The continuum of material, structure and space.

Anti-gravity architecture: a new utopia for an experimental architecture

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Abstract

In the historical development from static to dynamic perception of space, there are concomitant changes in the concept of architectural style. Materials become lighter, structures more kinetic and spaces less bounded and more energetic. This paper is an attempt to examine the expression of movement in architecture, advanced concepts of equilibrium, and a new sense of weight, that would finally lead to a new concept of space expressing the essence of movement. Energy, is the basic element of this new language, since it is capable of articulating the emerging concepts of force and dynamic space in a new architectural form. This language will be an abstract element behind every design, where typical themes from static compositions, arranged on the basis of tectonic principles are significantly altered to become new themes for a new dynamic composition. It is an attempt to predict a new architecture for the future. Axes at right angles, that provided orientation in the modern movement, must now be altered. Architecture, will no longer be the play of masses under light, it is a new kind of freedom, where mobility and immateriality are its main tendencies.

"A new architecture, which will take us out of the sterility of the past and the servility of copying, is what everybody demands, and what the public wants."

Cesar Denis Daly.

The architecture of the future was a continual pre-occupation of the nineteenth century, whose theories were caught between nostalgia and progressivism. For those who longed for a glorious past, the architecture of the future could only be established through an emphatic imitation of past forms. For those with a sense of mission towards the industrial present, especially the followers of Saint
Simon, a new architecture could only be born from an authentic utilization of new materials according to new functional demands.

Cesar Daly (1811-1894), believed that a new architecture would evolve if geometry was posited as the constructive basis of all styles. For him, the curve and the inclined plane represented a harmonious new world and, by implication, the necessity of social reform and a new way of living. He pursued his aesthetic geometry to the point of actually choosing an architectural form for the future. The elliptical arch was the basis for a new style, since it was a more complex form than those from which it had evolved. The sequence, from simple to complex forms implied an important concept, where architectural forms continually strive for higher levels of sophistication. For him, the origin of architecture may be related to mass and movement. It begins with the pure frame structure raised over a platform, attempting to free itself from the hold of gravity. Passing on to the massive stone huts, and finally arriving to a new synthesis, where masonry and wood were combined. It is a trend towards lightness, and the shift from massiveness to frame structures to tension and finally to energy oriented architecture; characterizes the evolution of the whole architectural theory. It is a search for a new architecture: architecture of defying gravity. An argument between heaviness and lightness; thus leading to a spatial geometry.

There exist an urge to create newborn, original and unique architectural style. According to Italo Calvino, humanity is condemned by its weight and heaviness. It is the lightness not of a feather but of a bird, not of Medusa but of Icarus that we are searching for. It is a Paul Valery would identify; an aerial rather than terrestrial architecture. The influence of gravity is waning, this literally means a revolution. Gravity bound architecture in which cornices and capstones, the constant reminders of earth, must be altered. It is the task of architecture to bring expediency and beauty, or in Vitruvian terms, \textit{Utilitas} and \textit{Venustas} to expression. With the possibility of flight, architecture was virtually removed from the gravitational axis. The consequence was a new stereo-metric system; where grouping and telescoping of architectonic elements, were no longer the product of an outlook tied to only one axis. Instead, they sprang from Sant Elia's futuristic drawings and Moisei Ginzburg's dynamic force lines.

Similarly, the visual language had evidently evolved over time. In crossing out the image of the Mona Lisa, Kasimir Malevich (1878-1935) freed himself from the last representational ties: the crossed out culture of the past, to create a new image. This position is revealed in the painting of a Black Square on a White Canvas. The black square was intended as a full stop in the history of art, before a new beginning. It was a mystical icon for the new age, new culture and new space concept. I would call this effect phenomenal kinetics (Wolin [1]). His geometrically formed masses, were intended to convey a feeling of floating. This new space, which we may call The Hypre-Space constituted an imaginary concept, within its bounds, the answer to all questions of motion and dynamism are to be found (Malevich [2]). The Hovering Planits by Malevich in 1920, reflects his new spatial concepts. The House's position places it in a state of
virtual flying. Behind this idea, he freed himself from the vertical earthly gravitational axis, to a new axis of suspension, in the future not a single grounded structure will remain on Earth; nothing will be fastened or tied down (Malevich [3]).

These kinetic notions were given visual expression in Vladimir Tatlin's (1885-1935) Monument to the Third International. His architectural form was based on the dynamic relationship among material, structure and space. It is best described in his slogan:

Painting + Engineering - Architecture = Construction (Tatlin [4]).

This phenomena of dynamism and motion would suggest a new style and a new form for future architecture: the aerial style and the anti-gravity architecture. Thus a new space, for which there is no known structural system, would reflect a concept of living that could be compared to the new social considerations in the Russian Constructivist era: the F-Type plan and section. Tatlin's major contribution is the creation of new architectural forms, and the prediction of new spaces based on dynamism and motion. His idea was a plea for a new kinetic architecture. By lessening the sense of gravity, he predicted a new space. These ideas were extremely important, not only because they pointed to the future, but also they were significant in asserting a spatial directional approach within the four dimensional limits. Tatlin's monument, is an ethereal, kinetic structure which triumphs over its own weight. The focal point, is the new concept of space acting as a new visual logic for future architecture. Thus leading to a de materialization of architecture and the creation of new forms of space and architecture.

