CHANGING PARADIGMS IN SPACE THEORIES: Recapturing 20th Century Architectural History

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Abstract
The concept of space entered architectural history as late as 1893. Studies in art opened up the discussion, and it has been studied in various ways in architecture ever since. This article aims to instigate an additional reading to architectural history, one that is not supported by “isms” but based on space theories in the 20th century. Objectives of the article are to bring the concept of space and its changing paradigms to the attention of architectural researchers, to introduce a conceptual framework to classify and clarify theories of space, and to enrich the discussions on the 20th century architecture through theories that are beyond styles. The introduction of space in architecture will revolve around subject-object relationships, three-dimensionality and senses. Modern space will be discussed through concepts such as empathy, perception, abstraction, and geometry. A scientific approach will follow to study the concept of place through environment, event, behavior, and design methods. Finally, the research will look at contemporary approaches related to digitally supported space via concepts like reality-virtuality, mediated experience, and relationship with machines.

Keywords: Space theories; architectural history; modern space; place; digitally supported space.

INTRODUCTION
The present epoch will perhaps be above all the epoch of space. We are in the epoch of simultaneity; we are in the epoch of juxtaposition, the epoch of the near and far, of the side-by-side, of the dispersed. We are at a moment.

Michel Foucault (1967)

In his talk for the RIBA Annual Discourse of 1996, Anthony Vidler makes an architectural overview reexamining the last two centuries in three categories: For him, the common interest of the architectural theorists of the 19th century is time, temporality and history, including historical styles and narrative. Foucault agrees: history is the obsession of the 19th century (1967). At the beginning of the 20th century, a critique of temporality starts directing architects and critics from the concept of time to space: “Space’ rapidly replaced time, and specifically time as represented by historical ‘style’” (Vidler, 1996: 181). Space -as a timeless time, an eternity- becomes the new concept of the last century of the second millennium, which witnesses competing ideas of space (Vidler, 1996: 178-82). Elsewhere Vidler explains, “In historical-cultural terms, like the body, or like sexuality itself, space may be considered not so much as a constant, but as a concept that shifts and changes over time and according to the conceiver” (1998: 53). The third period, “the second machine age” includes what he calls the spaceless, the spatially absent, or digital space as a result of cybernetics and digitalization (Vidler, 1996: 183-84):
In its fundamental form, [digital space] has nothing to do with space at all, or rather not with space conceived in modernist terms… After all, what is spatial about an endless string of 0’s and 1’s, a string that for the purposes of display has to be looped around a screen; an endless line, without direction, displayed on a screen without depth? While the representation of information might well have spatial cognates, information itself seems to have no inherent spatiality. Nor can we return to the comforting terms of a temporal discourse. … For narrative itself, temporality itself, has been collapsed, like space, into no-time and no-space (Vidler, 1996: 183-84).

The reflection of this shift in architecture is “counter-space,” a rejection or elimination of space that Vidler sees, for instance, in the work of Daniel Libeskind (the extension to Victoria and Albert Museum, 1996) and Rachel Whiteread (‘House’, 1993-94) (1996: 186). Later, he takes digital space more seriously declaring it a form of space: “Digital space, installed rather than designed, is already all around us; it envelopes us in the virtual forms of media. It fights our wars, controls our consumer habits, and ensures the security of our houses” (2001: 72).

The way Paul Virilio locates the concepts of space and time historically contradicts with Vidler’s three-partite classification: the dominance of time in the 19th century, the appearance of space in the 20th century, and the disappearance of both after the 1980s. Virilio argues that contemporary architecture does not witness spacelessness and timelessness; on the contrary, a concept of temporal space dominates our times. Just like space itself, the definition of time is changing in time, and the concept of time takes over the concept of space in contemporary architecture and philosophy: “Here no longer exists; everything is now” (Virilio, 2000a: 125). In the foreword of Virilio’s A Landscape of Events, Bernard Tschumi writes, “space itself becomes engulfed in time. Space becomes temporal; … time has finally overcome space as our main mode of perception” (2000b: viii-ix). Unlike 19th-century historicism, this understanding of time is a conceptual interpretation rather than stylistic.

