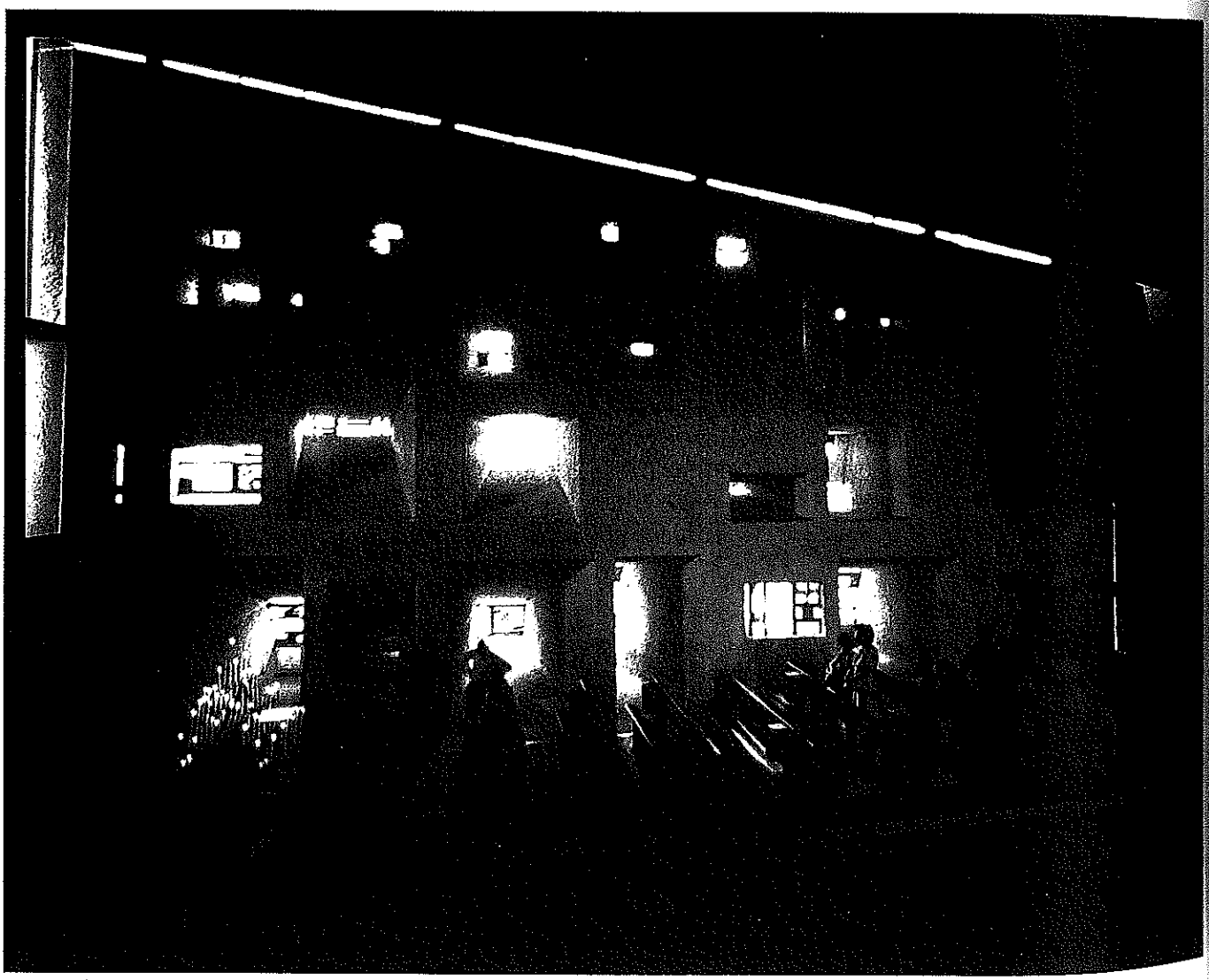
The restoration provoked almost as much controversy and publicity as had Wright's original design, and some critics have argued that a major icon of American architecture has been tragically compromised. The new addition (fig. **23.2**) consists of a thin rectangular slab whose beige limestone façade is ornamented with a gridded pattern. Four new floors of galleries, three of which have double-height ceilings, make it possible to show large-scale works for the first time. In its present renovated state, which was opened to the public in 1992, the great spiral—a monumental sculpture in its own right—was opened all the way to the reexposed dome, where new ultraviolet-filtering glass was installed. Formerly unused roof space was converted into a sculpture terrace providing sweeping views of Central Park, invoking the intrinsic connection between Wright's architecture and nature.

Le Corbusier

The enormous 1947–52 building in Marseilles, France, known as the Unité d'Habitation (fig. **23.3**), an apartment complex designed primarily for blue-collar workers, both carries out Le Corbusier's town-planning ideas and asserts its rough-surfaced concrete structure as if a massive sculpture. The building is composed of 337 small duplex apartments, with a two-story living room, developed in Le Corbusier's earlier housing schemes. It includes shops, restaurants, and recreation areas, to constitute a self-contained community (community facilities are provided on the roof). Unités were also built in the French town of Nantes and in Berlin. In them, Le Corbusier abandoned the concept of concrete as a precisely surfaced machine-age material and presented it in its rough state, as it came from the molds. In doing so, he inaugurated a new style—almost a new age—in modern architecture, to which the



23.3 Le Corbusier, Unité d'Habitation, Marseilles, France, 1947–52.

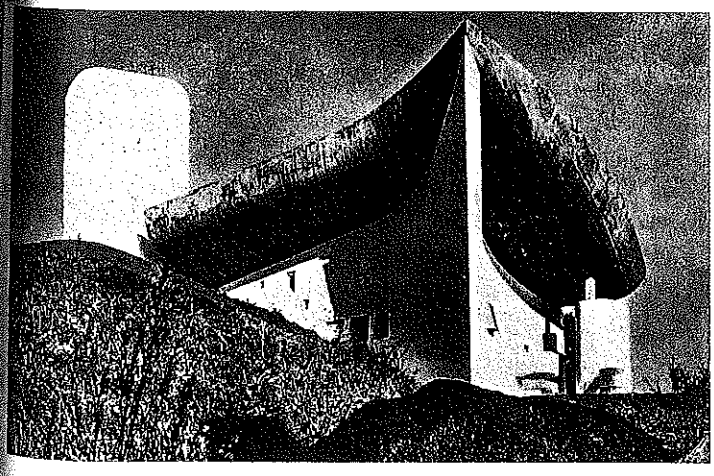


23.4 Le Corbusier, Interior, Notre-Dame-du-Haut, Ronchamp, France, 1950–54.

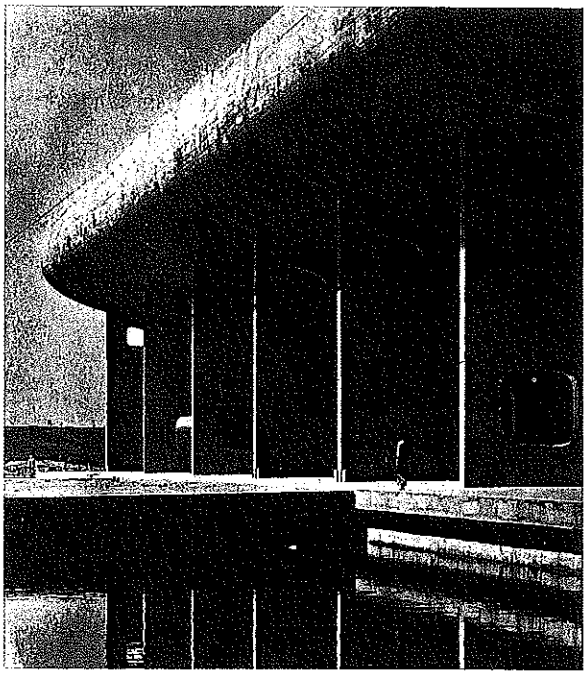
name Brutalism was later given. Possibly related to the French word *brut* (uncut, rough, raw), the term has taken many forms, but fundamentally involves the idea of "truth to materials" and the blunt statement of their nature and essence. Frank Lloyd Wright had preached this doctrine from the beginning of his career, and the epitome of the International Style architect, Mies van der Rohe, in his own way was as ruthlessly dedicated to the statement of glass and steel as Le Corbusier was to the statement of concrete. Brutalism, however, most characteristically manifests itself in reinforced concrete, not only because of its texture but even more because of its innate sculptural properties.

Le Corbusier's seminal pilgrimage chapel of Notre-Dame-du-Haut at Ronchamp in France (fig. **23.4**, fig. **23.5**), built in 1950–54, is a brilliant example of his new sculptural style. Completed during the height of a new formalism in the United States (for example, the cultural center complex of buildings at Lincoln Center in New York City—see fig. 23.34), the Ronchamp chapel represented a radical departure from Le Corbusier's previous projects. Sensitively and elegantly attuned to the hilltop site on which it was built, the structure is molded of white concrete topped by the dark, floating mass of the roof and accented by towers (inspired by Roman emperor Hadrian's villa at Tivoli, near Rome), which together serve as a geometric counterpoint to the main mass. The interior is lit by windows of varying sizes and shapes that open up from small apertures to create focused tunnels of light, evoking a rarefied spirituality. Its external, curvilinear forms and the mystery of its interior recall prehistoric grave forms. Since Ronchamp, form, function, symbolism, and plasticity have all taken on new meaning. This structure succeeded in relaxing architects' formerly traditional attitudes toward form and space; the "box" was finally exploded.

In the fifties, Le Corbusier was finally given the opportunity to put into effect his lifelong ideas on total city planning in the design and construction at Chandigarh, a new capital for the Punjab in India, on which he worked into the sixties. The city of Chandigarh is situated on a plain at the edge of hills, and the government buildings, comprising the Secretariat, the Assembly, and the High Court, rise to the north in the foothills, with the three buildings arranged in an arc around a central area incorporating terraces, gardens, and pools. The Court Building was conceived as a giant umbrella beneath which space was made available for court functions and for the general public. Access roads to the city are largely concealed, while changing vistas are achieved through ingeniously placed man-made mounds. The Assembly Building (fig. **23.6**) is the most impressive of the three, with its ceremonial entrance portico and upward-curving roof set on pylons, the whole reflected in the pool and approached by a causeway. Le Corbusier's achievement is embodied not only in the individual buildings but also in their subtle visual relationships to one another. The total complex constitutes a fitting climax to Le Corbusier's career; it fulfilled the request of the client, Prime Minister Jawaharlal Nehru, that the city be "symbolic of the freedom of India, unfettered by the traditions of the past," in its new era of independent statehood following the end of British rule in 1947.



23.5 Le Corbusier, Notre-Dame-du-Haut, Ronchamp, France, 1950–54.



23.6 Le Corbusier, Assembly Building, Chandigarh, India, 1959–62.

Purity and Proportion: The International Style in America

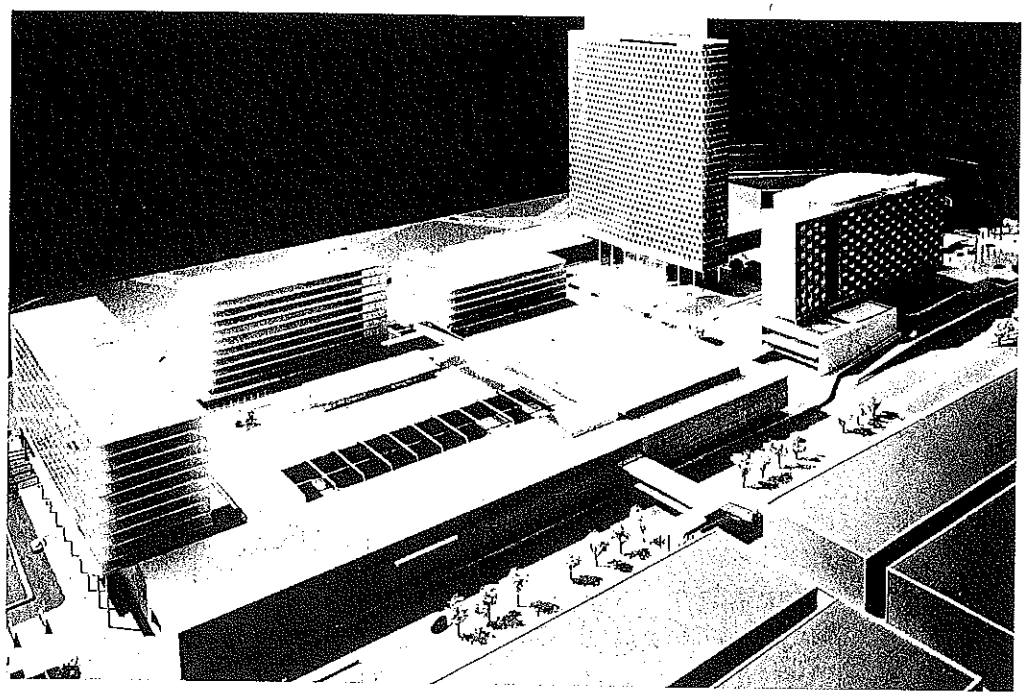
The Influence of Gropius and Mies van der Rohe

In stark contrast to Wright, who always maintained his role as "chief architect" supported by his Taliesin Fellowship, **Walter Gropius** (1883–1969) soon put into effect his principles of collaboration, a "team approach" to design, and his ideas concerning the social responsibilities of the architect (see chapter 16). For Gropius, who had founded

the Bauhaus in 1919 on these ideas, collaboration meant that architects, landscape architects, and city planners would work together to create a cohesive vision of the modern world. This view increasingly gained acceptance in the profession and would eventually triumph over Wright's approach. In 1945, with some of his students, Gropius formed The Architects' Collaborative (TAC) to design buildings in the United States and elsewhere. At Harvard he continued his design of school structures with the Harvard Graduate Center of 1949–50. Here he had the problem of placing a modern building among traditional structures dating from the eighteenth to the twentieth century. He made no compromises with tradition but used stone and other materials to enrich and give warmth and variety to his modern structure. He also commissioned artists such as Miró, Arp, and Albers to design murals, thus introducing to Harvard the Bauhaus concept of the integration of the arts. In his later years with TAC, Gropius moved again into full-scale architectural production. Perhaps the most ambitious of the later designs was the 1953 Boston Back Bay Center (fig. **23.7**), unfortunately never constructed. This was a large-scale project comprising office buildings, a convention hall, a shopping center, an underground parking lot, and a motel. It involved two slab structures set in a T form, raised on stilts above intricate, landscaped pedestrian walks and driveways. The façades were to have been richly textured, and the entire complex represented a superior example of recent American experiments in the creation of total industrial, mercantile, or cultural centers—social and environmental experiments with which Gropius himself had been concerned in Germany during the twenties.

Having completed relatively few buildings before leaving Germany in 1937, **Mies van der Rohe** (1886–1969) was finally able to put his ideas into practice in the United States, a country that since the Depression had witnessed almost no new major public constructions. Big institutions were eager to put up new buildings and to develop a new architecture. In the skyscrapers he created, as well as in the new campus for the Illinois Institute of Technology (IIT), Mies's solutions had an incalculable influence on younger architects everywhere. The plan of the Institute, as drawn by Mies in 1940, has an abstract quality characterized by rectangular complexes. Located in a deteriorating area on the south side of Chicago, the school complex, with its conception of architecture geared to industrialization and standardization, became a model of efficient organization and urban planning. In fact, it inspired large-scale slum clearance in the area, a process that was intended to, but ultimately did not, eliminate overcrowding and physical deterioration of older buildings there. Of steel-and-glass construction, the IIT buildings are organized on a modular principle. Each unit in itself and in relation to others exemplifies Mies's sensitivity to every aspect of proportion and detail of construction.

