

ARCHITECTURE AND THE FOURTH DIMENSION

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Abstract

Today's scientific spirit throws light on the entire field of the irrational in man, uncovering individual and social problems of the unconscious. This short essay briefly traces the historical evolution of architectural space from the Classical Period to Modern Architecture with the purpose of unraveling and bringing to the forefront the fourth dimension of architectural space. The main emphasis of the essay is on developing a genuine understanding of architectural space from the vantage of a spatial paradigm.

Keywords: *polarized space, expansive space, metrical space, tensile space, measured space, liberated space, organic space, the fourth dimension.*

Introduction

Buildings are judged as if they were sculpture, as purely plastic phenomena. Even art critics treat architecture as a reflection, an echo of tendencies in painting and sculpture. It is not merely an error of critical method. It is a misconception arising from the lack of a philosophical position. Architecture is different from sculpture by qualities which are uniquely essential to architecture. Some of the qualitative terms essential to architecture are in fact truth, movement, force, vitality, shape and outline, harmony, grace, breadth, scale, balance, proportion, light and shade, eurhythmics, solids and voids, symmetry, rhythm, mass, volume, emphasis, character, contrast, personality and analogy, etc. These are attributes of architecture which occupy a legitimate place in the history of architecture.

We are still not accustomed to thinking in terms of space from a spatial point of view. Architecture, however, does not consist in the sum of the width, length, and height of the structural elements which enclose space, but in the void itself; the enclosed space in which man lives and moves. Even though a plan may have abstract beauty on paper, well-balanced facades, and well-proportioned overall volume, the building itself may turn out to be poor architecture.

Internal Space

Internal space cannot be completely represented in any form. To grasp space, to know how to see it, is the key to understanding *the architecture* of a building. But first we have to develop a conceptual and theoretical understanding of space and how to apply that understanding. Otherwise, our enjoyment of architecture will remain haphazard and our use of words like rhythm, scale, balance, mass, etc. will be vague.

No matter how beautiful the facades of a residential building, a mosque, or a castle may be, they are only the container, the box formed by the walls. The content is the internal space. One will discover easily that there is a discrepancy between the container and the contained. In fact, the box formed by the walls has been the object of more thought and labor than the architectural space itself.

The mind of man discovered that a fourth dimension existed in addition to the three dimensions of perspective. This was the Cubist revolution in advancing the concept of space. Accordingly, the value of an architectural work resides in experiencing the internal space of a building from successive points of view. Notably, architectural space can only be experienced from within the interior of a building and such interior space represents the whole of an architectural experience.

The character of any architectural work is determined both by its internal space and its external volume as well as by the fundamental factor of scale, the relation between the dimensions of a building and the dimensions of man. For instance, the scale of Roman buildings neither is, or was intended to be the scale of man; only static spaces rapt in the bombast of megalomania and rhetoric.

Polarized Space

Christians had to select the forms of their temples from the lexicon of Hellenistic and Roman architecture. Selected forms were equally remote from Greek contemplation and self-sufficiency of Roman taste; marrying in their churches the human scale of the Greeks and the consciousness of interior space of the Romans. In the name of humanity, they brought about a functional revolution in Latin space. It was not a house of God, but rather a place of congregation, of communion and prayer. It was logical, then, that Christians would turn to the Roman basilica that represents the social congregational theme of buildings. The functional adaptation consisted in ordering all elements in terms of man's path inside the church.

If we compare a Roman basilica, Trajan's for example, with one of the earliest Christian Churches, such as Santa Sabina, we find apart from overall scale, relatively few points of difference. The Roman basilica was symmetrically disposed with respect to its two major axes: colonnade opposite colonnade, apse reflecting apse. The created internal space had a single definite center which was a function of the building itself, not of a man's path.

The Christian architect made two essential changes in this scheme: 1) he eliminated one of the apses; and, 2) he shifted the entrance to the secondary side of the building. By these changes, the double symmetry of the rectangle was lost, leaving only the longitudinal axis, which then became the directive line for man's movement; internal space became polarized. It is clear that such an innovation constituted an architectural fact of tremendous importance for the Christians; creating a new system out of old elements and endowing them a new spirit and function.

Expansive Space

In buildings planned around a center, particularly in the great Justinian period, SS. Sergius and Bacchus, Hagia Sophia in Constantinople and S. Vitale in Ravenna, the conception of space was basically the same. As in the longitudinally oriented basilica wherein vertical relationships are nullified and directional rhythm is accelerated to seemingly hallucinatory swiftness, so in buildings of a central plan space is agitated, as it were, into rapid currents and expanded to far distances.

If you glance at the plan of Hagia Sophia, you will note its characteristically Byzantine configuration of enormous, semicircular barrel-vaulted exhedras. Starting from two fixed points in the principal area, the wall surface seems to propagate from

the center of the building as if thrown outwards in an elastic, centrifugal movement which opens, rarefies and expands the interior space.