Though Vidler and Virilio disagree in their theories, there is one fact that the critics share: The concepts and conception of space, and time, have changed radically by the end of the second millennium. Accordingly, this research aims to create an additional reading, one that is not supported by “isms,” to the architectural history in the 20th century. We will base this history on diverse space theories, which have had a significant effect on architecture in the previous century. In this context, the objectives of the article are to bring the concept of space and its changing paradigms to the attention of architectural theoreticians, to introduce a conceptual framework to classify and clarify the first theories of space, and to enrich the discussions on the 20th century architecture through theories that are beyond styles. In this study, the theories of space between 1890 and 1930 are categorized as to Cornelis van de Ven's Space in Architecture (1978). The theories between 1960 and 1990 are sorted as to Atilla Yücel’s model in two of his lecture series at Istanbul Technical University, Space Analysis in Architecture and The Techniques of Typological Analysis. The study will focus on space and time in the discipline of architecture following Vidler’s advise (1996: 178) on avoiding stylistic terms, and speaking of paradigms, or frames of reference that cut through these surface descriptions.

THEORIES OF SPACE: A CONCEPTUAL FRAMEWORK

Any definition of architecture itself requires a prior analysis and exposition of the concept of space.

Henri Lefebvre (1991: 15)

Everything exists and moves in space (that Panofsky would call mathematical or geometric space). “Space and time are the framework in which all reality is concerned. We cannot conceive any real thing except under the conditions of space and time. Nothing in the world, according to Heraclitus, can exceed its measures - and these measures are spatial and temporal limitations,”
(Cassirer, 1953: 42). People would be lost without space and time. Paradoxically, space theories are not an ancient part of architectural history and theory. Space becomes a subject of architecture only by the end of the 19th century through the treatises of art historians and the formal experiments of the avant-garde. It has not been considered the essence of artistic experience before the 1890s (van de Ven, 1978: 80). Before the industrial revolution, as a metaphysical concept rather than architectural, space was a subject of philosophy and science. Besides, what is meant by space in this relatively short period -from 1890 to the present- varies from text to text, and from time to time. As soon as it becomes a part of architectural theory, this multi-dimensional concept begins to gain different meanings and keeps on altering. Like their designs, architects’ conceptions of space vary. It is discussed within different (aesthetic, technical, functional, formal, social, cultural, political, philosophical, historical and economic) contexts, through different paradigms, and via different viewpoints. One may come across various types of space in architecture:

Abstract space, artificial space, Baroque space, capitalist space, Cartesian space, cinematic space, conceptual space, communicational space, cosmic space, cubist space, cultural space, differential space, digital space, divine space, ecological space, egocentric space, epistemological space, Euclidean space, existential space, expressionist space, family space, fantastic space, felicitous space, formalist space, functionalist space, galactic space, geographical space, geometric space, global space, Hegelian space, heterogeneous space, ideological space, industrial space, ineffable space, infinite space, irrational space, Kantian space, literary space, local space, Marxist space, mathematical space, mental space, metaphysical space, mobile space, modern space, montage space, musical space, natural space, neutral space, Nietzschean space, non-Euclidean space, organic space, perceptual space, peripheral space, personal space, perspectival space, physical space, psychological space, pictorial space, plastic space, poetic space, political space, postmodern space, pragmatic space, public space, real space, religious space, representational space, semiological space, social space, socialist space, strategic space, symbolic space, tactile space, textual space, topological space, urban space, virtual space, visual space, warped space... There is no single definition of space.

Table 1. A classification of 20th century space theories
(Source: Authors).

<table>
<thead>
<tr>
<th>Space</th>
<th>Dominant Influence</th>
<th>Related Theorists</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td>a new concept</td>
<td>von Hildebrand, Schmarsow, Riegli, Wölfflin</td>
<td>1890-1900</td>
</tr>
<tr>
<td>Modern space</td>
<td>Architecture as art</td>
<td>Worringer, Spengler, Brinckmann, Frankl,</td>
<td>1900-1930</td>
</tr>
<tr>
<td>(interval)</td>
<td></td>
<td>Sörgel, van Doesburg, Gropius, Wright,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Le Corbusier, Lissitzky (Giedion, Zevi)</td>
<td>(1930-1960)</td>
</tr>
<tr>
<td>Place</td>
<td>Architecture as art</td>
<td>Rossi, Alexander, Lefebvre, Norberg-</td>
<td>1960-1990</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schulz, Rapoport</td>
<td></td>
</tr>
<tr>
<td>Digitally supported</td>
<td>Architecture as technology</td>
<td>Rajchman, Virilio, Vidler</td>
<td>1990-present</td>
</tr>
<tr>
<td>space</td>
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</table>

In this context, the conceptual framework in Table 1 will be introduced in an attempt to classify and clarify spatial theories of the 20th century. The introduction of space in art and architecture will revolve around subject-object relationships, three-dimensionality and senses, and the development of modern space will follow in the first half of the 20th century. This artistic period will be discussed through concepts such as empathy, perception, abstraction, and geometry. A more scientific approach to architecture will follow to discuss concepts of place stating in the 1960s. This period will revolve around concepts like environment, event, user, behavior, and design methods. Finally, the research will look at contemporary approaches under the topic digitally supported space. Within the context of a technological approach, the discussion will include
concepts like reality and virtuality, mediated experience, and relationship with machines. This additional reading of 20th century architectural history is likely to open up a new discussion that is beyond styles.