After having envisioned (but not built) two highly advanced skyscraper designs in around 1920 (see fig. 16.7), Mies was finally able to carry out some of his ideas in his 1951 apartments on Lake Shore Drive in Chicago (see fig. 23.10) and in the 1956–57 Seagram Building, on which Philip Johnson collaborated (see fig. 23.12). Both the Seagram Building, Mies's first New York building, and his 1964 Federal Center in Chicago represent the climax of a development in the United States that began with Sullivan and the Chicago School, was diverted during the age of eclecticism, and gradually came back to its original principles. The common element of this development is the use of steel I-beams, which were fundamental to Chicago



23.7 Walter Gropius, Project for City Center for Boston Back Bay, 1953.

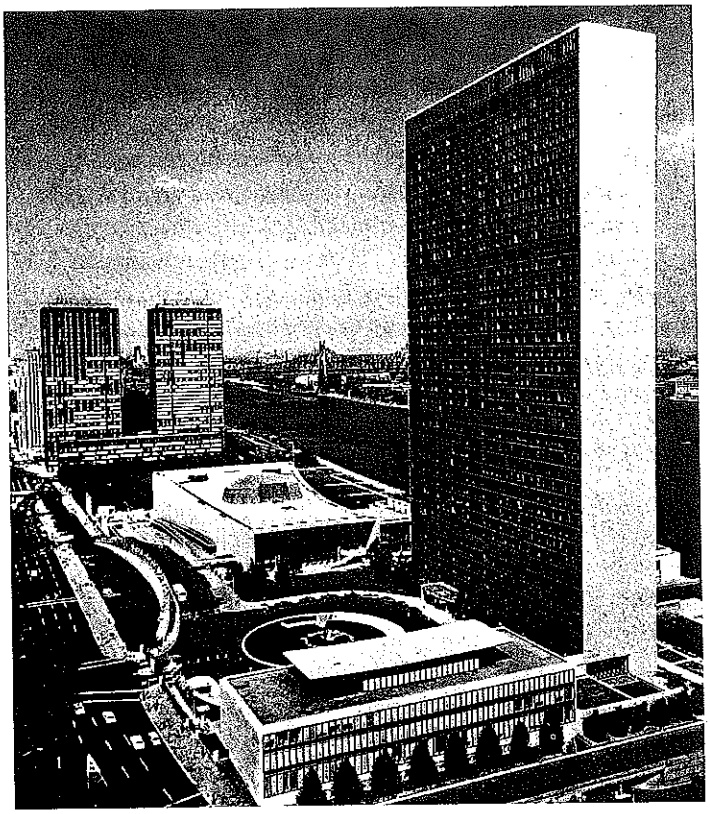
23.8 Mies van der Rohe, New National Gallery, Berlin, 1968. Sculpture by Alexander Calder.

School construction and which Mies used almost decoratively on the exteriors of some of his skyscrapers. In his later works, such as the 1963–68 National Gallery in Berlin (fig. **23.8**), Mies not only refined his modular system to a point of utmost simplicity, but, using a suspended frame structure, was able to realize his ideals of a complete and uninterrupted interior space divisible or subdivisible at will. For Mies, space was neutral and floating; the structure was a grid. Many imitators have tried to copy his forms through their continuous repetition of the steel-and-glass motif, but usually without his feeling for space, scale, and proportion. His perception of universal, open, and flexible space is as fundamental to modern architecture as is the free plan of Le Corbusier.

Skyscrapers

In 1947, an international group of architects (including Le Corbusier and Oscar Niemeyer—see below) met in New York under the general direction of **Wallace K. Harrison** (1895–1981) to design the permanent headquarters of the newly formed United Nations organization (fig. **23.9**). Situated at the edge of New York's East River and built between 1947 and 1950, this building was the first monument of the postwar renaissance in American architecture. Symbolically the most important building to be constructed in the aftermath of World War II, the headquarters complex represents the epitome of modern functionalism and midcentury optimism. Aesthetically, it attempted to replace diverse national traditions with a design appropriate to the universal concept of the new world organization. The thirty-nine-story Secretariat, a glass-and-aluminum curtain-wall building, introduced to the United States a concept of the skyscraper as a tall, rectangular slab; in this case the sides are sheathed in glass and the ends are clad in marble.

Le Corbusier was principally responsible for the main forms of the Secretariat, but its simplified, purified structure embodies the Bauhaus tradition of Gropius and Mies van der Rohe, who designed the Lake Shore Drive Apartments in Chicago in 1951 (fig. **23.10**). The skyscrapers of Louis Sullivan and the Chicago School fascinated Mies and drew him to study the skyscraper form. The basic



23.9 Wallace K. Harrison, United Nations Headquarters, New York, 1947–50.

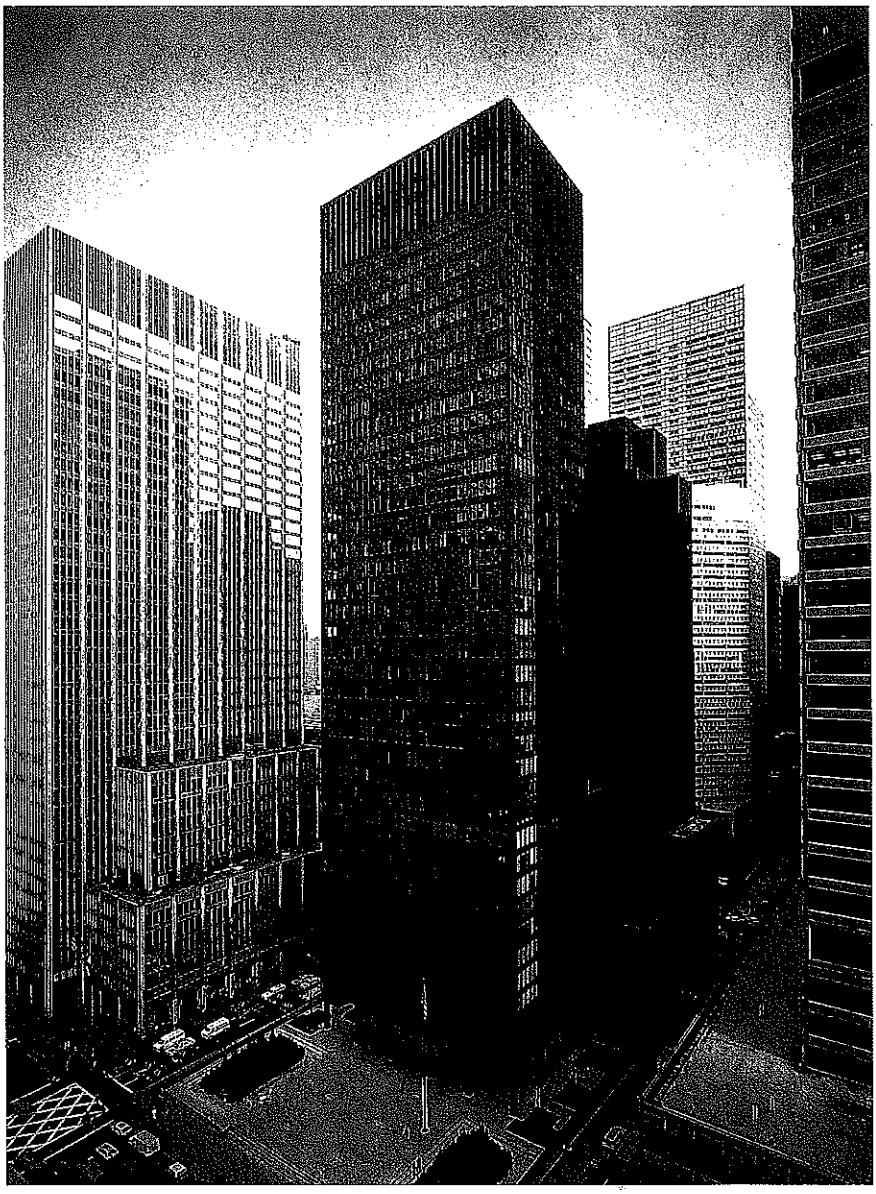
23.10 Mies van der Rohe, Lake Shore Drive Apartments, Chicago, 1951.

problems—of steel structure, its expression, and its sheathing—were of longstanding interest. (He had already explored these problems in his earlier unbuilt skyscraper designs.) The twin Lake Shore apartment buildings consist of two interrelated twenty-six-story vertical blocks set at right angles to each other. The steel structural members accent the verticality. As is customary with Mies, the structures are built on a module and have floor-to-ceiling windows.

The inspiration of Mies and the United Nations building led immediately to the first large office building of the fifties, Lever House (fig. **23.11**), completed in 1952 by the architectural firm of **Skidmore, Owings & Merrill**, with Gordon Bunshaft as chief architect. Lever House, which was intended as a monument-symbol for an international corporation, is a tall rectangular slab, occupying only a small part of a New York city block. It is raised on pylons that support the first enclosed level—the principal public areas—thus giving the total structure a vertical L-shape. The building is one of the first to have an all-glass-clad façade and windows of alternating horizontal ribbons of opaque green and light green tinted glass.

Across Park Avenue from Lever House is a masterpiece of skyscraper architecture, Mies van der Rohe's 1958 Seagram Building (fig. **23.12**). In it Mies and Philip

23.11 Skidmore, Owings & Merrill, Lever House, New York, 1951–52.



23.12 Mies van der Rohe and Philip Johnson, Seagram Building, New York, 1958.

Johnson were given an unparalleled opportunity to create a monument to modern industry, comparable to the Gothic cathedrals that had been monuments to medieval religious belief. The building is a statement of the slab principle, isolated with absolute symmetry within a broad plaza lightened by balanced details of fountains. The larger skeleton structure is clearly apparent within the more delicate framing of the window elements that sheathe the building. The materials of bronze and amber glass lend the exterior an opaque solidity that does not interfere with the total impression of light that fills the interior. The building is perhaps the consummate expression of Mies's emphasis on "the organizing principle of order as a means of achieving the successful relationship of the parts to each other and to the whole." In addition to its dramatic utilization of International Style principles of design, the Seagram Building is noted also for its detachment from the surrounding city streets. A deeply set plaza pushes the building away from the busy traffic, while the abrupt termination of the glass curtain—one floor above the plaza—appears to raise the building on stilts. No other building of modern times has had such influence on subsequent skyscraper design. Through the late sixties and seventies, skyscrapers were constructed in increasing numbers and heights throughout the world, although distinguished examples of the form were the exceptions.

Until 1974, the world's tallest skyscraper (1,454 feet, or 443 m) was the Sears Tower in Chicago (fig. **23.13**), designed by Skidmore, Owings & Merrill. Conceived as a bundle of nine "tubes" lashed together for mutual bracing, the Sears Tower would seem to return to the original pragmatism of Bauhaus aesthetics, in that each of the independent but clustered tubes has its own height and setback, dictated by the internal needs of corporate activity.

23.13 Skidmore, Owings & Merrill, Sears Roebuck Tower, Chicago, 1966–69.

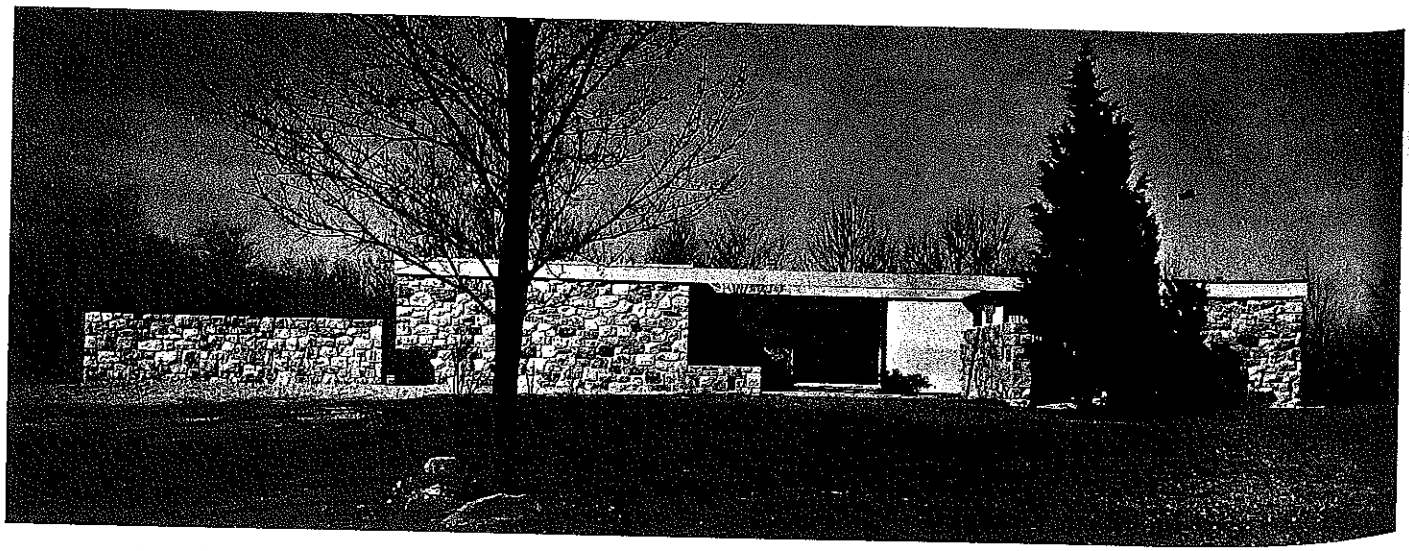
The blank anodized aluminum skin is highly functional—it resists weathering and soot better than other materials, while also symbolizing the sobriety of the retailing enterprise originally headquartered within the structure.

Domestic Architecture

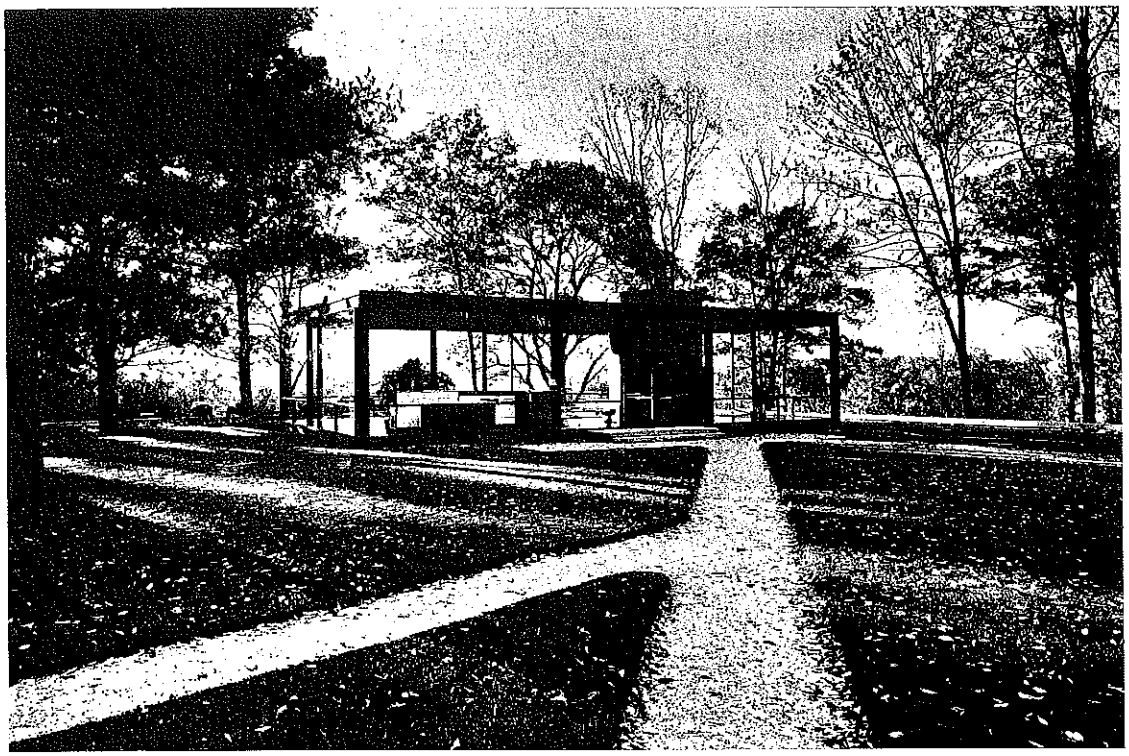
After World War II, as roads and highways made outlying areas more accessible than ever, and as a war-based economy was replaced by peacetime values and normalization of life, the market for single-family houses exploded. The variations on the theme of the detached house in the International Style were endless and interchangeable from country to country. Much of the early American architecture of Gropius and Breuer consisted of homes following Bauhaus principles. For Gropius, standardization satisfied the needs of the masses for economical housing. Marcel Breuer's own second house at New Canaan, Connecticut, built in 1951, illustrates his ability to use materials that blend with the local environment. In this case, Breuer selected principally concrete and fieldstone, with weathered wood beams used for the ceilings (fig. **23.14**).