Although he was outside the revolutionary context of the Soviet architectural utopias, Le Corbusier associated architecture with aeronautic forms. His approach to produce new spatial concepts was a major item in his program, aiming at overcoming the earth-bound state. The Pilotis, raising the ground floor in spite of the pull of gravity, reflects a new potential in spatial design: the open floor plan, (Pilotis ---- Pilot ---- Planits). Similarly, his design for the Palace of the Soviets in 1931, reveals a free standing parabola as a support for the roof of the auditorium. The peak of the parabolic trajectory designates the transition between ascent and descent, as a moment of weightlessness. This concept of dynamic equilibrium, will finally generate a new perception of space.

The youngest exponent of this intellectual heritage is Santiago Calatrava. He is interested in movement in construction, not only in the problem of showing process in the product, but also in demonstrating change and development in the static form. He overlays his concern with Robert Maillart's expression of monolithic structures and Christian Menn's building process to create what I may identify as "articulated monolithic structures. Trained as he is, as both an architect and engineer, Calatrava is equally interested in form and process. This interest quickly evolved into an interest in transformation, in the mutability which has since become articulated monolithic construction. A transformation can demonstrate a possible flow of forces and its path through a structure can
lead to a transformable geometry or to the physical mobility of the structure. All of which have continued to fascinate Calatrava. This interest in mutability demonstrated a distinguishing relationship between stable and unstable equilibrium; as shown in Calatrava's abstract models. In reality, these models are far from being traditional sculptures, they are experiments in a new structural concept. Similar in a way to Buckminster Fuller's "Tensegrity" but with the important addition of the beauty of shape. View in the light of his structural work, these models bear resemblance to Antonio Gaudi's articulated tensile study models of his churches. Gaudi invented compressive stone frames to study them as wire models in tension, this invention has an analogy in Calatrava's dialectic examination of the two forms of equilibrium. His studies in equilibrium lies in the mainstream of current structural thought. The mass-dampened frames of many New York skyscrapers with their heavy concrete masses sliding to and fro at their summits to balance the oscillation, are hidden examples of such disturbingly unstable equilibrium. Calatrava merely expresses this condition explicitly.

In Coesfeld - Lette ware house, Calatrava introduced a collapsible dynamic element into the main structural system in order to express the sense of movement. He took the wave form of the cladding and the conic section it forms with concrete base and used them dynamically. In this process, he reinvented the garage door, by giving it a novel function; that of a canopy. This idea was to give a spatial or volumetric expression to a facade originally conceived in two dimension. Similarly, in the Concrete Pavilion for the Swiss Building Industry, Calatrava invented a large concrete moving machine, that could move. The shadow patterns produced by these concrete ribs change continually as they move up and down. The movement of these ribs is generated through the rotation of reels. These reels are coaxial along a longitudinal axis, giving them a common organic form. This movement creates a sinusoidal change in the shape of the roof. These experiments with stable and unstable equilibrium, repetition, movements, translation, and articulation are all major elements in Calatrava's designs. Through his work, he succeeded in creating an iconography of movement even more dynamic than did Ero Saarinen in the TWA Pavilion at J.F. Kennedy Airport. Saarinen evokes the emotional image of flight with his architectural form. Calatrava demonstrates movement and simultaneously a logic flow of stresses in the structure.

We should not exclude irrationality, but we should accept it as an integral part of our architecture, together with the faculty of reason. This is precisely the path we must take in order to create a new architecture and to constitute a new space. Architecture can now be considered as a force field full of tension, floating in endless space. from the rationality of the right angle to the irrationality of floating in space; destroying boundaries and limits, would be the ideal for the next millennium. Not only does this architecture have no fixed floor plan, it also assumes that there is no fixed manner of experiencing space. Along with this new spatial experience, architecture would reveal a new kind of freedom: mobility and immateriality. Just as the triangle, an image of general
equilibrium, was the best expression for the Renaissance, so anti-gravity architecture is the best and most effective symbol of modern spirit. Energy is the basic element of this architecture, since it is capable of articulating the emerging concepts of force and dynamic space in a forceful architectural form. The aim to energize the architectural form, this image provides the ultimate rationale for the structure and imbues the building with character and visually dynamic aspects. I am of the opinion that architecture is destined to reveal not only gravity and flexibility, but at the same time true weightlessness, which is their very opposite (Schopenhauer [5]).

References:


Figure 1: Anti-Gravity Architecture: Dynamic Versus Static Architecture.
Figure 2: Kasimir Malevich: "The Pilot's Planite," 1921. Architecture has freed itself from the bonds of Gravity.
Figure 3: Dynamic Versus Static Perception of Space. Vladimir Tatlin's Monument to the Third International Versus the Chicago Frame Construction.
Figure 4: Santiago Calatrava:
Dynamic Architecture and the Concept of Movement.