1890-1900: WHAT IS SPACE?

It is not space in particular that interests the art historians of the late 19th century; they are more concerned with the relation between the observer and the artwork. Subject-object connection leads them to the relation of people with their environment, the space within. The concepts theorists come up with to unfold the relation of the subject with the other, such as light, viewpoint, scale, direction, depth and enclosure, are spatial aspects. Thus, as soon as the concept of space appeared in art in the 1890s, it is related to senses, perception, and psychology. Human body is considered as the generator of the three-dimensional extension of space - width, height and depth. Not only visual but also tactile senses are taken into account; space is perceived through the movement of the body as well as through the eyes (van de Ven, 1978: 71-93).

Figure 1: Loie Fuller, “Serpentine Dance” Performance, 1890s: 3-D space as the extension of human body  

In The Problem of Form in the Visual Arts, which includes the artistic musings of Adolf von Hildebrand, the German sculptor clarifies this approach with two ways of seeing: pure and kinetic visions. von Hildebrand relates vision to the perceptual form of the object as opposed to its actual form, its physical reality. The pure vision of a distant object creates a unified two-dimensional image of the object and the background that the observer perceives at a single look, whereas the kinetic vision of closer objects requires the perception of a mobile body to create successive two-dimensional impressions that give a plastic idea of the three-dimensionality of the object. The permanent movement of the glance is similar to touching. It is the task of art, for von Hildebrand to merge these two visions (Barasch, 1998: 133-42). Austrian art historian Alois Riegl supports the idea that vision and touch work together; he also distinguishes optical (distant, objective) vision from tactile (close, subjective) vision (Iversen, 1993: 9-16).
Similarly, von Hildebrand’s contemporary August Schmarsow deals with the psychology of space, however, approaches the same issues from a different angle. German historians von Hildebrand and Schmarsow introduce the concept of space in art both in 1893. Their analyses are not limited to subject-object relationship like some of their contemporaries’ theories but include space in the real sense of the concept for the first time in art history.

For Schmarsow, architecture is composed of three-dimensional space -as the extension of the human body- and time through the movement of the observer. The sense of space is perceived via the experience of muscular sensations, the structure of the body, and the sensitivity of the skin. He distinguishes space (the contained) from mass (the container), which will be an important part of spatial discussions soon after. Architect August Endell, for instance, sees space as a void expanding rhythmically between walls that define it. Purpose leading to space, for Schmarsow, is a fundamental in architectural aesthetics (van de Ven, 1978: 90-93). Riegl, on the other hand, rejects any utilitarian motivation and defines space as the source and the aim of Kunstwollen (artistic will); not necessity but the architect's volition drives him to space-making. “I see in the work of art the result of a specific and purposeful Kunstwollen that asserts itself in conflict with practical purpose, material, and technique,” (Riegl in Iversen, 1993: 71). This is not the will of a single artist rather one orientation of the artistic will governs plastic arts in every period; it is a cultural and collective attitude (Riegl, 2000: 94). These two theories are the basis of another long-term opposition in architectural criticism about the foundation of space: functionality versus aesthetics (van de Ven, 1978: 90-93) (Table 2).

**Table 2.** Dominant approaches to architectural space in the first half of the 20th century (Source: Authors).

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Aesthetics</th>
</tr>
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<tbody>
<tr>
<td>Starts with:</td>
<td>August Schmarsow</td>
</tr>
<tr>
<td>Followed by:</td>
<td>Alois Riegl</td>
</tr>
<tr>
<td>Focusses on:</td>
<td>Abstraction/Geometry</td>
</tr>
<tr>
<td>Designed as:</td>
<td>Geometric space</td>
</tr>
</tbody>
</table>

As part of the early space theories in art and architecture, von Hildebrand, Riegl and others concentrate on the fear of space, especially agoraphobia, the fear of large open spaces. This psychological illness concerning space leads art historians like Heinrich Wölfflin to focus on mass instead of space as early as the 1880s. Wölfflin sees architecture as the art of physical mass, and studies matter and form in relation with the theory of empathy that uses form and mass to overcome the fear of space. His formal analysis of art history depends on planar vision; for him, architecture is composed of two-dimensional images set up by mass. History of art is the history of form (van de Ven, 1978, 94-98).