Mies van der Rohe built only one house in the United States—the Farnsworth House in Plano, Illinois—but Philip Johnson's own home, Glass House, in New Canaan, Connecticut (1949) (fig. **23.15**), is a classic extension of Miesian principles of uninterrupted interior space. Few "boxes" have reached the level of rationalism and sophistication of the main house, which is a transparent glass "box." With its supreme structural clarity, the main house provides protection yet destroys the boundaries between nature and interior space, while the guesthouse, at the other extreme, is an enclosed structure.

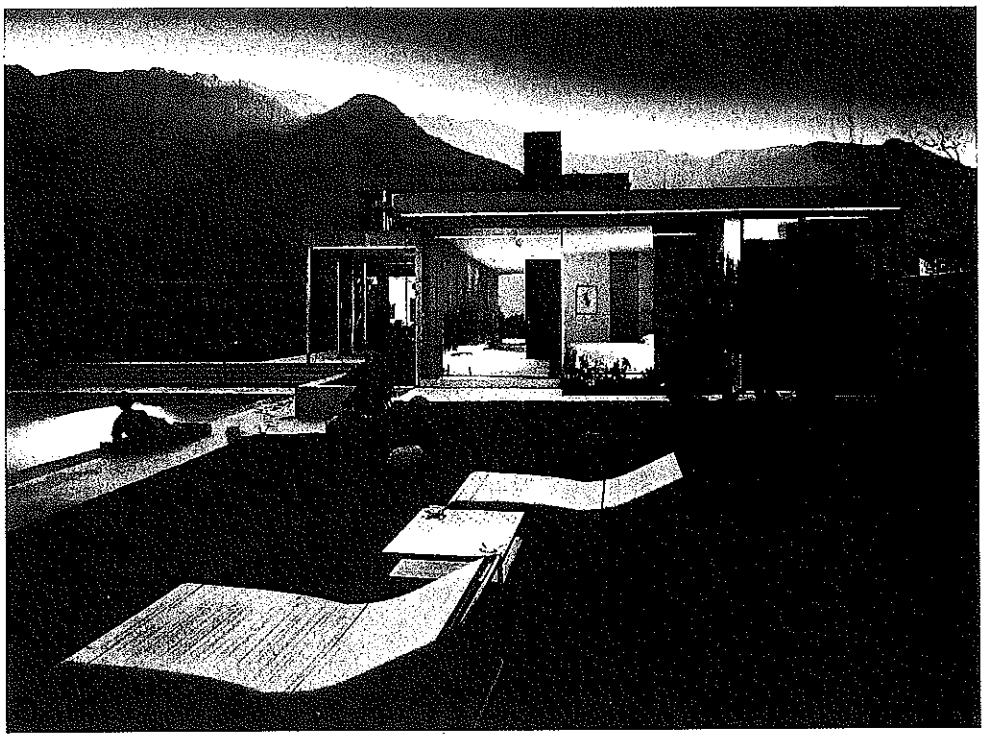
Richard Neutra (1892–1970), an émigré from Austria, developed his practice on the basis of the American preoccupation with building houses. A winter home in Palm Springs, California, for Edgar Kaufmann—the same client who in the thirties had commissioned Fallingwater from Frank Lloyd Wright (see fig. 16.16)—was designed for a desert site by Neutra, who had been an employee of Wright in the twenties. Set against a spectacular backdrop, the Kaufmann House (1947) (fig. **23.16**) is pristine and cool in its elegant rectilinearity. Glass is used generously, and the plan is arranged so that the space flows from interior to exterior with unfettered freedom. Walls can be pulled back to allow the interior to become part of the wide outdoor courtyard spaces. Neutra combined glass, stucco, and natural rock in this house, which is shaped in a cross



23.14 Marcel Breuer, House II, New Canaan, Connecticut, 1951.



23.15 Philip Johnson, Glass House, New Canaan, Connecticut, 1949.



23.16 Richard Neutra, Kaufmann House, Palm Springs, California, 1947.

of two intersecting axes. In his work and writing, Neutra advocated the link between architecture and the general health of the human nervous system. His physiological concerns addressed the beneficial impact of well-designed architecture and ambient environment. Though his buildings could function independently of their site, Neutra, like Wright, felt that landscape was more important than historical precedent.

Internationalism Contextualized: Developments in Scandinavia, Europe, Latin America, Asia, and Australia

Finland

Alvar Aalto (1898–1976) created architecture that is characterized by a warmth and humanity in his use of materials; by buildings that are individualized; and by a harmony with human scale. Aalto never abandoned the timeless quality of the traditional architecture of his Finnish homeland. His structures seem to grow out of the site and to solve particular design problems, whether those of factory, house, school, or town plan. Aalto was also a leading furniture designer known for his bentwood chairs and tables.

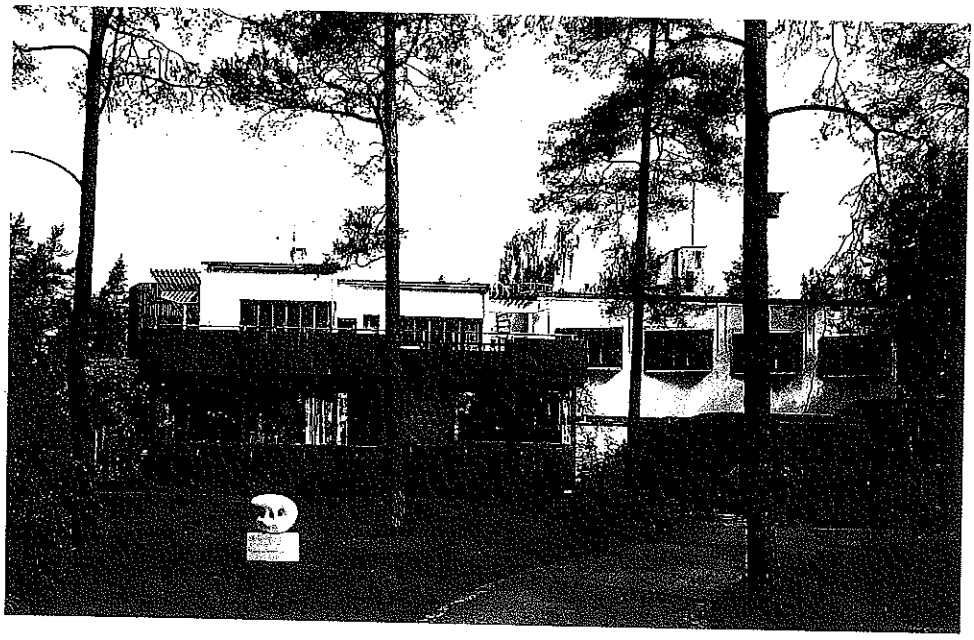
Aalto made his debut in 1937 with the interior of the Savoy Restaurant in Helsinki, where he introduced his perforated plywood screen and free-form furnishings, quite different in style from the understated luxury of the Villa Mairea (1939) in Noormarkku, Finland (fig. **23.17**), designed for patrons Harry and Maire Gullichsen. The villa anticipates Aalto's own words of the following year, when he wrote that the function of architecture is to "bring the material world into harmony with human life." Villa Mairea is highly compatible with natural materials and clearly harmonizes with the fir forest that surrounds it. Aalto employed polished teak and other woods and rough masonry throughout in order to soften the modernist rigor of his design. Warm-toned wood is used inside in the paneled flooring and slatted ceilings, the columns, and in his own birchwood furniture.

Aalto's was a major response against the machine aesthetic that was creative rather than reactionary. In nonresidential buildings, traditional rectangular windows replaced the "orthodox" glass curtain wall. He expanded the vocabulary of avant-garde architecture to the point where the original sources of the new style all but vanished, and he established a distinctly personal alternative. Irregular, even picturesque, shapes and masses dominate his work, but the very informality of his buildings defies comparison with Mies or Le Corbusier. There are affinities in Aalto's work with the organic, site-specific forms of Wright, the exuberant expressionism of Erich Mendelsohn, and the cool rationality of Gropius. But his free-form brick and glass-brick walls and undulating wood vaults made fresh use of natural materials. Even his grandest structures have a human scale. His versatility helped establish a distinctive brand of modernism that still flourishes in Finland and Scandinavia.

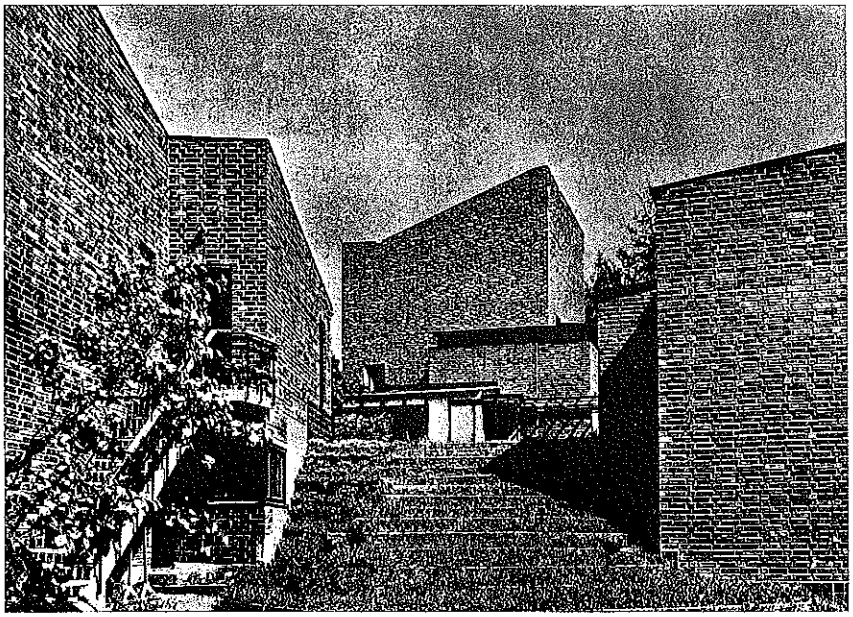
As the leading architect of far northern Europe, Aalto had opportunities to experiment with public buildings, churches, and town planning, and he achieved one of his most personal expressions in the Town Hall at Säynätsalo (fig. **23.18**). This is a center for a small Finnish town, and includes a council room, library, offices, shops, and homes. The brick structure with broken, tilted rooflines merges with the natural environment. Heavy timbers, beautifully detailed, are used for ceilings to contrast with the brick walls inside. Somewhat romantic in concept, this center illustrates the combination of effective planning and respect for the natural environment characteristic of Aalto and the best northern European architecture.

Great Britain

After the pioneering work of the late nineteenth century by William Morris, Philip Webb, Charles Voysey, and Charles Rennie Mackintosh (see figs. 4.6, 4.8, 4.9), there was little experimental architecture in Great Britain during the first decades of the twentieth century. The arrival in Britain in the thirties of the architects Gropius, Breuer, Mendelsohn,



23.17 Alvar Aalto, Villa Mairea, Noormarkku, Finland, 1939.



23.18 Alvar Aalto, Town Hall, Säynätsalo, Finland, c. 1950–53.

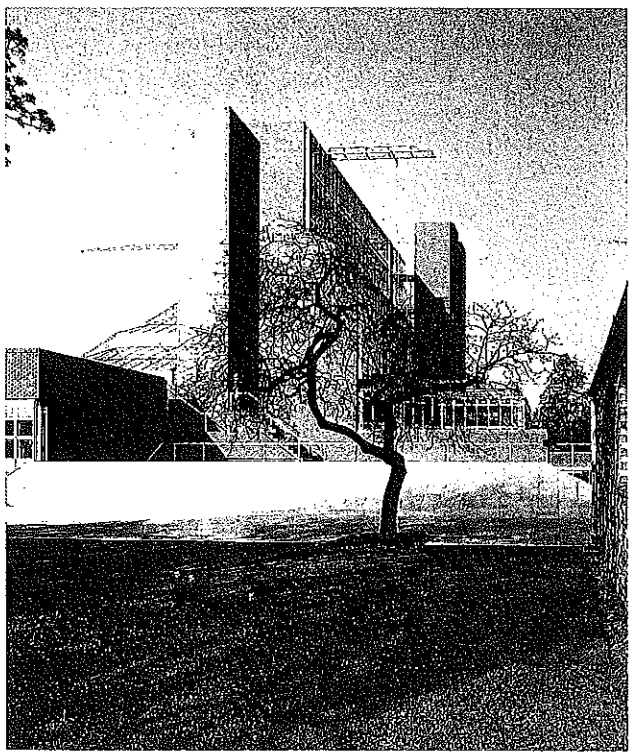
and the Russian Serge Chermayeff stimulated new thinking. But World War II interrupted any new work and, after the war, budgetary limitations prevented large-scale architectural development. Although few great individual structures were built in England in the mid-twentieth century, progress was made in two areas: town and country planning, and the design of schools and colleges.

The work of **James Stirling** (1926–92), one of the most imaginative and influential British architects of the postwar period, is associated with the tradition of Le Corbusier. Stirling had a masterly ability to combine all sorts of materials—glass, masonry, and metal—in exciting new contexts. Like Louis Kahn's work (see fig. 23.37), Stirling's early buildings are not so much functional, in the original International Style sense, as they are expressive and personal. With James Gowan he designed the low-cost housing complex of Ham Common in England in 1958, when he was studying the later ideas of Le Corbusier and exploring the possibilities of readymade products in new architectural contexts. In the 1968 Cambridge University History Faculty (fig. **23.19**), Stirling used a cohesive approach to achieve a dense and complex spatial integration. Although Stirling was an important teacher and thinker in his field, he was often pessimistic about the state of modern architecture. This is ironic because his own accomplishments continually demonstrated modern architecture's possibilities, especially, as we shall see, in his Postmodern work (see fig. 25.16).

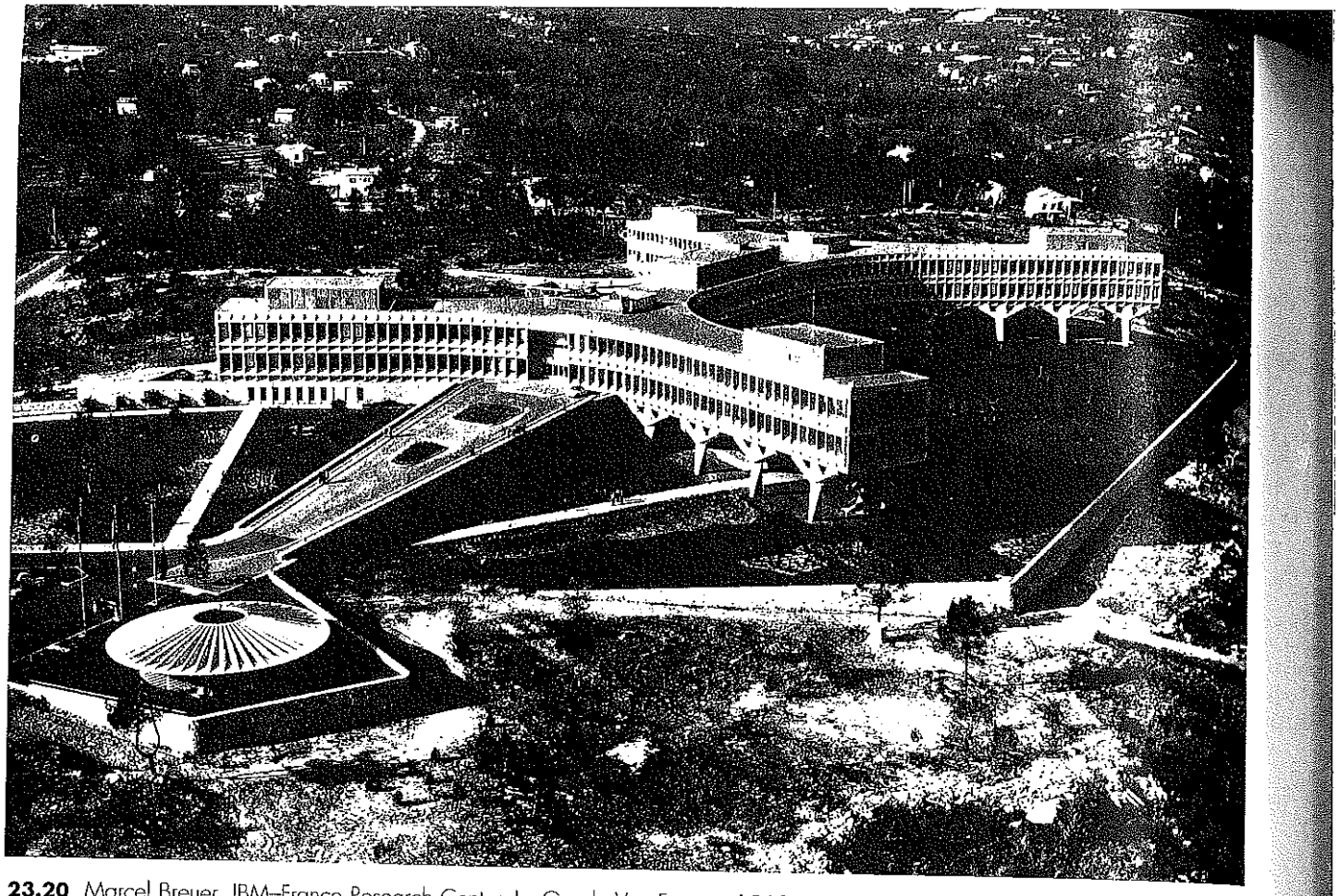
France

With the exception of works by the titanic figure of Le Corbusier and earlier ones by Auguste Perret (see fig. 12.25), French architecture of the twentieth century had comparatively few moments of inspiration. This was in part the result of the continuing academic system of training for architects and the persisting influence of a bureaucratic old guard. Swiss-born Le Corbusier produced a number of masterpieces in France, but he ultimately achieved greater standing elsewhere.