In terms of space, these innovations were initially meant as a tentative negation of the Byzantine conception of space. The interruption of horizontals and the breaking of the single rhythm established by the longitudinal axis, from the Early Christian basilica to the two churches of S. Apollinare in Ravenna, had been the principal concern of architects. Increasing the importance of the presbytery meant breaking up the length of space. Grafting onto the ambulatory meant articulating the edifice, rendering it a more complex organism at the expense of a unified spatial view.

Metrical Space

Romanesque architecture constituted the first period after the fall of the Roman Empire when European civilization moved in unison towards the renewal of architecture. Romanesque architecture was a truly organic upheaval and created something integrally different. Romanesque architecture was characterized by two features: the linking of all elements of a building; and metrical space. With the first, architecture ceased to act in terms of surface and expressed itself in terms of structure. The emphasis shifted from the skin to the bony skeleton. The slow and gradual concentration of thrusts and resistance; the reduction in the thickness of walls; the final elimination of the triumphal arch which obstructed the unity of the church; the disappearance of the atrium and the consequent increase in attention to the facades, which now expressed two-dimensionally the articulation of interior space. The body had become an organism aware of its wholeness and its circulation, and it began to move. The Romanesque cathedrals of France, England, Spain and all of Europe, the psychological stimuli that now guided a man's walk through a building were far more complex than a merely univocal statement of direction, as before.

Tensile Space

The Gothic architect completed the experimentation begun by the Romanesque architects. The designer of S. Ambrogio supported his vaults on ribs, but the fabric of the vaulting was so massive that even without ribs the vault would have remained in place. He concentrated the thrust on pilasters, but the walls were thick enough to contain the thrusts without them.

Gothic architecture achieved the acme of tension, becoming a bundle of bones, fiber and muscles; a structural skeleton covered by unsubstantial cartilage. The dream of negating walls by reducing them to their functional minimum and establishing a spatial continuity between interior and exterior appeared to have been realized.

For the first time in the general history of architecture, architects conceived spaces which were a deliberate antithesis to human scale and which induced in the observer a mood of imbalance, of conflicting impulses and emotions of struggle rather than a sense of peaceful contemplation.

Measured Space

Renaissance architecture was an absolute novelty with respect to the preceding period. Renaissance architectonics called for a conception of measured internal space. The foundation was laid for modern architecture. The entire effort of the Renaissance consisted in emphasizing man's intellectual control of architectural space.

We who find ourselves, after a contorted eclecticism and a lengthy self-criticism, trying to create a period in which culture and individual vision might be profoundly unified, in which the personal, creative moment and the hour of social reflection might be intimately joined, turn precisely to 15th century culture because there we find a new science, an integration of art and thought; creativity, doctrine and genius. There, the logical was almost mathematical but never had become mechanically produced, but prepared a solid base for a common spatial vocabulary which inspired and stimulated, rather than inhibited, individual expression.

In S. Lorenzo, Brunelleschi's measurement of space meant constructing according to simple mathematical relationships. In the 16th century, buildings of a central plan were preferred. Examples range from S. Sebastiano in Mantua to Bramante's and Michel Angelo's projects for St. Peter's. In the case of Latin cross schemes, the long arm is shortened; whenever possible preference was given to the Greek cross plan, where the arms balance each other. The composition does not culminate in a center, but spreads out from the center under the dome, and it is from here that the aisles radiate.

Accordingly, Alberti, in S. Andrea, Mantua, eliminated the side aisles and created a single space by enlarging the central nave and lining it with rows of chapels. A single path, a single idea, a single law, a single unit of measure – this was the human and humanistic, but never classicistic, characteristic of Renaissance architecture. In Palazzo Rucellai, Alberti was the first to divide and measure a volumetric surface with pilasters and to establish a rhythm according to simple modules. What Brunelleschi had wrought in interior space, Alberti accomplished for surfaces.

The architects of the 16th century declared themselves humble followers of ancient architectural ideals. There is thus a clear dichotomy between cultural theory and creative practice which, though later to become the forerunner of Neo-Classic scholasticism and intellectual justification of innumerable eclecticism, did not weaken the vital force of that series of supreme artists in the Renaissance from Bramante to Palladio.

Liberated Space

Michel Angelo did not initiate the Baroque period, as so many histories of art continue to repeat, but opened the way to Baroque space. Baroque is the liberation of space. It is a mental revolt from the rules of treatises, from convention, from elementary geometry and immobility. It is an emancipation from symmetry and from the antithesis between interior and exterior space. Because of this spirit of liberation, the term Baroque has taken on a psychological meaning beyond its specific application to 16th and 17th century architecture. The term refers even today to an attitude of freedom, a creative state of mind disengaged from intellectual and formal pre-conceptions, a condition common to more than one moment in the history of the arts.