The fact that architectural theories mainly deal with physical aspects of buildings until late 19th century emphasize the significance of the ideas of von Hildebrand and Schmarsow in the 1890s. Form and mass have not been the only concerns of architects ever since. A new concept-space- and discussions related to the spatiality of architecture enrich and inform theories behind architectural design.

**1900-1960: ARCHITECTURE AS ART AND MODERN SPACE**

The 20th century starts with a background in which the ideas of mostly German art historians based on psychology and science, including visual and tactile space, mass, time, function, and aesthetics, guide the theorists, artists and architects of the new century. Modern space starts to form with the early ideas and applications in architectural practice (Berlage, Endell, and Art Nouveau) supported, as always, by theory. The concept of space continues to be the center of attraction until the 1920s. Studies on space do not improve much in the 1930s up until the 1960s when reactions against the modern movement are intense. Modern space of the first half of the
20th century is rational, geometrical, abstract, functional, mathematical, and transparent in character.

Figure 2: Theo van Doesburg, Construction in Space-Time II, 1924

In the first decade of the new century, an opposition, which Wilhelm Worringer uses in Abstraction and Empathy: A Contribution to the Psychology of Style (1908) to clarify some of the earlier discussions, guides the ideas of the forthcoming avant-gardes: empathy and abstraction as the two poles of a pendulum of art. Some artists follow the organic, naturalistic forms of empathtical theory for space-making. Empathy as a projection of one's feelings onto an object seen is considered as a natural intuitive human ability. The tendency to purify the chaos of the universe, on the other hand, directs others to abstraction and inorganic, crystalline, stylized regularity of geometry. They believe abstraction (as a result of self-protection, introversion and leaving life behind) is necessary to overcome the fear of space. Worringer believes both abstraction and empathy are crucial for an understanding of space creation (Barasch, 1998: 171-87).

In the late 1910s, Oswald Spengler defines two expressionist spaces following Worringer's theory: organic and geometric spaces. Organic space, for example Erich Mendelsohn's Einstein Tower, is related to empathy, destiny, and anthropomorphism, whereas geometric space, for instance Bruno Taut's Glass Pavilion, is related to abstraction, causality and the crystalline. Comparing the space conception of Western culture with Classical space, he outlines a transition from plastic, physical mass to three-dimensional pure space, from static and finite space to dynamic and infinite space, from designing from the outside-in to the inside-out (van de Ven, 1978: 154-67). On the other hand, Albert Erich Brinckmann who adds several terms
to the vocabulary of space in the 1910s -space-formation, spatial effect, spatial design, and feeling of space- focuses on three concepts of space: mass surrounded by space, space surrounded by mass, and the combination of the two. For him, architecture is the unity of space and mass, whereas the aim is creating space (van de Ven, 1978: 110-17).

In the same decade, Czech architectural historian and theoretician Paul Frankl studies the morphology of space for the first time. His categories of architecture are space, mass, light, and purpose. He classifies form in four categories accordingly: The first is spatial form categorized due to the organization of spatial parts: spatial addition of single spaces versus spatial division of one space. The second is corporeal (mechanical) form categorized due to the generators and transmitters of physical force: the structural where forces are expressed versus the textural where forces are covered. The third is visual form categorized due to light, color, surface and optical effects: frontality (unity) versus diagonality (multiplicity), one image-like perception (single viewpoint) versus many image-like perceptions (multiple viewpoints). This is similar to pure and kinetic visions of von Hildebrand. For Frankl, the stylistic principles of Romanesque architecture are addition, frontality and structure whereas of Gothic architecture are division, diagonality and (at first structure, later) texture. His fourth category is purpose related to human activities that support spatial form: spaces of repose (necessary activities) versus spaces of movement (circulation) (Frankl, 2000: 9-50).

Herman Sörgel, on the other hand, sees architecture as a spatial art and supports the idea of the unity of space and mass. He classifies space concepts as actual, perceptual and effectual spaces in his aesthetical theory of architecture in the late 1910s. The actual space, for him, is the objective, physical space; the perceptual space is the physiological impression of this space on the retina of the eye, and the effectual space is the architect’s underlying aesthetic idea of space and the perception of this idea by the observer. He sees plane, mass, and space as the perfect triad (van de Ven, 1978: 110-17).

Relating the concept of space with continuity, movement and time has been the tendency of historians as early as the 19th century. However, time is not considered as a dimension of space before the 20th century. Despite Futurist Filippo T. Marinetti who claims “time and space died yesterday” (Caws, 2001: 187), space-time becomes a new concept in art and architecture with the influence of Albert Einstein’s theory of relativity in physics and the mechanical improvements in technology. Four-dimensional space replaces Euclidean space first in Cubism. The concept of simultaneity brings forth the coexistence of more than one point of view expressing aesthetic experience in time. Representation of the visual memory of a moving observer is preferred to optical vision in Cubist paintings.