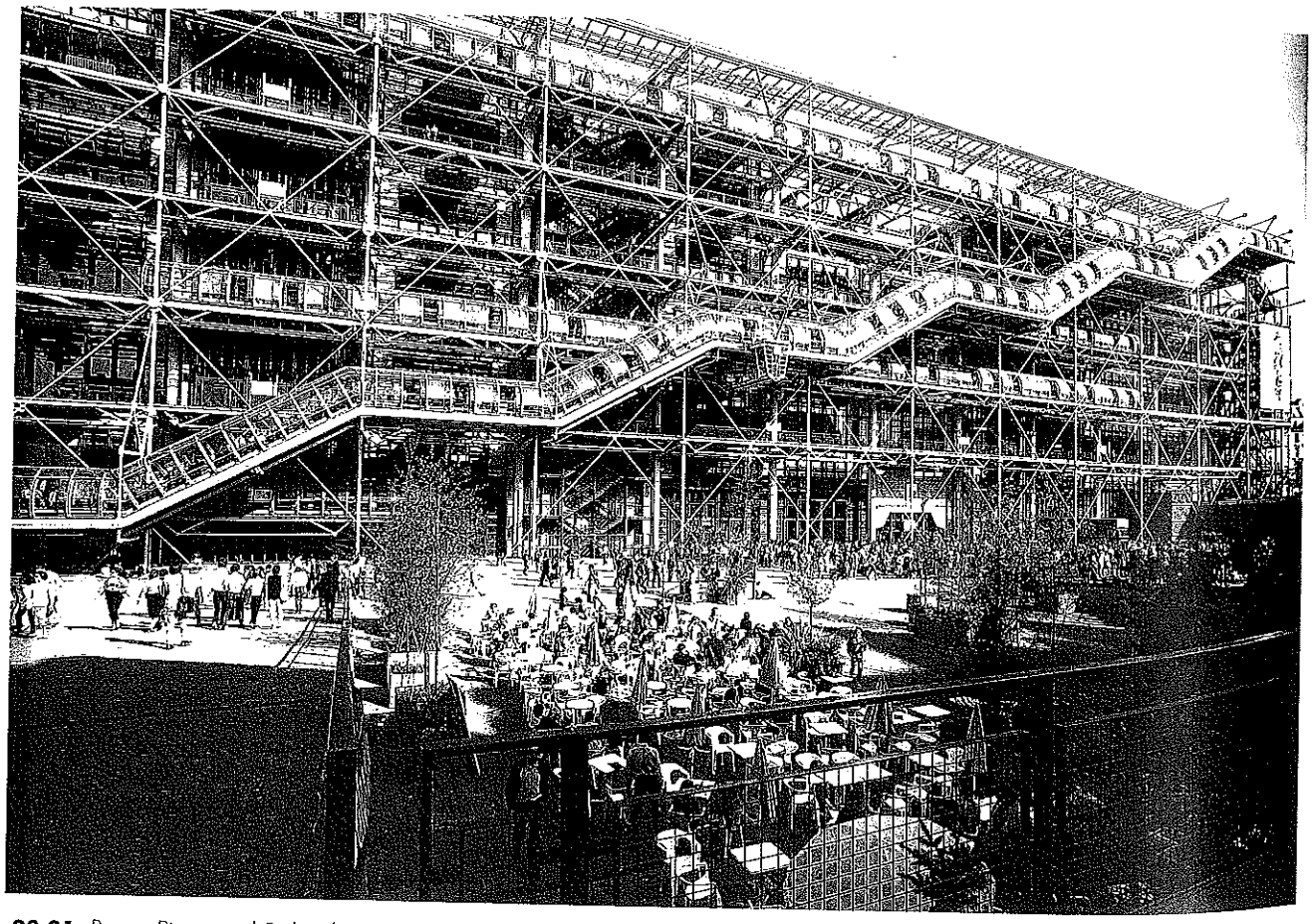
The most ambitious postwar structure erected in Paris was that of the Y-shaped building for the United Nations Educational Scientific and Cultural Organization (UNESCO), designed by an international team of architects that included the Hungarian Breuer and the French Bernard Zehrfuss with the Italian architect-engineer Pier Luigi Nervi. The total complex is excellently adapted



23.19 James Stirling, History Faculty, Cambridge University, England, 1968.



23.20 Marcel Breuer, IBM–France Research Center, La Gaude Var, France, 1960–62.



23.21 Renzo Piano and Richard Rogers, Centre National d'Art et de Culture Georges Pompidou, Paris, 1971–78.

to a difficult site and is adorned by a large number of sculptures, paintings, and murals by artists such as Miró, Calder, Picasso, Noguchi, and Henry Moore. Breuer developed the ideas and plan of the UNESCO building into his work on a research center for IBM–France at La Gaude Var (fig. **23.20**). This is a huge structure of a comparable, double-Y plan, with windows set within deep, heavy, concrete frames, the whole on concrete supports. The effect is of openness and airiness combined with massive, rugged detail.

As a result of an important postwar international competition, the most sensational and hotly debated building to be designed in the sixties (erected in Paris during the early seventies) was the high-tech extravaganza officially known as Le Centre National d'Art et de Culture Georges Pompidou designed by **Renzo Piano** (b. 1937) and **Richard Rogers** (b. 1933). (It is referred to as the Pompidou Center after the then-president, and also as the Beaubourg after the market district on which it was built.) One of the few constructed buildings conceived by England's Archigram Group (an association that derived from the British avant-garde), the Pompidou Center (fig. **23.21**) is an icon to Parisian popular culture, housing France's national museum of modern art, a public library, an audiovisual center, a rooftop restaurant, and, added later, an Internet café. In its time, the design achieved a new standard in open-space flexibility. The structural and service functions were channeled along the outer walls, leaving the interior open to be freely subdivided, and suitable for a multitude of changeable institutional and public uses. The Pompidou Center takes Bauhaus pragmatism and technology as its point of departure, only to transform them into a surreal dream of pipes and trusses, marine funnels and vents, most of which festoon the exoskeleton. With its exposed fretwork, its clearly expressed structure and services, and its great diagonal escalators, as well as its bright colors and open planning, the building, as one commentator remarked, is like "a child's Tinkertoy fantasy realized on an elephantine scale." Despite a gargantuan appetite for fuel and difficult-to-manage, barnlike galleries, the Pompidou Center is a great popular success, partly because of a five-story outside escalator, whose transparent plastic tubes offer riders a moving, spectacular view of Paris and the immense, open plaza below. The latter has become a forum—like the parvis of a medieval cathedral (the open space in front of and around the building)—for the whole human carnival, from artists displaying their works to jugglers and, of course, tourists and Parisians going about their daily business.

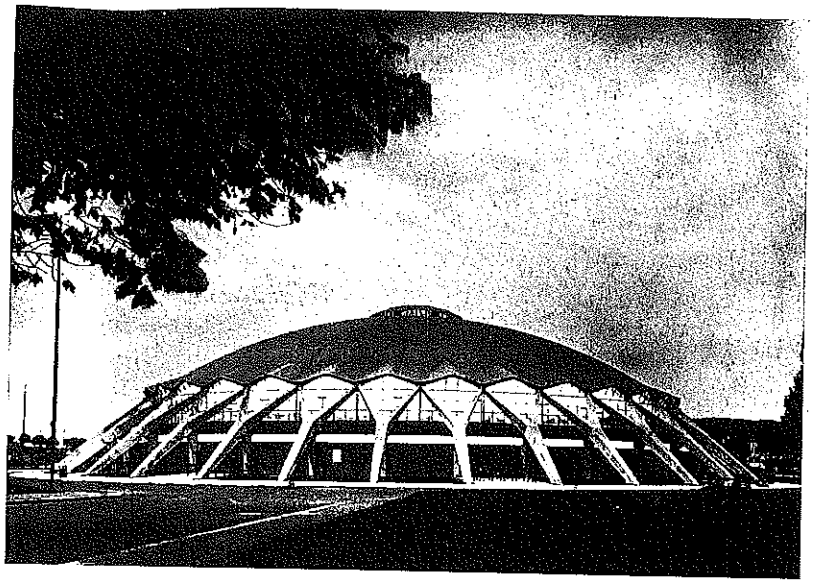
Germany and Italy

As we have seen, Germany until 1930 was a world leader in developing new architecture. During the Nazi regime, German architecture declined from its position of world leadership to academic mediocrity. After the war, morale was low for those architects and artists who had remained in Germany through the war years. While America was enjoying prosperity, Germany underwent a slow, traumatic period of rebuilding, and it took that country a full decade to recover the principles forcibly surrendered to the Nazis.

In Italy, modern architecture made a somewhat belated arrival, perhaps because the sense of the past was so strong. The visionary Futurist Antonio Sant' Elia was killed in World War I at the age of twenty-eight, before he had a chance to execute his concepts for cities of the future (see fig. 12.27). His ideas faded along with Futurism, and his influence was diffused principally through publications that inspired pioneers outside of Italy, importantly Le Corbusier and the architects of de Stijl and the Bauhaus.

Although progressive architecture was not formally suppressed by Italian fascism, as it was in Germany under the Nazis, the climate did not favor growth. The official governmental style looked back to showy, nationalistic monumentalism, of which the nineteenth-century monument to Victor Emmanuel II in Rome is the most conspicuous example. In 1933 a group of younger architects, gruppo 7, banded together and called for a functional and rational architecture that would value form over surface in modern architecture. A few outstanding, though isolated, buildings resulted from this and other aspects of Italian rationalism between the wars, notably the aesthetically pure 1932–36 Casa del Popolo (House of the People) at Como, designed by Giuseppe Terragni (1904–42). Originally designed as a building wrapped around three sides of a square court, the structure is a simple half-cube. The court, which became a large meeting hall, stands in radical contrast to the Renaissance cathedral opposite it. After World War II, Italy expanded its experiment beyond progressive architecture, moving into a position of European and even world leadership in many aspects of industrial, product, and fashion design.

The most influential of Italy's prewar design giants was the engineer-architect **Pier Luigi Nervi** (1891–1979). Nervi had a resounding ability to translate engineering structure into architectural forms of beauty. Chronologically he belongs with the pioneers of modern architecture, and his fundamental theses were stated in a number of important buildings executed during the thirties. Working with reinforced concrete, his main contribution was the creation of new shapes and spatial dimensions with this material. As in the work of Mies van der Rohe, Nervi's buildings show a subtle fusion of structure and space. But while Mies searched for free internal space, Nervi's aesthetic was dependent on an energetic display of the structural parts of a building. One of the most important commissions of his career was the design of an aircraft hangar in 1935, the first of a number of variants that he built for the military from 1936 to 1941. These hangars, which involve vast, uninterrupted concrete roof spans, led him to study different ways to create such spans. He learned how to lighten and strengthen his materials and to integrate aesthetic and structural variations in his designs.

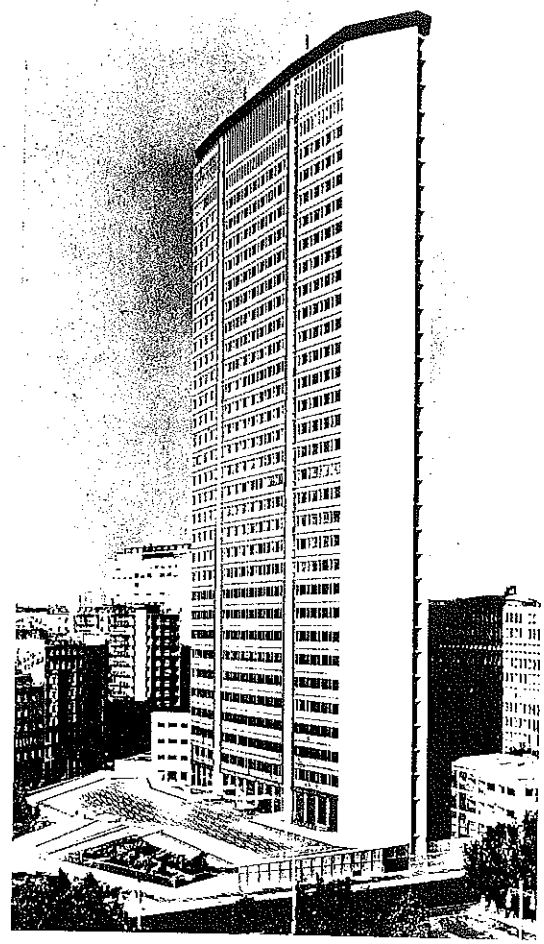


23.22 Pier Luigi Nervi and Annibale Vitellozzi, Sports Palace, Rome, 1956–57.

In 1948–49, his Exhibition Hall was built in Turin, using prefabricated concrete units to create a vault spanning 312 feet (95 m).

In the fifties, Nervi developed the technique of hydraulic prestressing of ferroconcrete, which made it possible to lighten the support of buildings. Two of the dramatic applications of his experiments with ferroconcrete are the small and large sports palaces built for the 1960 Olympic Games in Rome (fig. **23.22**). The smaller one, seen here, meant to hold four to five thousand spectators, was built in 1956–57, in collaboration with the architect Annibale Vitellozzi. The building is essentially a circular roof structure in which the enclosed shell roof, 197 feet (60 m) in diameter, rests lightly on thirty-six Y-shaped concrete supports. The edge of the roof is scalloped, both to accentuate the points of support and to increase the feeling of lightness. A continuous window band between this scalloped edge and the outside wall provides uniform daylight and adds to the floating quality of the ceiling. On the interior, the ceiling, a honeycomb of radiating, interlaced curves, floats without apparent support. The shell domes of the small and large sports palaces became prototypes for other such structures.

During the fifties and sixties, Nervi collaborated with architects all over the world, including Italy's own **Gio Ponti** (1891–1979). The distinguished Ponti was the chief architect of the Pirelli Tower in Milan (fig. **23.23**), the result of a close collaboration between architects and engineers. Ponti developed slowly but consistently from Neoclassical beginnings toward an elaborate modernism. The Pirelli Tower, for which Nervi was the structural engineer, remains Ponti's masterpiece, one of the most lucid and individual interpretations of the skyscraper yet achieved. In contrast to most American skyscrapers built before the fifties, it is a separate building surrounded by lower structures, designed to be seen from all sides. The

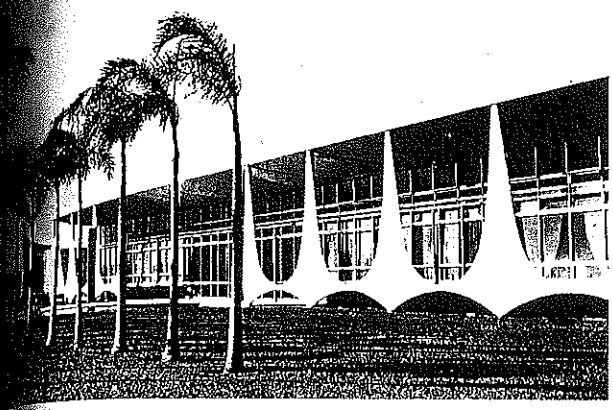


23.23 Gio Ponti, Pier Luigi Nervi, and others, Pirelli Tower, Milan, Italy, 1956–59.

architect was concerned with making it a total, finite, harmonious unit. A boat shape, rather than the customary rectangular slab, was used. The thirty-two-story building is carried on tapering piers, resulting in the enlargement of the spaces as the piers become lighter toward the top. The entire building, with the diagonal areas at the ends enclosed and framing the side walls of glass, has a sculptural quality, a sense of solidity and mass unusual in contemporary skyscraper design.

