1944

Louis Kahn's contribution to the debate on monumentality already joined by
27–30 José Luis Sert, Fernand Léger, and Sigfried Giedion with their "Nine Points on Monumentality" was published in Paul Zucker's *New Architecture and City Planning* together with five other papers on the same subject, including a new essay by Giedion. It was Kahn's first extended theoretical statement. If Giedion had drawn a lesson from the war concerning the symbolic and emotional values of civic architecture, the younger architect found a different one in its "engineering achievements in concrete, steel, and wood." What impressed Kahn were the "added powers" that the new structural resources could afford architecture.

In Kahn's definition, monumentality, characteristic of the great architecture of past ages, was "a spiritual quality inherent in a structure which conveys the feeling of its eternity, that it cannot be added to or changed." At the time of this writing Kahn was associated in practice with George Howe and Oscar Stonorov. Having accepted International Style modernism in the early 1930s, he had mainly built social housing during the years of the New Deal and the war and designed little in the way of large-scale public architecture. His earlier schooling, however, had had a profound impact on him. Under the Beaux-Arts architect Paul Cret at the University of Pennsylvania, he had absorbed the lessons of rational engineering and historical form. In approaching the question of monumentality, Kahn now synthesized both inputs. A new monumentality, he concluded, could arise only by reinterpreting historical concepts of construction in light of contemporary technical possibilities.

Kahn argues that architecture's historical development led it from the compressive stone construction of Greco-Roman antiquity up to the dematerialized structural skeleton of the Gothic cathedral, a point it could not go beyond without collapsing (like Beauvais Cathedral, which he draws "after" Auguste Choisy, an important influence on his work from this date). It was the tubular steel frame, welded and capable of enormous spans, "worthy of being exposed," that now held the promise of a new expressiveness, in his view, even surpassing the monumentality of Greco-Gothic construction: "Beauvais Cathedral needed the steel we have." His sketch of a giant welded-steel arcade on axis to an idealized cultural center illustrates the point.

Although Kahn's emphasis on the potential of lightweight structures seems uncharacteristic of the more massive classicism he was to pursue later in his career, it presages the sculptural space frame of his Philadelphia City Tower project, designed in 1954 with Anne Tyng. Significantly, he rejects the implication in Giedion's argument that monumentality can be created intentionally, advancing a theory that recalls (consciously or not) Alois Riegl's *Kunstwollen*. Monuments, Kahn states, are historical manifestations of "the desires, the
270–72 aspirations, the love and hate" of an epoch. In later writings he would speak of an "existence will" of architectural form, what a building "wants to be."

While acknowledging that past monuments "cannot live again with the same intensity and meaning," Kahn affirms that their greatness and didactic value remain. His structural-historicist interpretation of the monument not only looks forward to a central theme of his own work, but anticipates the reprise of the monumentality question in the 1970s in the debate over postmodernism—a debate in which his work figures as an essential point of reference.

From Paul Zucker, ed., New Architecture and City Planning *(New York: Philosophical Library, Inc., 1944), pp. 577–88.*

Monumentality

Louis I. Kahn

Gold is a beautiful material. It belongs to the sculptor.

Monumentality in architecture may be defined as a quality, a spiritual quality inherent in a structure which conveys the feeling of its eternity, that it cannot be added to or changed. We feel that quality in the Parthenon, the recognized architectural symbol of Greek civilization.

Some argue that we are living in an unbalanced state of relativity which cannot be expressed with a single intensity of purpose. It is for that reason, I feel, that many of our confrères do not believe we are psychologically constituted to convey a quality of monumentality to our buildings.

But have we yet given full architectural expression to such social monuments as the school, the community or culture center? What stimulus, what movement, what social or political phenomenon shall we yet experience? What event or philosophy shall give rise to a will to commemorate its imprint on our civilization? What effect would such forces have on our architecture?

Science has given to the architect its explorations into new combinations of materials capable of great resistance to the forces of gravity and wind.

Recent experimenters and philosophers of painting, sculpture, and architecture have instilled new courage and spirit in the work of their fellow artists.

Monumentality is enigmatic. It cannot be intentionally created. Neither the finest material nor the most advanced technology need enter a work of monumental character for the same reason that the finest ink was not required to draw up the Magna Carta.

However, our architectural monuments indicate a striving for structural perfection which has contributed in great part to their impressiveness, clarity of form, and logical scale.

Stimulated and guided by knowledge we shall go far to develop the forms indigenous to our new materials and methods. It is, therefore, the concern of this paper to touch briefly on the broader horizons which science and skill have revealed to the architect and engineer and sketch the faint outlines of possible structural concepts and expressions they suggest.

No architect can rebuild a cathedral of another epoch embodying the desires, the aspirations, the love and hate of the people whose heritage it became. Therefore the images we have before us of monumental structures of the past cannot live again with the same intensity and meaning. Their faithful duplication is unreconcilable. But we dare not discard the lessons these buildings teach for they have the common characteristics of greatness upon which the buildings of our future must, in one sense or another, rely.

In Greek architecture engineering concerned itself fundamentally with materials in compression. Each stone or part forming the structural members was made to bear with accuracy on each other to avoid tensile action stone is incapable of enduring.