The spatial ideas of architect and painter Teo van Doesburg are worth mentioning, even though he contradicts with painter Piet Mondrian, the other significant figure of De Stijl, who supports an abstract planar understanding of space. van Doesburg says, “The modern painter’s task consists in creating with the aid of color a harmonious whole in the new four-dimensional realm of space-time -not a surface in two dimensions” (1970: 80). In the 1910s and 1920s, he deals with the floating aspect of space, composition of rectangular planes extending infinitely, objects in motion, immateriality, abstraction and designing from inside-out (1970: 79). He declares, “The pure expressional means of architecture are plane, mass (positive) and space (negative). The architect expresses his aesthetic experience through the relationship of planes and masses to internal spaces and to space” (1969: 15). He is after a non-Euclidean, neo-plasticist space through the unity of space and time (1970: 79).

In the 1920s, Walter Gropius accepts space as the core of the artistic research in Bauhaus. In “The Theory and the Organization of the Bauhaus,” he claims, “The objective of all creative effort in the visual arts is to give form to space.” Looking for a science of space, he defines four aspects of the concept: illusory space as an immaterial space generating from one’s intuitive and metaphysical power, mathematical space as a measurable space of the intellect, material space as a real, tactile space, and artistic space as an emotional, spiritual space combining one’s soul and spirit with actual reality (van de Ven, 1978: 135-44).
Frank Lloyd Wright, on the other hand, focuses on organic space in the late 1920s and defends the concept as his design principle all his life. The five integrities of his architecture, as he describes in The Natural House, are firstly the unity of the interior and exterior, and the house as a whole (destruction of the box, wall as a screen, form and function as one, association with the ground, planes parallel to the ground, and horizontality), secondly glass as a new material that makes unity and integration possible, thirdly continuity (plasticity, continuous physical movement, flow of space, free plan, depth as the third dimension, and use of cantilever), fourthly the nature (and natural use) of materials, and lastly integral ornament (as the expression of inner rhythm of form, as structure expressed as a pattern, organic simplicity) (1973: 13-66). He believes, “Architects were no longer tied to Greek space but were free to enter into the space of Einstein” (1973: 21).

Though surface, mass and plan are key concepts for Le Corbusier; space begins to dominate in his architecture in the early 1920s. Space as he describes in connection with promenade architecture, is related to the temporal experience of the viewer as in Cubism. It is composed of the images perceived by a mobile observer. The concept of ineffable space that he defines in the 1940s is about the emotional state in which one experiences spaces. That includes all senses of the observer whether or not they can be described. Vidler calls it inexpressible, indefinable, or indescribable space (2000: 53-54).

Russian Constructivist Eleazer Lissitzky who deals with the aesthetics of space perception defines four space concepts in the 1920s: Planimetric space is composed of two-dimensional surfaces, planes; perspective space is the cubic box of three-dimensional Euclidean geometry; irrational space (space-time) is composed of the multiplication of perspectives creating a four-dimensional space. Here, the observer experiences time through movement. Finally, imaginary space is film space with the immaterial representation of depth and movement/time. It can be argued that this classification summarizes the different approaches to the conception of space during the modern period (van de Ven, 1978: 209-20).

Two books published in the 1940s are worth mentioning especially because they are still widely referred to: Siegfried Giedion’s Space, Time and Architecture and Bruno Zevi’s Architecture as Space. These studies move space to the core of architectural discussions by rewriting the history of architecture based on space. Some of the concepts Zevi makes use of to understand space are interior-exterior, form-content, space-mass, solid-void, architectural-urban, romantic-rational, horizontal-vertical, light-shade, function, empathy, relativity, time, movement, continuity, unity, rhythm, balance, symmetry, proportion, scale, color, perspective, and line-plane-depth. These concepts are still widely used in architectural practices and schools. Although we believe in their importance deeply, we argue that contemporary theoreticians need new concepts to understand and create the space of the 21st century.

As discussed above, most of the spatial discussions of the first half of the 20th century take place between 1900 and 1930. The second thirty-year period up until 1960 is not as productive in terms of space theories. This inertia changes when architects look for a more scientific approach to the discipline.