Latin America, Australia, and Japan

A spectacular example of the spread of the International Style occurred in Latin America after 1940. Le Corbusier's participation in the design of the Ministry of Education and Health in Rio de Janeiro between 1937 and 1943 provided the spark that ignited younger Latin American architects, among them **Oscar Niemeyer** (b. 1907) in Brazil. Le Corbusier's influence is apparent in most of the subsequent development of Brazilian architecture, but Niemeyer and his contemporaries added expressionist and Baroque elements—such as curving shapes and lavish use of color reflecting the Latin American tradition—to plans and façades. In his Pampulha buildings of the early forties, Niemeyer hinted at an integration of painting and



23.24 Oscar Niemeyer, Palace of the Dawn, Brasília, Brazil, 1959.

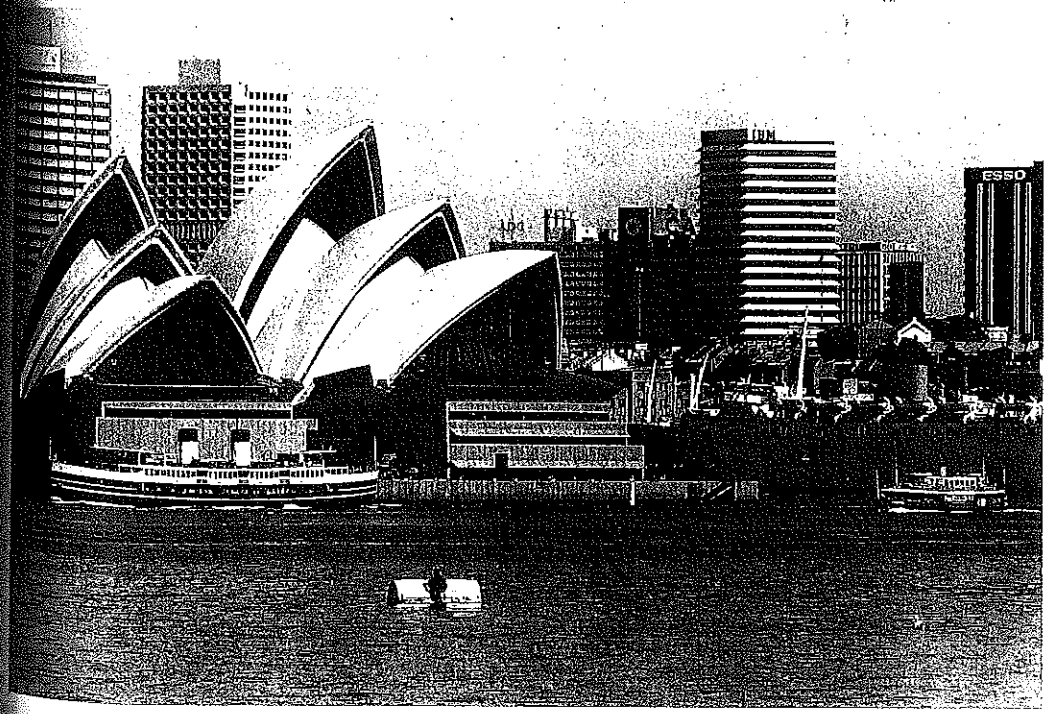
chitecture and effectively introduced a wilder interplay forms and levels into his buildings.

Niemeyer's greatest work, and one of the most dramatic ommissions in the history of architecture, was the design the entire city at Brasília, the new federal capital of Brazil g. **23.24**). The general plan of the city was laid out Lúcio Costa, who won the competition sponsored by razil's president in 1956. Niemeyer, as chief architect, as entrusted with the principal public buildings. Costa's uild plan was essentially two axes in the form of a cross. Niemeyer designed large-scale civic buildings for the top of he cross, with residential sites along the two arms of the orizontal axis, incorporating places for work and recre-tion. The idea of building an entire utopian city far emoved from any of the principal centers of commerce nd industry probably doomed Brasília to failure as a socially integrated community. At a time in the history of architecture when very little attention was being paid to concepts of total urban planning, such a project must be seen as important, despite its deficiencies and failures.

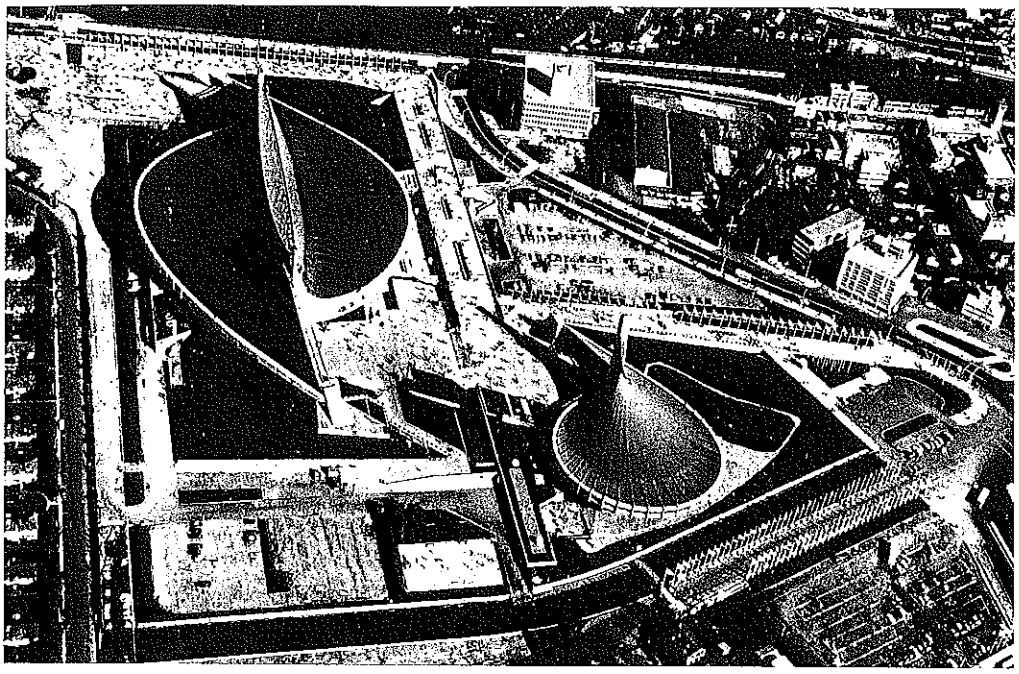
In Australia, too, there was a comparable development of new architectural forms, from the slab skyscraper to the integrated educational institution and advanced experiments in housing and urban planning. The most spectacular modern structure is the sail-form, freestanding Sydney Opera House of 1972 on Bennelong Point (fig. **23.25**), jutting out into Sydney Harbor. The architectural firm of Hall, Todd, and Littleton succeeded the Danish architect **Jørn Utzon** (b. 1918), who made the original design. This cultural center includes an opera hall, a theater, an exhibition area, a cinema, and a chamber music hall.

Postwar architects in Japan exploited possibilities that had been previously regarded as utopian. An independent style in modern Japanese architecture has been apparent only since the sixties. Before then, most of the new building was in derivative commercial modern style, particularly in Tokyo, where there were few buildings of distinction or originality. Modern architecture in Japan, despite a long history of sporadic progressive examples extending back to Frank Lloyd Wright's Imperial Hotel (see fig. 12.6), was only at its inception after World War II. While assimilating the powerful influence of Le Corbusier, the tradition of Japanese architecture (which for centuries embodied so many elements that today are called modern), helped to turn contemporary influences into something authentically Japanese.

One of the most significant later twentieth-century Japanese architects is **Kenzo Tange** (b. 1913), whose work in the fifties and sixties combined rationalist and traditional directions in Japanese aesthetics. Like most Japanese

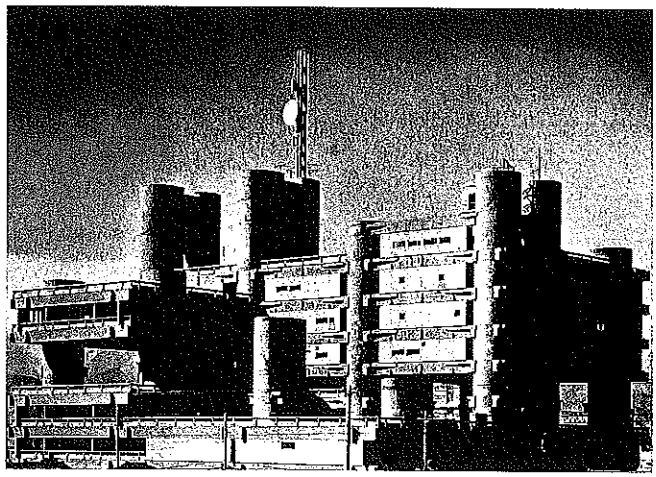


23.25 Jørn Utzon and Hall, Todd, and Littleton, Sydney Opera House, Bennelong Point, Sydney Harbor, Australia, 1972.



23.26 Kenzo Tange, Aerial view, The National Gymnasiums, Tokyo, 1964.

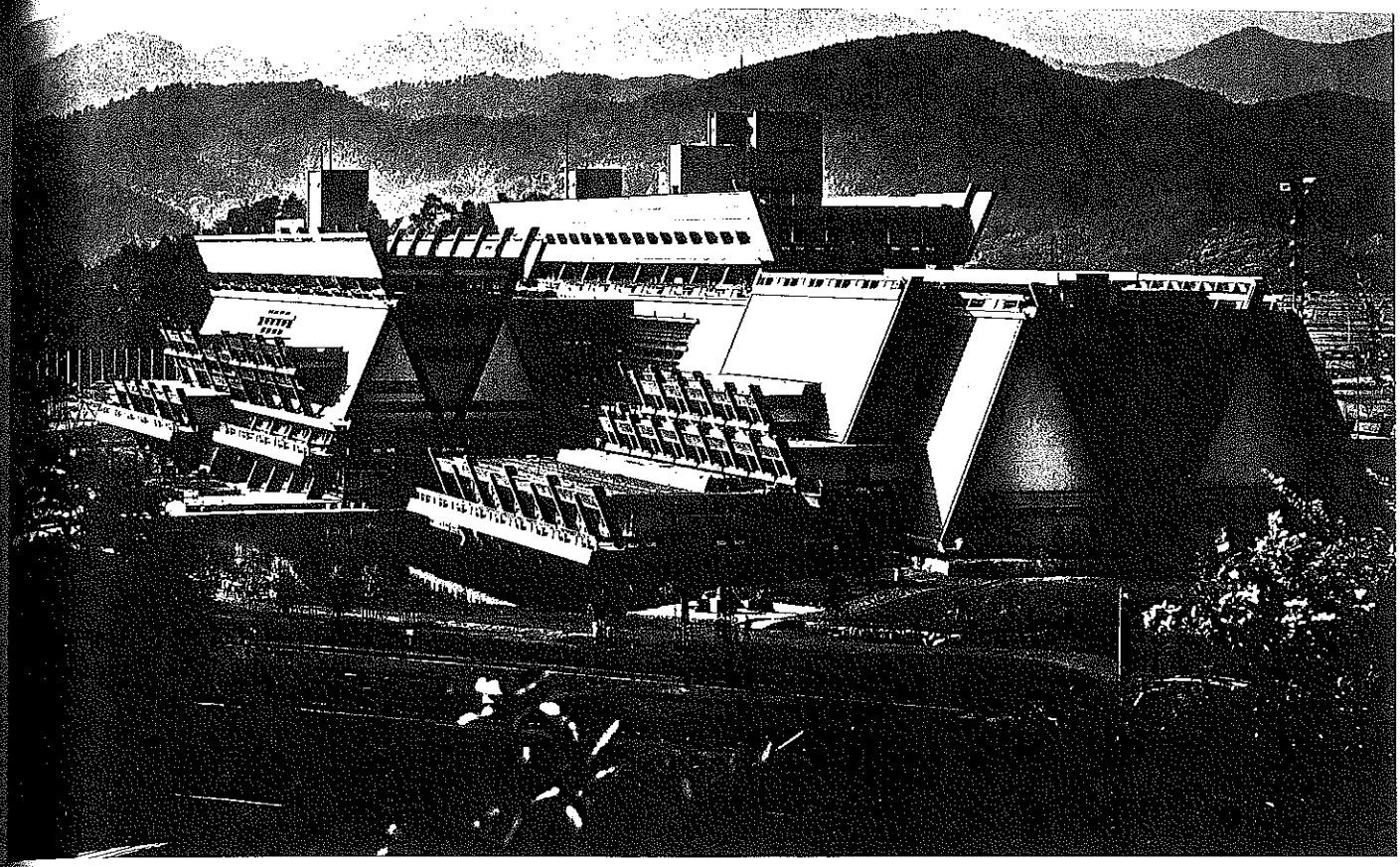
architects of his generation, Tange was a disciple of Le Corbusier and particularly of Le Corbusier's later, Brutalist style. Tokyo City Hall, a work of 1952–57, is a rather thin version of Le Corbusier's Unité d'Habitation (see fig. 23.3), but with the Kasagawa Prefecture Office at Takamatsu (1955–58), Tange used a combination of massive, direct concrete treatment and horizontally accentuated shapes reminiscent of traditional Japanese architecture. Perhaps Tange's most striking achievement is the pair of gymnasiums that he designed for the Olympic Games held in Tokyo in 1964 (fig. **23.26**). Both steel-sheeted roofs, somewhat resembling seashells, are suspended from immense cables, and their structure is at once daring and graceful. The larger roof hangs from two concrete masts, while the smaller is ingeniously suspended from a cable spiraling down from a single mast. The Brutalism of the buildings themselves, with their rough surface texture and frank structure, gives the complex—set as it is on a huge platform of undressed stone blocks—a sense of enduring drama.



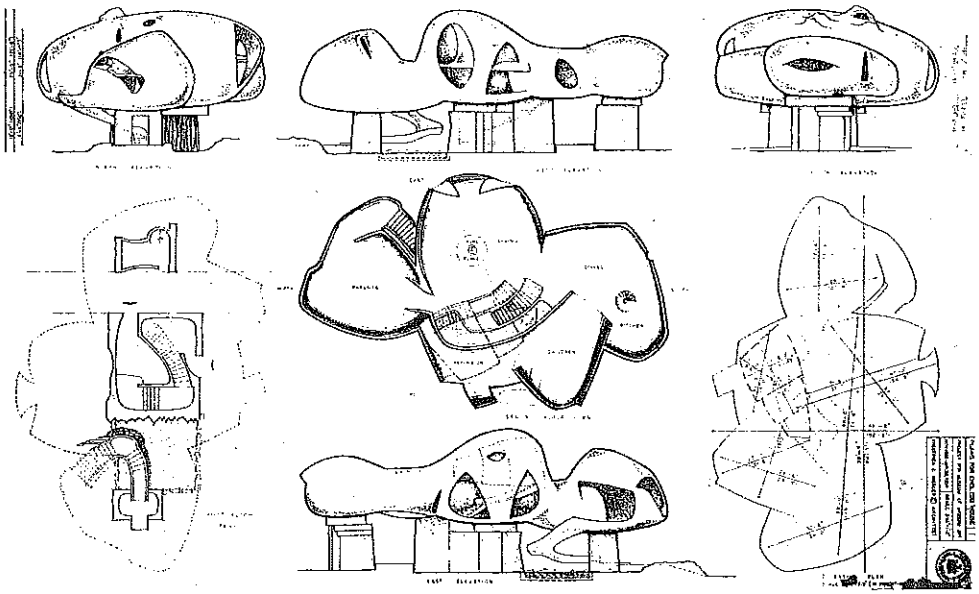
23.27 Kenzo Tange, Yamanashi Press Center, Kofu, Japan, 1967.