The age old hostile criticism directed against the Baroque has never been aimed at Bernini and his school despite the fact that the fortress-like, closed-box structure of Palazzo Farnese was followed by the open and inviting Palazzo Barberini with its illusions of perspective and its large windows.

Bernini respected the classic sense of space though he gave its components movement, and tension. In Bernini's S. Andrea al Quirinale, the substitution of the circle with the more dynamic form of the ellipse did not bother anyone as long as all the elements around this heretical figure were organized according to cinquecento principles.

The Baroque ceased to limit itself to bringing the light of new taste to old schemes, but created a new conception of space, that is to say, precisely where the Baroque was at its greatest. Even nowadays, understanding Baroque architecture does not merely mean freeing the mind from classicist conformism, accepting daring, fantasy, variability, intolerance of formalistic canons, variety of theatrical effects, asymmetry, disorder, the symbolic collaboration of architecture, sculpture, painting, gardening and jeux d'eau. Certainly, it means all this, but principally it also means understanding Baroque space. It means an understanding of the supreme monuments of the Baroque character of movement and interpretation triumphed not only in terms of architecture plasticity but in terms of architectural space.

The movement which characterized Baroque space was entirely different from Gothic dynamism. The latter was engendered by the contrast between two visual directives and made two-dimensional use of indications of perspective established by the play of lines on the surface of the building structure. Baroque dynamism, on the other hand, followed the plastic and volumetric experience of the 16th century, rejecting its ideals, but accepting its technical achievements.

A Gothic line directs the eye along a surface and thus keeps a wall from appearing solid, but in Baroque the whole wall undulates and bends to create a new spatial conception. Baroque movement is not a space which is achieved, but a process of achieving space; it represents space through volumetric and decorative elements in action. The ascending spiral of the dome which tops Borromini's S. Ivo alla Sapienza is its plastic symbol.

Organic Space

The two most important conceptions of space in modern architecture are those of functionalism (occasionally called the International Style) and the organic movement. Among the masterpieces of contemporary residential architecture, the Villa Savoye of Le Corbusier, and Falling Water by Wright.

Le Corbusier starts with a reticulated structure, a quadrangle modulated regularly by pilasters. His internal space is enclosed by four walls with continuous windows. In the case of Wright, aspiration toward spatial continuity has far more vitality; his architecture is centered upon the living reality of interior space and is therefore in opposition to elementary volumetric, to that sense of proud detachment from nature characteristic of Le Corbusier.

In Mies van der Rohe's delightful pavilion constructed for Barcelona Exposition of 1929, the structural order of structural elements remains rigidly geometrical, but the architectural volume is broken up. The continuous space is cut by vertical planes which never result in closed, geometrically static areas, but create an uninterrupted flow in the succession of visual angles. Here we have a still freer development of the modern theme.

Because of this, organic architecture has been erroneously interpreted as a Romantic, movement. Organic space is rich with movement, directional invitations and illusions of perspective. Its movement is original in that it does not aim at dazzling visual effects, but at expressing the action of man's life within it. Human scale became as the fundamental law in the organic conception of architecture, which rejects all buildings that dominate man and is independent of him.

Conclusion: Understanding Architecture

Understanding architecture means being able to deal with periods of rigid spatial language, such as the Renaissance; to see the point where individual spirit expresses itself and achieves a poetic language which rises above architectonic rules of syntax and semantics. It means, in periods of revolt like the Baroque, knowing how to distinguish works with disorder as an end in itself from works of genius, which achieve a moment of classical synthesis even if by means of an infinite multiplication of images.

The Baroque period was followed by the Neo-Classic period and by 19th century Eclecticism with its numerous revivals. From the point of view of interior space, the 19th century offered variations in taste but no new conception. The principal building themes of the late 19th century, and the beginning of the 20th century, represented a total failure in terms of inner space; a type of space that was nothing but a small-scale version of classicism. It was based on the open plan plus the new technique of construction in steel and reinforced concrete; a new technique which made possible the concentration of elements of static support in a slender skeletal framework and the provision of the practical conditions for realizing the theory of the free or open plan.

Eclectic architecture marked this crystalline structure in imitation of the solidity and plastic consistency so favored in the 16th century. Modern architecture has attained the spatial dream of the Gothic, by executing its artistic insights. Using vast windows, by now entire walls of glass, it has established complete continuity between interior and exterior space.

The open plan offered unlimited possibilities in an isolated building of elastic, internal divisions and subdivisions. Modern space, therefore, re-evokes the Gothic desire for spatial continuity and incorporated structure. It re-conceptualizes the use of Baroque undulating walls by replacing them with light, suspended partitions of glass, and freedom from decoration.