1960-1990: ARCHITECTURE AS SCIENCE AND PLACE

In the 1960s, architecture begins to look for scientific methods to improve. It can be considered that architecture as a form of art is replaced with architecture as a branch of science. In the early 1960s, the concept of space-time is replaced by existential space under the influence of the philosophy of Martin Heidegger, while the 1970s witnesses a return back to the concept of mass. Terms like environment, place, location, and site begin to be used more than space itself. Architectural theoreticians study and integrate diverse philosophical approaches like structuralism, phenomenology, and semiology; they analyze design methods, typologies, syntaxes, and relationships between environment and user behaviors.
Italian Neo-rationalist Aldo Rossi is one of the architect-theorists dealing with architecture as science. He designs buildings, mainly in the 1970s, which are monumental, minimalistic and abstract with simple basic geometries. He believes in evaluating architecture in itself, without applying to other disciplines. He uses an analytical method to study the physical forms of buildings and cities. He looks at the elements cities are composed of and the ways they are grouped together. In The Architecture of the City, published in the 1960s, he talks about typology as “the study of types of elements that cannot be further reduced, elements of a city as well as of an architecture” (Rossi, 1982: 41). Being independent of place, time and function (rejecting Sullivan’s “form follows function”), type remains constant and unchanging, underlying all built examples. It is a logical principle, permanent and timeless, that is prior to form. Besides typology, Rossi deals with concepts like place (locus), memory, monument, logic and analogy in his lecture notes. Place gives an architectural entity its condition of being: “The locus is a relationship between a certain specific location and the buildings that are in it. It is at once singular and universal,” (Rossi, 1982: 103); it is singular because of its position, time, topographical dimensions, form and memory of successive ancient and recent events (Rossi, 1982: 107). For Rossi, logic and memory -not history- are much related. Monuments are the memory of a city. Either personal or collective memory is set into motion through the essence of types and the analogous design process.

Another scientific approach to architecture belongs to Christopher Alexander who bases his analytical design method on users, communal participation and context, in which synthesis (design) follows analysis (programming) (1960s-80s). In A Pattern Language, published in the
In the 1970s, he analyzes similar spaces using the same logic, technique and scale. The book includes more than 250 patterns, each as a fragment of the environment in one of the three scales he writes about, town, building and detail (construction). Alexander states “every place is given its character by certain patterns of events that keep happening there. These patterns of events are always interlocked with certain geometric patterns in the space” (Caws, 2001: 658). He not only deals with geometric criteria but also relates the events taking place in spaces with the layout of the space. For him, there is a connection between activities and form, event patterns and spatial patterns. Space is actually a context for events. The physical environment makes up space together with the experienced actions. Using patterns, Alexander aims to create a common language for different experts like architects, planners and engineers.

Well-known French architectural theoretician Henri Lefebvre who starts writing as early as the 1930s sees space from a political, scientific and sociological standpoint (1960s-70s). Dealing with Marxist theory, revolutionary politics, urbanization and social processes, he is involved in the production of space more than its elements. He talks about social, absolute, abstract, contradictory and differential spaces. As a social product, as the space of society, “social space is constituted neither by a collection of things or an aggregate of (sensory) data, nor by a void packed like a parcel with various contents, and that it is irreducible to a ‘form’ imposed upon phenomena, upon things, upon physical materiality,” (1991: 27). For Lefebvre, space is at once perceived, conceived, and directly lived. The perceived-conceived-lived triad leads to three concepts concerning social space that he discusses in The Production of Space published in the 1970s: materialized spatial practice in relation with social practice, and the process of spatial production and reproduction (abstraction), representations of space as conceptualized space in relation with production, order and knowledge, and representational space as space directly lived in relation with the underground side of social life (Lefebvre, 1991: 26-40).

Christian Norberg-Schulz, a follower of Heidegger, deals with existentialism, psychology, phenomenology of environment, behavior sciences, and concepts of place, house, dwelling, area and settlement (1960s-80s). In Genius Loci: Towards a Phenomenology of Architecture, published in the late 1970s, he defines places as the spaces where life occurs. Space is a system of places. Place (locality) as an integral part of existence is a concrete term for environment. A place is a space with a distinct character, not abstract, scientific or mentally constructed but qualitative and phenomenological. Dwelling is the purpose of architecture; architect’s tasks are to create meaningful places and to help one to dwell. “When man dwells, he is simultaneously located in space and exposed to a certain environmental character.” The environment influences people, and place gives them their identity. Norberg-Schulz talks about four elements of space: The first is physical space (center, place) that is physical existence as it is; the second is perceptual space (direction, path) which is the temporary space as it is perceived by the user; the third is existential space (area, domain) that is related to the basic relationship of one and his/her environment. Existential space, for instance, the meaning of the concept of home, is abstract and permanent; it does not change with changing conditions. It “exists independently of the immediate situation, possessing its own order and stability.” It stands for one’s concept or image of the environment. Architecture is a concretization of existential space. Finally, he defines conceptual space that is the space concept of specialists like architects, economists, mathematicians. The conceptual space of an architect is different, for example, from the space of a physicist (Norberg-Schulz, 1988: 14-29).