Tange's Yamanashi Press Center in Kofu (fig. **23.27**) is a fantastically monumental structure in which immense pylons provide for elevator and other services and act visually as tower supports for the horizontal office areas. The total impact is like that of a vast Romanesque fortified castle. The interior, however, is open and flexible, with spaces defined by movable shoji screens that allow occupants easily to adapt their space to changing needs. Reminiscent of traditional timber post-and-beam constructions, the press building is one of the earliest examples of a reaction against the abstract, homogenous trends of modern architecture. Its very "uncompletedness" is an important aspect of its design; it is open-ended and not confined by more traditional architectural approaches that rely on finite elevations and concise imagery.

Another Japanese architect who followed the late Le Corbusier line is Takeo Sato, whose City Hall in Iwakuni merges the design of a traditional Japanese pagoda with modern building materials including concrete and glass. Similarly, **Sachio Ohtani**'s (b. 1924) International Conference Building in Kyoto (fig. **23.28**) is a massive structure that houses meeting and exhibition rooms, restaurants, administrative offices, shops, and recreation areas. Employing old trapezoidal and triangular design elements, it represents one of the most spectacular attempts yet made to combine on a vast scale ancient Japanese motifs and concepts with modern architectural forms.



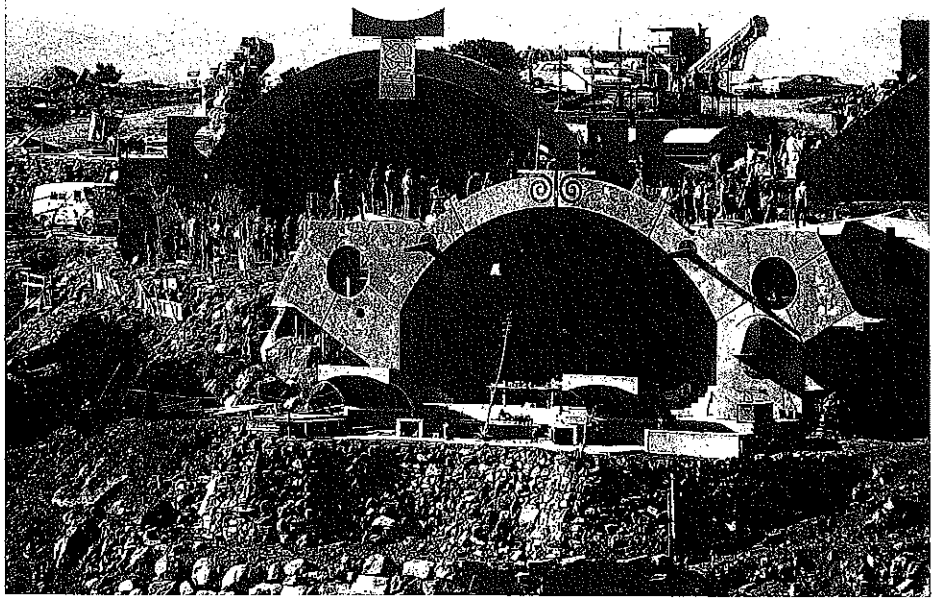
23.28 Sachio Ohtani, International Conference Building, Kyoto, Japan, 1955.



23.29 Frederick Kiesler, Plan of Endless House, 1958–59.

Breaking the Mold: Experimental Housing

Of great significance to working architects were some unbuilt visionary house designs belonging to a new phase of imaginary architecture. Outstanding is the Endless House (fig. **23.29**) designed by **Frederick Kiesler** (1890–1965), whom Philip Johnson called "the greatest non-building architect of our time." As early as 1925, Kiesler had conceived of a city in space built on a bridge structure, and an Endless Theater. From these, in 1934, he developed a "space house" and, after years of experiment, the so-termed Endless House, proposed many times in various versions but never built. The idea for an Endless Structure was to short-circuit any traditional divisions between floor, wall, and ceiling and to offer the inhabitant an interior that could be modified at will. In doing this, Kiesler abandoned the rectangle and turned to egg shapes freely modeled from plastic materials and proffering a continuously flowing interior space.



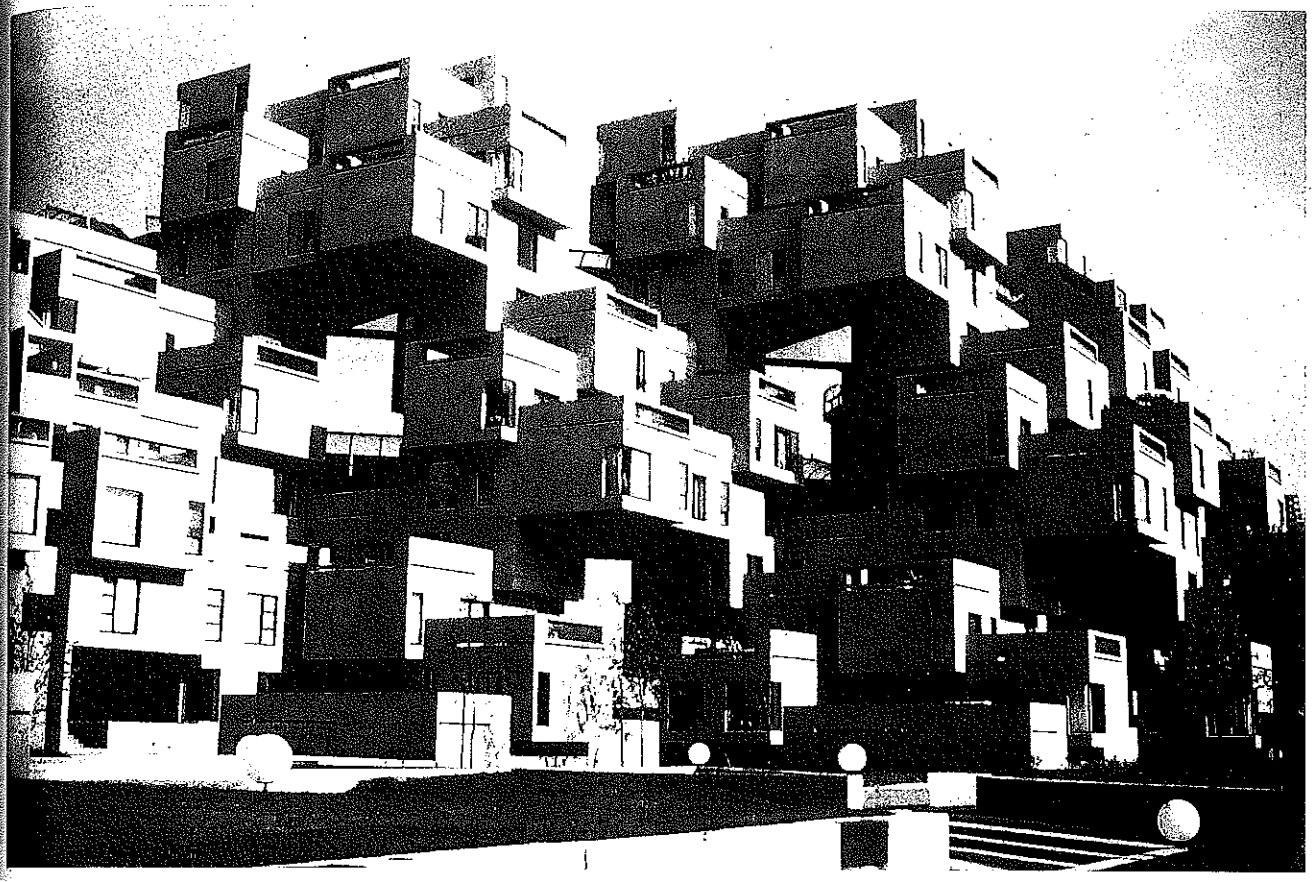
23.30 Paolo Soleri, Arcosanti, Scottsdale, Arizona, begun 1970.

Such experiments represented an attempt not only to find new forms based on natural, organic principles but also to utilize new technical and industrial developments while potentially cutting building costs. Among such projects is the 1961 house and studio in Scottsdale, Arizona, built by **Paolo Soleri** (b. 1919). Literally a cave, it is the forerunner of Soleri's Dome House in Cave Creek, Arizona (1950). Born in Turin, Italy, Soleri came to the United States in 1947 and spent a year and a half in fellowship with Frank Lloyd Wright at Taliesin West in Arizona and Taliesin East in Wisconsin. His compact prototype city, Arcosanti (fig. **23.30**), located in the high desert of Arizona in a 4,060-acre (1643-hectare) preserve and now a National Landmark, has been under construction since 1970. For some thirty years, it has been an experiment, or "urban laboratory," to demonstrate his theory of arcology. An arcology is an integration of architecture, ecology, and urban planning. It involves a whole new concept of urban environment that would eliminate the automobile from within the city (walking would be the main way of getting around), develop renewable energy systems (solar and wind), utilize recycling, and allow access to and interaction with the surrounding natural environment. Using rounded concrete structures, this miniaturization of the city allows for the radical conservation of land, energy, and resources. The arcology concept proposes a highly integrated and compact three-dimensional urban form that is the opposite of the wasteful consumption of land, energy, time, and human resources of urban sprawl. (Only about two percent as much land as a typical city of similar population is needed.) Therefore, it presents a new solution to the ecological, economic, spatial, and energy problems of cities.

Less utopian than arcology is prefabrication—the mass manufacturing and prefabrication of individual parts. Although relatively few, there are instances of successful, large-scale prefabrication in the twentieth century, such as Nervi's 1948–49 Turin exhibition hall (see above). Some manufacturers in the United States offer partially prefabricated small houses. In a number of California houses, including their own in Santa Monica (1949) (fig. **23.31**), the husband and wife architect-designers **Charles** (1907–78) and **Ray Eames** (1916–88) set out to prove that modern architecture could be both accessible and economical. Using prefabricated materials purchased through catalogues, the Eameses constructed residences consisting of light steel-skeleton cores covered with fitted plastic, stucco, or glass panels, as well as stock doors, windows, and accessories. These mass-produced materials were chosen for both their economic appeal and industrial aesthetic and represent a utilitarian domestic architectural style.

One of the greatest examples of prefabricated housing design is by Israeli architect **Moshe Safdie** (b. 1938). His megastructure, Habitat '67, commissioned for Expo '67,

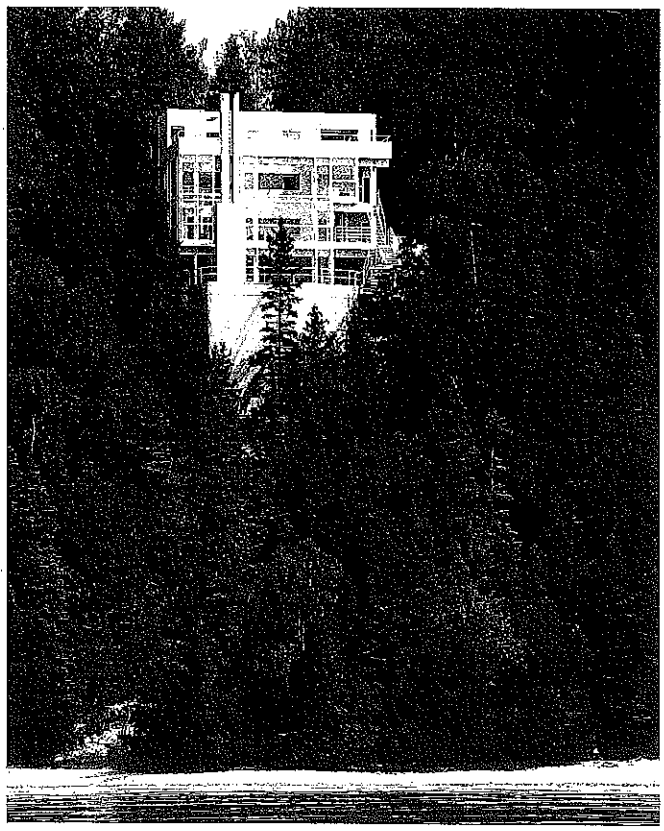
23.31 Charles and Ray Eames, Eames Residence, Santa Monica, California, 1949.



23.32 Moshe Safdie, Habitat '67, Montreal, Canada, 1967.

the 1967 World's Fair in Montreal, Canada, was conceived to provide fresh air, sunlight, privacy, and suburban amenities to residents of an urban location (fig. **23.32**). It was designed as a permanent settlement of 158 dwellings made up of fifteen types of independent, interlocking prefabricated boxes. The boxes are staggered in order to provide open-deck space for each unit and to ensure versatile visual and spatial combinations. It is possible to add more prefabricated, mass-produced units to such a structure, rather than constructing them on site.

Another signal of the arrival of an antimodernist aesthetic can be seen in the work of the self-styled New York School (not to be confused with the New York School of Painting that began with the Pollock–de Kooning–Rothko generation in the mid-forties). Architects identified with the New York School include Peter Eisenman, John Hejduk, Michael Graves, Charles Gwathmey, and Richard Meier. The most heavily commissioned of these was **Richard Meier** (b. 1934), whose glistening, white Cubist temples—supersophisticated exploitations of the modernist vocabulary—have proved irresistible to wealthy private clients, corporations, and cultural institutions. In Douglas House in Harbor Springs, Michigan (fig. **23.33**), one sees Purist or de Stijl classicism so wittily elaborated as to become a new Mannerism, reversing simple closed forms and ribbon windows into intricate, openwork abstractions with double- and triple-height interiors and vast expanses of glass.



23.33 Richard Meier, Douglas House, Harbor Springs, Michigan, 1971–73.

23.34 Lincoln Center, New York. From left: New York State Theater, by Philip Johnson, 1964; Metropolitan Opera House, by Wallace K. Harrison, 1966; Philharmonic (now Avery Fisher) Hall, by Max Abramovitz, 1962.

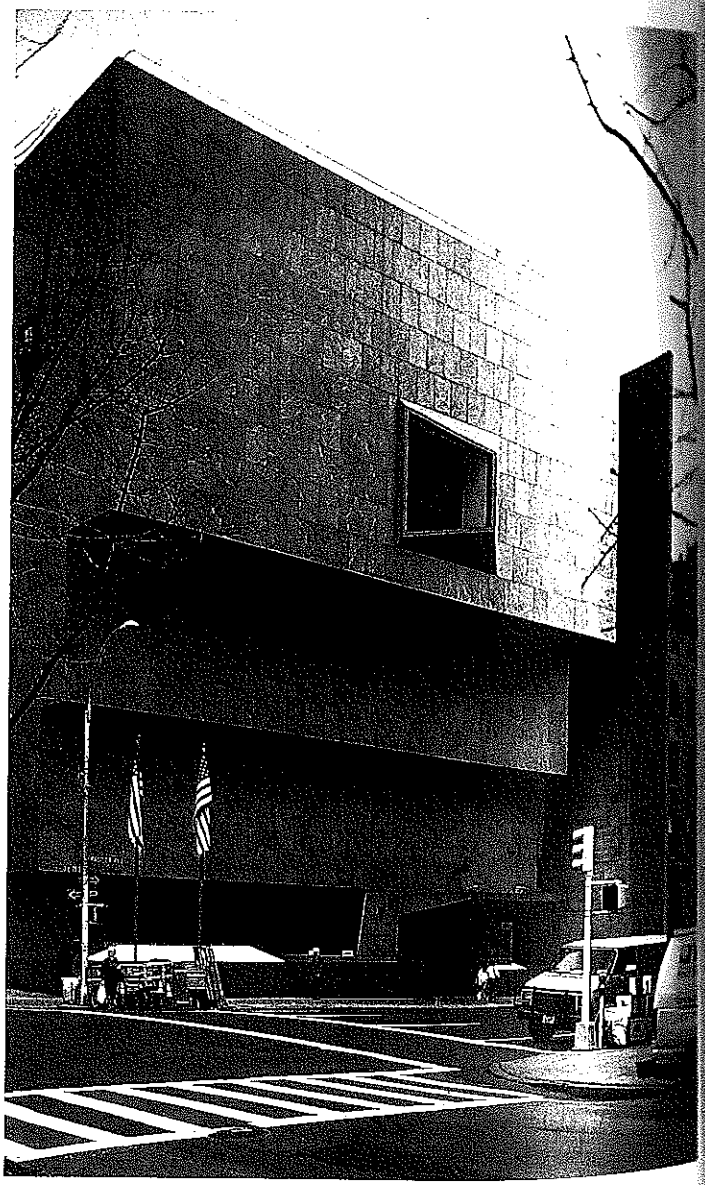
Arenas for Innovation: Major Public Projects