The great cathedral builders regarded the members of the structural skeleton with the same love of perfection and search for clarity of purpose. Out of periods of inexperience and fear when they erected over-massive core-filled veneered walls, grew a courageous theory of stone over stone vault skeleton producing a downward

and outward thrust, which forces were conducted to a column or a wall provided with the added characteristic of the buttress which together took this combination of action. The buttress allowed lighter walls between the thrust points and these curtain walls were logically developed for the use of large glass windows. This structural concept, derived from earlier and cruder theories, gave birth to magnificent variations in the attempts to attain loftier heights and greater spans creating a spiritually emotional environment unsurpassed.

The influence of the Roman vault, the dome, the arch, has etched itself in deep furrows across the pages of architectural history. Through Romanesque, Gothic, Renaissance, and today, its basic forms and structural ideas have been felt. They will continue to reappear but with added powers made possible by our technology and engineering skill.

The engineer of the latter part of the nineteenth century developed from basic principles the formulas of the handbook. Demands of enormous building quantity and speed developed the handbook engineer who used its contents, more or less forgetting basic principles. Now we hear about continuity in structures, not a new word but recently an all-important word in engineering which promises to relegate the handbook to the archives.

The I-beam is an engineering accomplishment deriving its shape from an analysis of stresses involved in its use. It is designed so that the greater proportion of the area of cross section is concentrated as far as possible from the center of gravity. The shape adapted itself to ease of rolling and under test it was found that even the fillets, an aid in the rolling process, helped convey the stresses from one section to another in continuity.

Safety factors were adopted to cover possible inconsistencies in the composition of the material of manufacture. Large-scale machinery and equipment needed in its fabrication lead to standardization.

The combination of safety factors (ignorance factor as one engineer termed it) and standardization narrowed the practice of engineering to the selection of members from handbooks recommending sections much heavier than calculations would require and further limited the field of engineering expression stifling the creation of the more graceful forms which the stress diagrams indicated. For example, the common practice of using an I-beam as a cantilever has no relation to the stress diagram which shows that the required depth of material from the supporting end outward may decrease appreciably.

Joint construction in common practice treats every joint as a hinge which makes connections to columns and other members complex and ugly.

To attain greater strength with economy, a finer expression in the structural solution of the principle of concentrating the area of cross section away from the center of gravity is the tubular form since the greater the moment of inertia the greater the strength.

A bar of a certain area of cross section rolled into a tube of the same area of cross section (consequently of a larger diameter) would possess a strength enormously greater than the bar.

The tubular member is not new, but its wide use has been retarded by technological limitations in the construction of joints. Up until very recently welding has been outlawed by the building codes. In some cases, where it was permitted, it was required to make loading tests for every joint.

Structure designs must discard the present moment coefficients and evolve new

calculations based on the effect of continuity in structures. The structural efficiency of rigid connection, in which the shear value and the resisting moment is at least equal to the values of the supporting member, is obtained by the welding of such connections. The column becomes part of the beam and takes on added duties not usually calculated for columns.

The engineer and architect must then go back to basic principles, must keep abreast with and consult the scientist for new knowledge, redevelop his judgment of the behavior of structures and acquire a new sense of form derived from design rather than piece together parts of convenient fabrication.

Riveted I-beam plate and angle construction is complex and graceless. Welding has opened the doors to vast accomplishments in pure engineering which allows forms of greater strength and efficiency to be used. The choice of structural forms is limitless even for given problems and therefore the aesthetic philosophy of the individual can be satisfied by his particular composition of plates, angles, and tubular forms accomplishing the same answer to the challenge of the forces of gravity and wind.

The ribs, vaults, domes, buttresses come back again only to enclose space in a more generous, far simpler way and in the hands of our present masters of building in a more emotionally stirring way. From stone, the part has become smaller and cannot be seen observed and tested by the scientist through spectroscopy or by photoelastic recordings. His finding may go the architect and engineer in the more elemental form of the formula, but by that means it shall have become an instrumental part of the builder's palette to be used without prejudice or fear. That is the modern way.

Gothic architecture, relying on basically simple construction formulas derived from experience and the material available, could only go so far. Beauvais Cathedral, its builders trying to reach greater spans and height, collapsed.

The compressive stress of stone is measured in hundreds of pounds.

While not only the compressive, but also the bending and tensile stress of steel is measured in thousands of pounds.

Beauvais Cathedral needed the steel we have. It needed the knowledge we have.

Glass would have revealed the sky and become a part of the enclosed space framed by an interplay of exposed tubular ribs, plates, and columns of a stainless metal formed true and faired into a continuous flow of lines expressive of their stress patterns. Each member would have been welded to the next to create a continuous structural unity worthy of being exposed because its engineering gives no resistance to the laws of beauty having its own aesthetic life. The metal would have now been aged into a friendly material protected from deterioration by its intrinsic composition.

This generation is looking forward to its duty and benefit to build for the masses with its problems of housing and health.

It is aware of our outmoded cities.

It accepts the airship as a vital need.

Factories have adopted horizontal assembly and shifting population has required the transformation of large tracts of virgin territory at least temporarily for complete human living.

The building of a complete permanent town was attempted and almost built for the workers at Willow Run.

The nation has adopted the beginnings of social reform.

War production may become normal production on the same scale accepted as sound economics.