Environment-behavior studies that Amos Rapoport deals with are a science-based design theory related to environmental design, cultural context, communication, and the user (1970s-80s). He differentiates perceived environment from built environment and talks about environmental evaluation, cognition, and perception. As he mentions in The Meaning of Built Environment, published in the 1980s, elements organized in designing the environment are space, time, communication, and meaning; “space is the three-dimensional extension of the world around us, the intervals, distances and relationships between people and people, people and things, things and things. Space organization is, then, the way in which these separations
(and linkages) occur and is central in understanding, analyzing, and comparing built
environments” (Rapoport, 1990: 179). In this humanistic approach, he uses the term environment
instead of space, built environment instead of architecture, and environmental design instead of
architectural design.

A scientific understanding of space-making dominates theories of space in the 1970s and
1980s. This is a fundamental shift from previous artistic approaches. In this period, there is a
stronger connection between architectural and urban space; the scientific theories respond to
urban problems. The scientific period turns into a mediator between the artistic theories of the
past and contemporary technological theories.

1990-2000 AND BEYOND: ARCHITECTURE AS TECHNOLOGY AND DIGITALLY
SUPPORTED SPACE
There has been an uninterrupted relationship between space and technology since the industrial
revolution. It can be argued that the major source of the musings about the concept of space in
the industrial age is technological changes. Giedion says “the seeds of the architecture of our day
were to be found in technical developments little regarded at the time of their appearance” (1967:
211). Vidler talks about “two of the major themes that characterized both modern architecture and
the history of architecture in the first fifty years of this century -the question of technology and the
problem of space” (1999: 483). He believes without spatial thought modern movement would not
be able to integrate the new technological structures and systems (1998: 54). Just like the 1890s,
the 1990s is a time when architects and theoreticians face the inevitability of a search for a new
approach to architecture. The search in the 19th century ends up with the addition of the concept
of space to architectural theory, whereas the output of the 20th century seems to be the concept
of virtuality.

John Rajchman who has a philosophical approach to architecture is a theoretician who deals with
the concept of virtuality. He believes the virtual has “multiple potentials for new connections or

Figure 4: “Panorama” Room, Delugan Meissl Associated Architects,
Eye Film Institute, Amsterdam, 2012
(Source: by the author).
A virtual construction is one that frees forms, figures, and activities from a prior determination or grounding, of the sort they have, for example, in classical Albertian perspective, allowing them to function or operate in other unanticipated ways; the virtuality of a space is what gives such freedom in form and movement. Thus virtual construction ... constructs a space whose rules can themselves be altered through what happens in it. (Rajchman, 1998: 119).

Architect and city planner Paul Virilio who studies the concept of time has a philosophical and political approach to architecture. He writes about concepts like technoscience, technoculture, real-time technologies, technologies of synthetic vision, and data, game and signal theories. He replaces architectural space with digital space based on computer-generated virtuality:

The new office is no longer a separate room, an architectural section, but has become a single screen, the space reserved for work and study has become the terminal of an office/viewer where the data of teleinformation appear and disappear instantaneously, the three dimensions of built space being transferred to the two dimensions of a screen, or rather of an interface which not only replaces the volume of the old room with its furniture, its layout, its documents and its work plan, but also saves the occupant having to travel nearer or farther. This transmutation ... would if necessary explain the present great ‘post-industrial’ deployment (1998: 6-7).

Anthony Vidler who has a psychological and technological approach to architecture is a notable theoretician and critic. He talks about Foucault, Sigmund Freud, Jacques Lacan, Friedrich Nietzsche, or Franz Kafka as long as their theories help him to clarify his points. Dealing with the concept of the uncanny, he goes back to a psychological idea of space related to spatial fear that was popular when space theories were just beginning to dominate in architectural theory. He uses contemporary terms like cyberspace, hyperspace, virtual space, imaginary space, or immaterial space interchangeably. He refers to the term virtual as opposed to the real (that which exists). Especially in his later work, he is searching for a new understanding of architectural space, which is under the influence of new technological transformations. He claims “the very rapidity of image manipulation and projection, merging with the reality represented, changes fundamentally the context of life and vision. A history of architecture that takes these, and previous, paradigm shifts in visual and spatial analysis into account is in this context, an urgent need” (1999: 485).