Cultural Centers, Theaters, and Museums in America

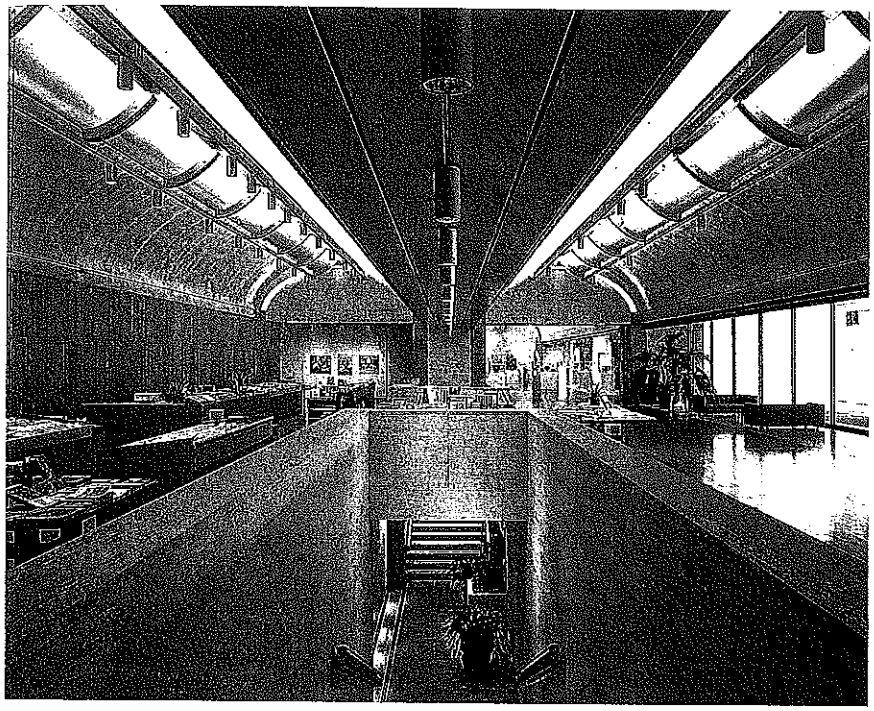
The most elaborate center to date in the United States is the Lincoln Center for the Performing Arts in New York City (fig. **23.34**), which opened in 1962 and represented a spectacular return to architectural formalism. The classical origins of its layout are not disguised. The focus of the principal structures on three sides of a monumental plaza is a fountain, designed by Philip Johnson. In addition to **Max Abramovitz**'s (b. 1908) Philharmonic Hall (1962) (renamed Avery Fisher Hall), the Center comprises **Philip Johnson**'s (b. 1906) New York State Theater (1964), **Eero Saarinen**'s (1910–61) Vivian Beaumont Theater (1965), Skidmore, Owings & Merrill's Library-Museum of the Performing Arts (1965), and Wallace K. Harrison's Metropolitan Opera House (1966). A large subterranean garage lies beneath this group. Adjunct structures include a midtown branch of Fordham University and a home for the Juilliard School, completed in 1969 by Pietro Belluschi with Catalano and Westermann.

The buildings created by this notable assemblage of talent exemplify a new monumental classicism characteristic of public and official architecture in the sixties. The project is impressive, despite the criticisms leveled against individual structures. The chief complaints, aside from problems of acoustics and sightlines, are focused on Lincoln Center's barren monumentality, its colossal scale unrelieved by ornamental detail that would provide a human reference.

We saw earlier in this chapter, in the discussion about the renovation of Frank Lloyd Wright's Guggenheim Museum (see fig. 23.2), that an art museum is actually a complicated design problem, involving basic questions of efficient circulation, adequate light—natural, artificial, or both—sufficient work and storage space, and, in most cases, rooms for other events, such as concerts, theatrical performances, and receptions. The Whitney Museum of American Art (fig. **23.35**) designed by Marcel Breuer is another important museum design. Breuer's building, illustrative of his later Brutalism, is a development of the forms he used earlier for St. John's Abbey Church in Collegeville, Minnesota (1953–61) and for the lecture hall of New York University's uptown campus in the Bronx (1956–61). The Whitney is a stark and impressive building, in which heavy, dark granite and concrete are used inside and out. The main galleries are huge, uninterrupted halls capable of being divided in almost any way by movable yet



23.35 Marcel Breuer, The Whitney Museum of American Art, New York, 1966.



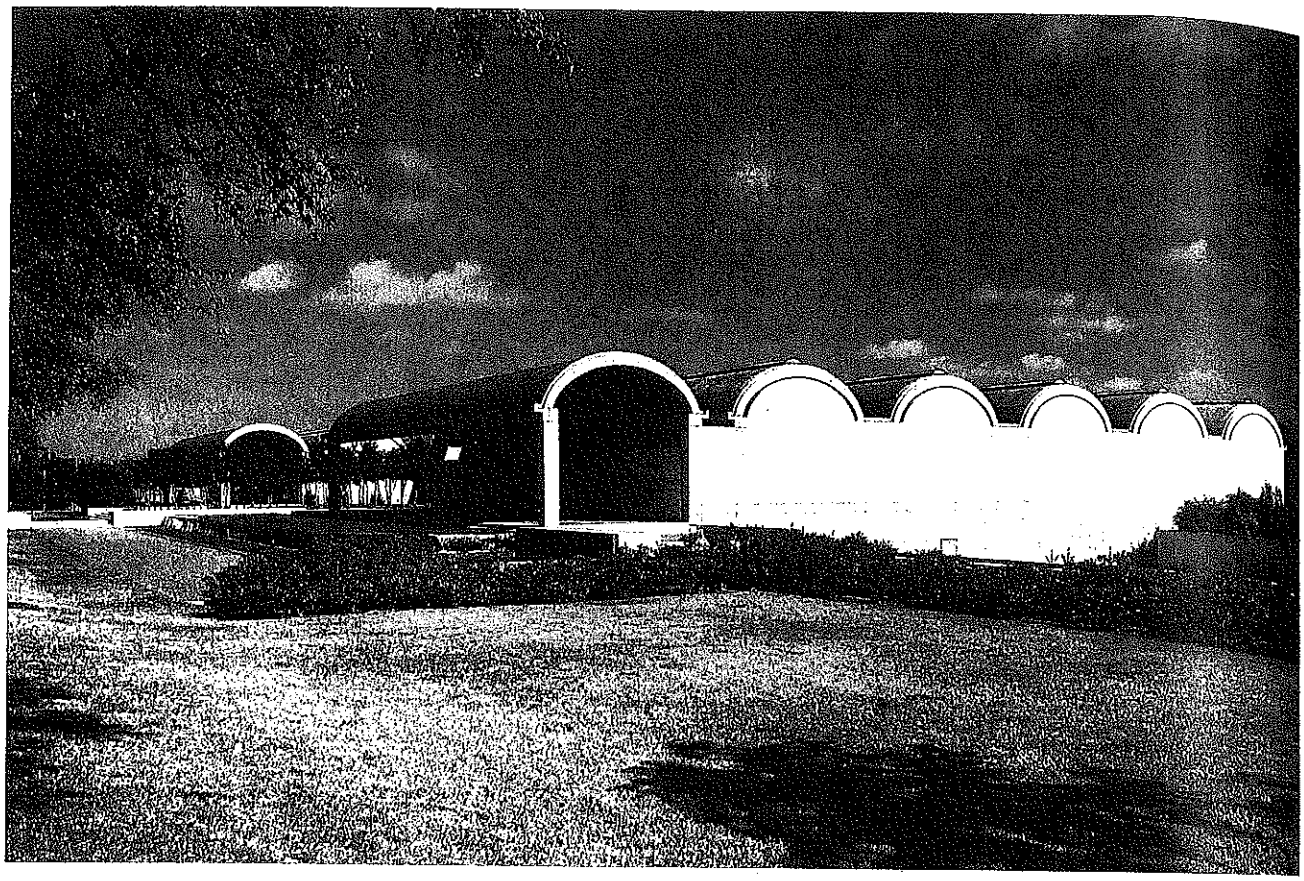
23.36 Louis I. Kahn, Interior, west gallery and bookstore, Kimbell Art Museum, Fort Worth, Texas, 1972.

solid partitions and representing the utmost flexibility in installation space and artificial lighting. Natural daylight has been ignored except for that emanating from a few trapezoidal-shaped windows that function as relief accents.

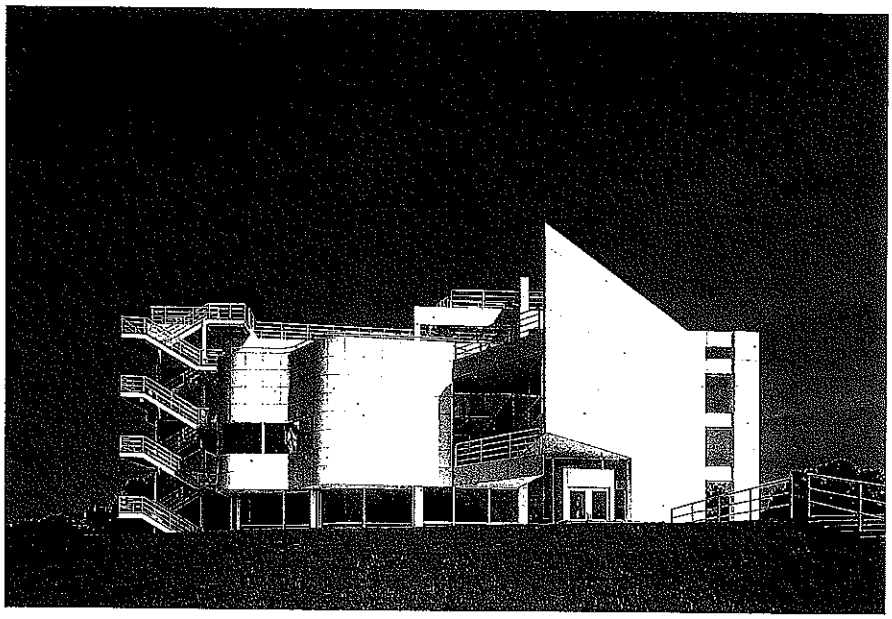
The architect **Louis I. Kahn** (1901–74) was responsible for the design of two important art buildings. Like Wright, Kahn initiated a new American architecture, but while Wright's work developed in the late nineteenth and early twentieth centuries, Kahn matured amidst the uncertainty and loss of idealism of the thirties and forties. Born in Estonia, Kahn emigrated with his family to Philadelphia in 1905. He received architectural training in the Beaux Arts tradition at the University of Pennsylvania. There followed a year in Europe, where he was impressed both by the monuments of classical antiquity and by his discovery of Le Corbusier. His later work would reflect a fusion of modernism's passion for technology and abstract form along with a profound awareness of history and its role in architecture. For a number of years, Kahn taught at Yale University, where he designed the Yale Art Gallery (1951–53), the university's first modern building and one of the first contemporary approaches to the design challenges of the art museum.

Kahn was not only a designer concerned with mechanical and visual relationships of extraordinary subtlety and aesthetic quality, but he was also a planner, both practical and poetical, whether for an individual building or an entire city. Perhaps the most visionary and completely realized of all of Kahn's buildings is his Kimbell Art Museum in Fort Worth, Texas, completed in 1972 (figs. **23.36**, **23.37**)—one of the most dramatic as well as functionally effective art museums in the world. The museum design is based upon a parallel series of self-supporting cycloidal vaults that eliminate the need for interior supports and facilitate an unobstructed and very flexible use of the spacious interior. Indoor and outdoor spaces are integrated through the attachment of a sculpture garden that creates a fluid interchange between the museum and its environment, thereby altering the traditional notion of a museum as a place that cloisters works of art. The architect is also noted for the close attention paid to the issues of lighting and displaying works of art. By combining artificial and natural light, and breaking up the cavernous heights of gallery space with low-hanging lights and shorter partitioning walls, the Kimbell becomes both a practical space for the display and conservation of art, and an aesthetically pleasing environment that is at once monumental and intimate to the gallery visitor.

The challenge of successfully designing a visitor center–museum for a highly specific and localized American community shows Richard Meier's versatility and his evolution as an architect. The differences between his rationalist Douglas House (see fig. 23.33) and the three-story Atheneum at Historic New Harmony in Indiana (fig. **23.38**) are revealing. Now a living museum, New Harmony was a vigorous nineteenth-century American religious and utopian community established by the Harmony Society in 1814. The 1975–79 Atheneum is a gleaming white metal structure set on a green lawn; a visual dialogue of solid and void, projecting terraces, recessive spaces, and folded stairs that exclaim its modernity. The commission required a 180-seat auditorium, four exhibition galleries, observation terraces, and visitor and administrative facilities. Meier's work fulfills the program and stands in great contrast to the log cabins and brick buildings of the historic settlement. Meier does not belong to the tradition of expressionist architects interested in empathy and feeling. His is an architecture interested in visual effects, looking at and framing



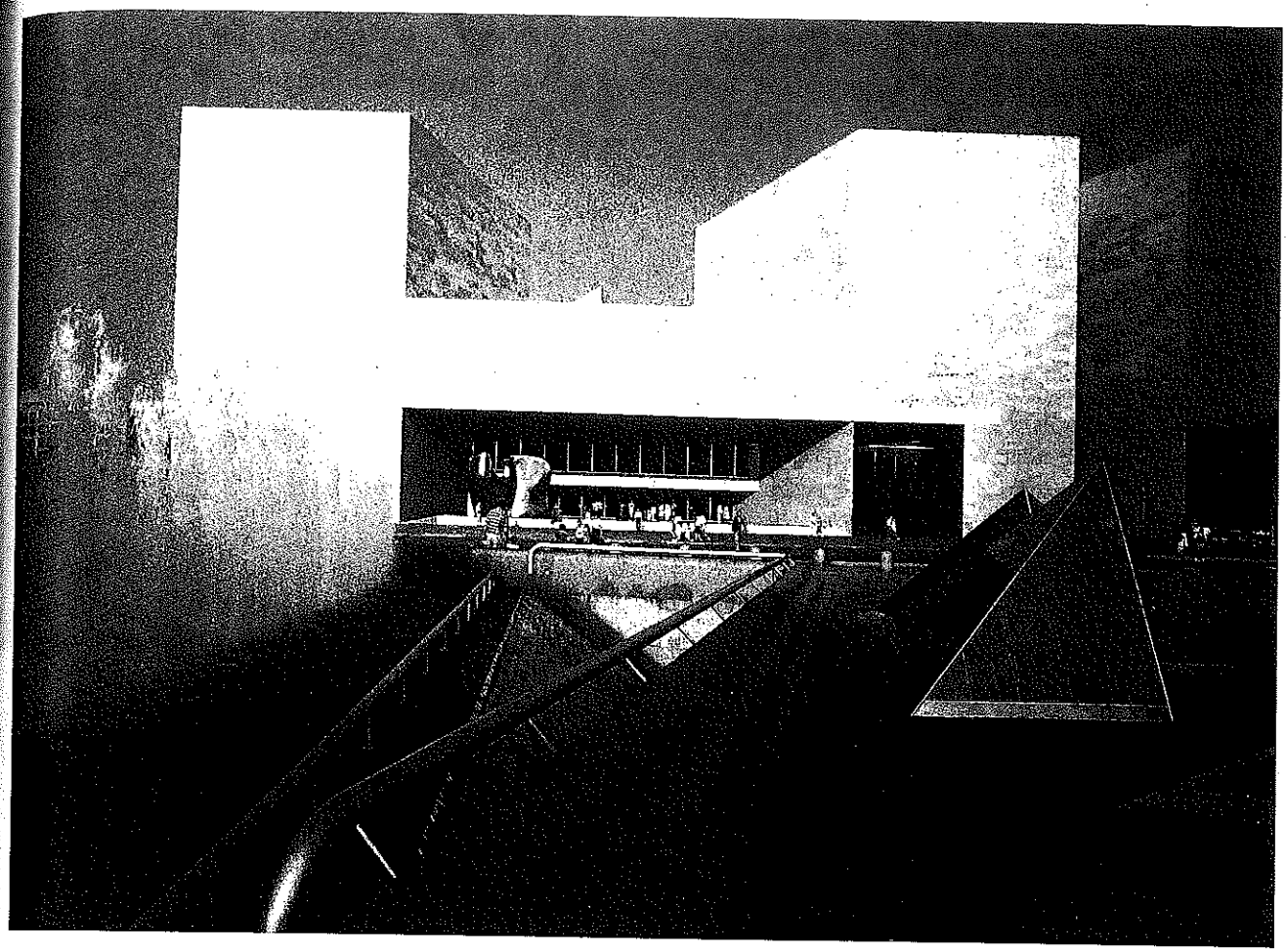
23.37 Louis I. Kahn, Kimbell Art Museum, Fort Worth, Texas, 1972.

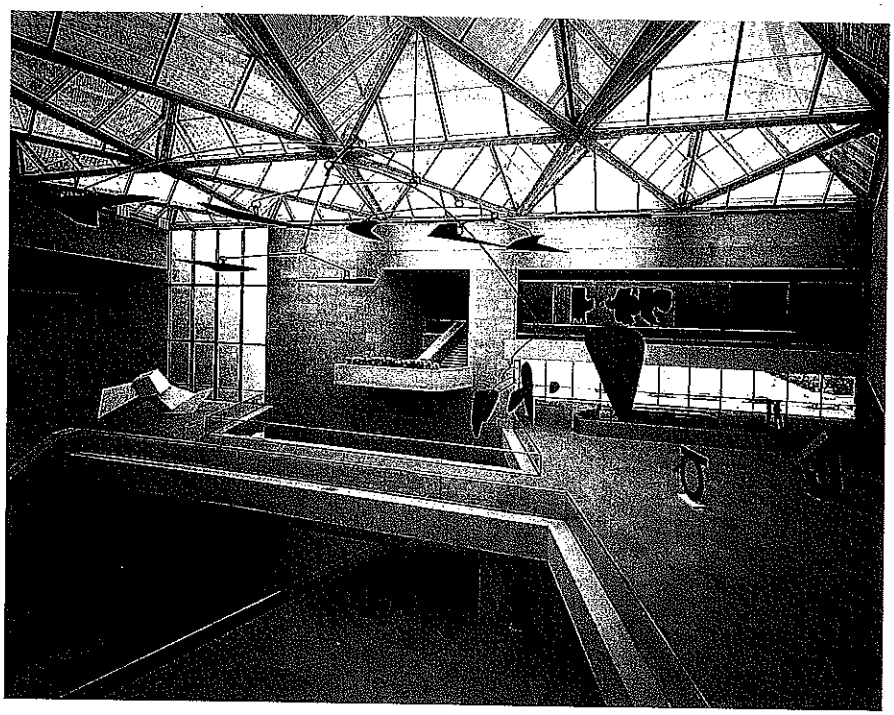


23.38 Richard Meier, The Atheneum, west entrance, New Harmony, Indiana, 1975–79.

objects in space. Much like Le Corbusier's dictum that a house is a machine for living, the Atheneum is conceived as a device, a sophisticated instrument for controlling the experience of observing its collection. There is something detached in the way the building relates to the site of one of the most intriguing social experiments in American history, but its very detachment offers a completely unbiased vantage point.

I. M. Pei's (Ieoh Ming Pei, b. 1917) East Wing extension to the National Gallery of Art in Washington, D.C. (fig. **23.39**), inaugurated in 1978, ten years after its initial conception, is an extraordinary venue for a broad range of museum activities. It is not only a site for temporary exhibitions and the museum's collection of twentieth-century art, but also houses museum offices, a library, and the Center for Advanced Studies in the Visual Arts (CASVA). The awkward trapezoidal site posed several challenges for the architect, as did the need to integrate the new structure with the extant Beaux-Arts style West Building (designed by John Russell Pope). Pei resolved these problems by

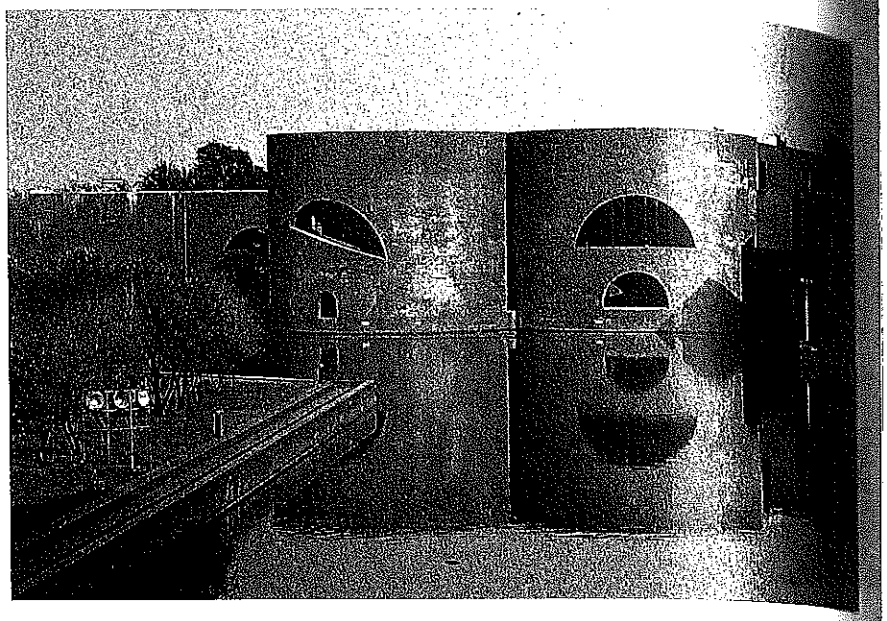




23.39 I. M. Pei, National Gallery of Art, East Wing, Washington D.C., 1978.

23.40 I. M. Pei, East Building, National Gallery of Art, Washington, D.C., 1968–78. At center, Alexander Calder, *Untitled*, 1976. Aluminum and steel, 29' × 10" × 76' (8.8 × 0.25 × 23.2 m).

dividing the plot into triangular forms that became the building blocks of his design—reiterated throughout the building in floor tiles, skylights, stairs, and tables—and then connecting the entire construction to the West Building via an underground passage. The entrance to the East Building opens to an expansive, light-filled atrium with skylighted ceilings that provide the backdrop for several works of art commissioned especially for the building, including a monumental mobile by Alexander Calder (fig. **23.40**). In contrast to the atrium's open, soaring space, the intimate interior is composed of individual galleries made from smaller rooms and lowered walls that



23.41 Louis I. Kahn, East Hostels, Bangladesh Assembly, Dacca, 1962–74.

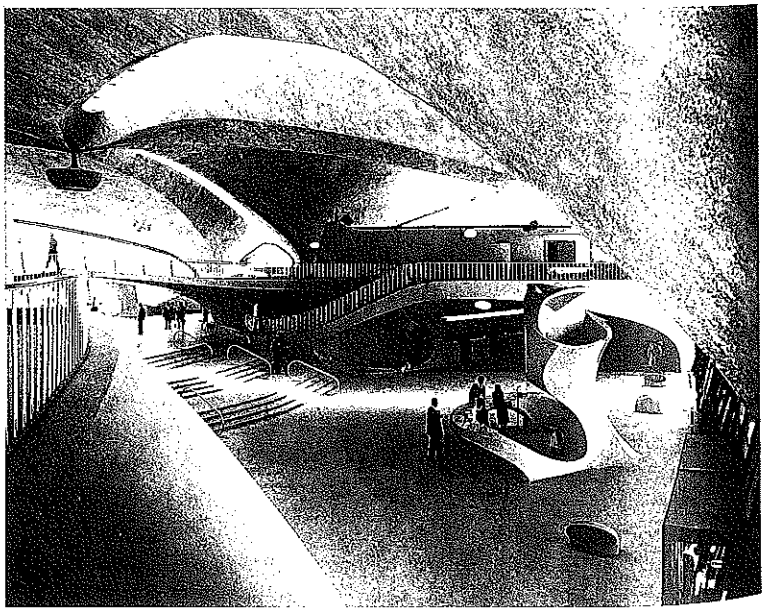
provide a quiet space for the contemplation of the exhibited art. Viewed from outside, the East Building—dramatically set against the view of the Capitol Building—is easily recognized by its H-shape design, which is formed by the stocky towers that extend from each of three vertices. Associated in his early years with both Gropius and Breuer, Pei was the consummate modernist, combining and refining the best principles of modern architecture in a continually inventive stream of eloquent commercial and public buildings, including the glass pyramid for the renovated Musée du Louvre in Paris in 1989 (see fig. 25.21).

Urban Planning and Airports

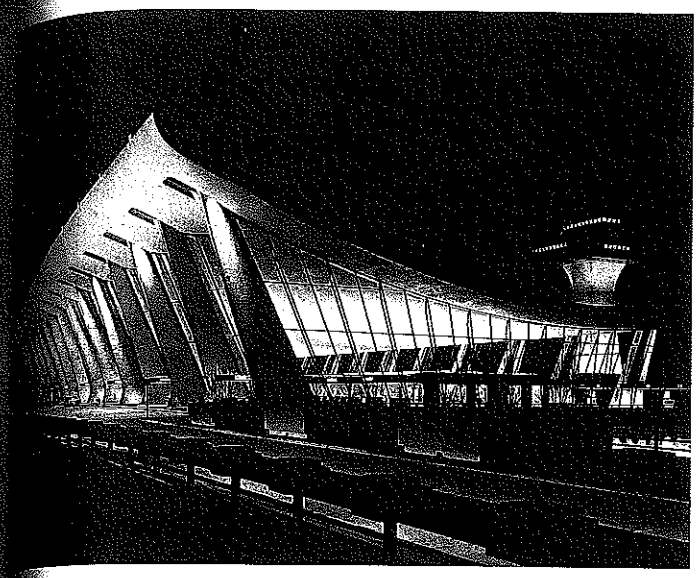
City planning has been a dream of architects since antiquity, and has only occasionally been realized, as in the Hellenistic cities built after the conquests by Alexander the Great, Roman forums, Renaissance and Baroque piazzas, the Imperial Forbidden City of Peking, and Baron Haussmann's rebuilding of Paris in the nineteenth century. Although Le Corbusier was one of the visionaries of European planning in his designs for a new Paris, it was only at Chandigarh (see fig. 23.6) that he was able to realize some of his ideas. Brasília was perhaps the most complete realization of a new city plan in the twentieth century (see fig. 23.24).

Most American efforts at urban planning or slum reconstruction have been brave but incomplete attempts, continually frustrated by antiquated planning laws and political or economic opposition. Among the most successful efforts at rebuilding the center of an American city are the urban renewal projects in Philadelphia, which were begun in the forties. These have involved building new highways and coordinating the design of public and commercial buildings, as well as slum clearance and, most important in a city like Philadelphia, the preservation of historic monuments. The achievements in Philadelphia have been remarkable. Other comparable rehabilitation programs are being carried out, but the dream of the ideal city is still far from realized. Great American metropolises like New York, Miami, Phoenix, Atlanta, and Los Angeles continue to fight day-to-day battles concerning human welfare, traffic congestion, and water and air pollution.

Like Le Corbusier's before him at Chandigarh, Louis Kahn's experience with the Asian subcontinent unleashed a flood of innovation and invention. In 1962 East Pakistan (Bangladesh) invited Kahn to design its new capital city of Dacca, including the Assembly and Supreme Court buildings, hostels, a school, a stadium, and a market. To protect the buildings from the harsh elements, Kahn enclosed them inside another structural layer. As he said of an earlier project, "I thought of wrapping ruins around the buildings." In this case, the "ruins" are large, freestanding concrete curtains pierced with geometric cutout shapes. For example, the curtain for the East Hostels for the members of Parliament (fig. **23.41**), with its large semicircular cutout shapes, serves not to provide views to the exterior, but to shield the interiors from intense sun glare. The result is both primal and sophisticated. Like Le Corbusier's monuments for Chandigarh, Kahn's work for Dacca achieves an ancient aura without being culturally specific;



23.42 Eero Saarinen, Interior, TWA Terminal, John F. Kennedy International Airport, New York, 1962.



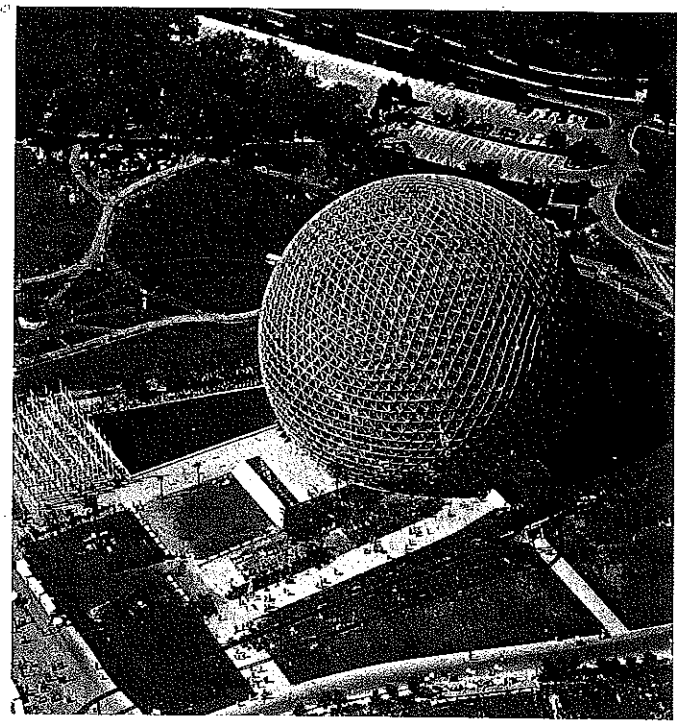
23.43 Eero Saarinen, Dulles Airport, Chantilly, Virginia, 1961–62.

the iconography of the cutout shapes seems almost indifferent to the history and artistic heritage of the patron.

Many of the best opportunities for a different kind of urban planning were offered by the airports that proliferated in the fifties and sixties. Unfortunately, very few of these opportunities were successfully realized. With some exceptions, the architecture proved routine and the solutions to such problems as circulation inadequate. New York's John F. Kennedy International Airport is a vast mix of miscellaneous architectural styles illustrating the clichés of modern architecture. A few individual buildings rise above the norm. One is Eero Saarinen's TWA terminal (fig. **23.42**), with its striking airplane-wing profile and interior spaces, clearly suggestive of the ideal of flight. In 1961–62, Saarinen had the opportunity to design a complete terminal at the Dulles Airport near Washington, D.C. (fig. **23.43**). The main building—with its upturned floating roof and the adjoining related traffic tower—incorporates an exciting and unified design concept. Saarinen here also resolved practical problems, such as transporting passengers directly to the plane through mobile lounges. Due to increased air traffic, Dulles was expanded in the mid-nineties to more than double its original size, reminding us that architectural form often derives from changing functions. In the sixties Saarinen had predicted such an expansion, and hence left behind explicit architectural plans for use at a future date. The final design, completed by the firm Skidmore, Owings & Merrill, remained loyal to Saarinen's original plans; the building's design was extended by 320 feet (97.5 m) on either end, thereby altering the airport's proportions but leaving the basic form undisturbed.

Architecture and Engineering

To many students of modern architecture, and particularly of urban design, the solutions for the future seemed to lie less in the hands of the architects than in those of the engineers. Architects themselves were closely following new engineering experiments, particularly such new principles of construction as those advanced by **Buckminster Fuller** (1895–1983). Fuller was the universal man of modern engineering. As early as 1929 he designed a Dymaxion House, literally a machine for living that realized Le Corbusier's earlier concept in its use of techniques of automobile and aircraft construction. In the early thirties, he built a practical three-wheeled automobile, which has been recognized as one of the few rational steps toward solving the problem of city traffic congestion, but which has never been put into production. These and many other inventions led ultimately to his geodesic dome structures, based on tetrahedrons, octahedrons, or icosahedrons. These domes, which can be created in almost any material and built to any dimensions, have been used for greenhouses, covers for industrial shops, and mobile, easily assembled living units for the American army. Although Fuller's genius had long been widely recognized, it was only in the second half of the twentieth century that he received an opportunity to demonstrate the tremendous flexibility, low cost, and ease of construction of his domes. Many innovative structures were constructed for Expo '67, including Safdie's Habitat (see fig. 23.32), but Fuller's geodesic dome (fig. **23.44**) dominated the whole exposition. The structure was a prototype of what he called an "environmental valve," which encloses sufficient space for whole communities to live within a physical microcosm. The American Pavilion at Expo '67 was a triumphant vindication of this engineer-architect, whose ideas of construction and design promised to make most modern architecture obsolete.



23.44 Buckminster Fuller, American Pavilion, Expo '67, Montreal, 1967.