We agree with the necessity of taking action in studying the relationship of architecture and technology. As the architects and theoreticians of the early 20th century search and find their concepts, we should look for ours. The concepts of the 21st century will be different from that of the 20th. “I think there is reason to believe that the digital revolution is forging a truly new kind of architecture, one that, for better or worse, will gradually enter the mainstream of 21st-century practice” (Vidler, 2001: 71). Similar events take place in the 1890s and 1990s: Humanity faces two revolutions, first the industrial, then the digital. In both cases, the revolution comes with technological transformations — in the former, machine (hardware) technology and in the latter, information (software) technology (supported with hardware). The changes influence not only architecture itself but also the way humans live and interact with their environment; computer space transforms into office space as in Virilio’s example.

Vidler reminds that “space and technology, always linked in the ideology of Modernism, have emerged as inextricably joined in the techniques of digitalization” (1999: 483). Space and technology are together in the digital age. The key to a new discourse in architecture is within the confines of the integration of architectural space and digital space.
CONCLUSIONS: DIGITALLY SUPPORTED ARCHITECTURAL SPACE

Indeed, in the present moment, where the question of space is itself being revised under the influence of digital technologies, as Michael Benedikt has shown, it becomes even more important to develop a critical practice of spatiotechnological history. For the new technologies are more than simply shifts in representational techniques.

Anthony Vidler (1999: 485)

To go beyond the spatial theories and designs of the 20th century, and to define the conception of space in contemporary architecture, digital spaces that are the outcomes of computer science and information technologies, are significant. They did not exist before the mid-1970s. Compared to the history of architecture, which is almost as long as the history of humanity, this is a relatively short period. However, the changes in the discipline in the second half of the 20th century, especially in the last quarter, it is possible to say, are more than the changes that took place in a few centuries. The traditional understanding of space-making is being transformed through the changes in technology as well as in daily life. Vidler explains the spatial transformation as follows (2000: 243-44):

… the infinite mutability, the seemingly endless permutations and rotations of digital constructions, the speed of virtual travel within the image, not to mention the complexity of the networks of communication themselves, all lead to the suspicion that some transformation in subjecthood is under way, … the relations between image and experience have nevertheless been changed beyond recognition within the processes, if not the outer forms, of spatial design (Vilder, 2000: 243-44).

To discover the new criteria of space in contemporary architecture, architects could and have begun to look through the relationship between architectural space and digital space. Concepts that are significant in the understanding of digital spaces and their relation with architectural space are reality and virtuality of space, (im)materiality of space and body, (dis)continuity of space and time, mobile versus static space, and introverted versus extroverted space. Different from the concepts discussed in the industrial age, the spatial concepts of the digital age are linked to one’s musings about the computer and digital technologies, and their influences on his/her relation with space. The digital technologies have opened up a big debate in philosophy, art and architecture about reality. They have developed an option to the materiality of being. They have broken the ultimate continuity of space and time. They have shaken the foundations of the architectural product. They have withdrawn people into themselves. We are just at the beginning of these discussions.

Digital spaces have spatial qualities; they are forms of space, but none of them can be considered as architectural space. Features of architectural space contradict with these spaces. Digital spaces are like the opposite of architectural space; they have features that are the reverse of architectural space. They are actually “the other” for architectural space. Industrial revolution has given architecture the concept of space, digital revolution its other. Contemporary architectural space is supported by digital technologies. It is digitalized gradually as new technologies develop. This way, architectural space blends with and gets closer to computer space. The architectural starts to include the digital. Contemporary architectural space is digitally supported.

As the theoreticians dealing with the outcomes of the industrial revolution concentrate on subject-object relationships, contemporary theoreticians concentrate on body-mind-space relationships. Since mind itself is immaterial (within a material world), it can “survive” in a digital
space unlike the body. Digital space puts the body in a virtual position in the form of an avatar. It separates the mind from the real body. The mind moves freely in space without the body. This creates a new way of being. The subject becomes a bodiless spectator. Diverse body-mind-space relationships inevitably influence the relationships in architectural space. They may even change our relationship with our bodies. Physical distance and orientation lose their significance. Digital spaces create a different reality from the actual real – not a single reality but a variety of realities and possibilities. The Internet is a gigantic cybercity with no physical existence (and boundaries). Worlds within worlds, new spatial and temporal forms of being are created. Through new ways of being and contact, digital space has the spatial potentials to change real/architectural space, which is now a digitally supported space.

The discussion of architectural space in the digital age has just begun. By reading the 20th century architectural history through the development of spatial theories, we have tried to provide a background for this discussion, which, it seems like, will continue for a while in the first decades of the third millennium.

REFERENCES


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