

Discreteness in the Architecture of the 21st Century*

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Abstract—The architect of the 21st century faces the question of how to encode the modern world. The advancement of modern technology inspires the architect's experiments with the form. This article considers the phenomenon of discreteness in architecture, firstly, as a specific aesthetic phenomenon in architecture (on the example of architectural projects by Retsin, Rehm, Wiscombe), and secondly, from the point of view of modern philosophy (Simondon), which departs from the well-known principle of "matter-form" and strengthens the role of the act of invention, a mental operation, uniquely related to the dynamics of individuation. While the theory and practice of discreteness in architecture today is maturing in the system of unrealized design, working with discrete form inspires the architect. The architecture of the near future is a subject of the invention, relying on computer procedures of incredible speed.

Keywords—the aesthetics of discreteness; Retsin; Rehm; Wiscombe; Simondon; digital technology; technical object; inventiveness; individuation

I. INTRODUCTION

The purpose of this article is to show how difficult it is for a formal turn to appear at a certain point in the development of modern architecture. Today we are witnessing the initial stage of such a turn. However, such an initiative cannot be called a stylistic turn due to many reasons, because in the 21st century, architecture does not follow the beaten path of changing stylistic paradigms. So, because what we are witnessing is rather an attempt to create a new language of forms in the flow of a number of similar initiatives. Reflections in the article consider the rising aesthetics of discreteness or discontinuity in architecture. Here, strange as it may seem, I would like to remind the thought of Heinrich Wölfflin, though he was referring to another phenomenon – the historical stylistic transition. He wrote that the transition of the Renaissance style to the Baroque style is a wonderful school example of how the new spirit of the era is forced to look for a new form for itself [1].

The spirit of the epoch always has to look for a form corresponding to the epoch. So today, in a situation of the

rejection of a single style of the era, there are similar phenomena. Always enthusiastic and necessary search for an architectural form corresponding to the era, its rhythm, and its technological capabilities is a constant task of the architect, especially acute in the era of digital design. The newest possibilities of the computer era were introduced and mastered at the stage of the first digital turn of the end of the 20th century. Psychological preparation of the architect to the new aesthetics played a considerable role then. We mean the phenomenon of the cyber-spatial experience of the architecture of the 1990s preceding the first digital turn, which changed the aesthetic criteria of architecture assessment. "At this stage, the stage of the post-non-classical trend in architecture, the movement towards the change of aesthetic criteria became especially noticeable. It is quite natural that architecture was looking for ways to new aesthetics in virtual reality..."[2]

At that time, the philosopher Gilles Deleuze prepared a turn in thinking, declaring the topological concept of the "fold of thought" as an intuitive grasp of the "outer" (otherwise, the grasp of novelty that scares the eye at first) – surpassing all logical justifications [3]. Free, dynamic, moving, living form, in other words – the form-movement, the bioform appeared in the sphere of architecture only 20-25 years ago, promoted by the technological shift in design and production. It proved to be an innovative phenomenon contrasting with all historical styles: both with the tectonic and rhythmic logic of the classics on the one hand and with the rational logic of the lattice of modernism on the other. Today we can say that almost a generation ago, in the 1990s, early software in architecture for computer-aided design and production (CAD/CAM) gave birth to a kind of style of smooth and curved lines and surfaces, which gave a particular visible form to the structures of this first digital period and left an indelible trace in the aesthetics of modern architecture and even in understanding the role of architecture. It was the work of an architect with spline curves. The energetically dynamic form of non-linear architecture, which appeared in a calm and structured historical environment, or an environment created by boxy modernism of the beginning of the 20th century, has taken on the role of a magnet. Due to its uniqueness, it has moved forward, causing an emotional rise. As a result: a clearly arranged rhythmic order of static shapes acquired the chance to be changed. Dynamic free form (as it is known from

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gestalt psychology) plays the role of a new "figure", pushing away the usual formal phenomena to the role of a "background". We remember the appearance of smooth curves in the large-scale buildings of star architects of the 1990s-2000s like Frank Gehry and Zaha Hadid, blob-shapes by Greg Lynn and Lars Spuybroek, rounded vertical forms of Norman Foster. The first digital turn presented to the world the architecture with its distinctive features of unreality and fluidity, gigantism and smooth motion, eccentricity and unique "fortissimo" dynamics.

The second digital turn in architecture that is taking place before our eyes will require, first of all, the persuasiveness of the architect's gesture – a new aesthetic wave. The degree of the search for formal novelty increases noticeably. Moreover, the aesthetic of discreteness, to which this article is devoted, plays this role of a new aesthetic wave is. Around the 2010s, in the world's most modern and advanced schools of architecture, such as The Bartlett School of Architecture (University College London), in a number of studios in Los Angeles, California, there is by a particular desire to tame the constantly accelerating development of digital technologies. And it is clear that taming takes place not only in the line of the technology itself but also in the line of the form, which prepares a kind of offensive against technological straightforwardness. Mario Carpo, a well-known theorist from the Bartlett School in London, calls this movement of the early 21st century the second digital turn [4].

II. THE RISE OF DISCRETENESS AESTHETICS IN EXPERIMENTAL DESIGN

One of the ways in which digital thinking and the formal search for the architecture of our time are united is through the recent experiences of the so-called discrete architecture. It is well known, that discreteness is a property opposed to continuity. In digital architecture, it is a computational understanding of the discrete part of a building. Discreteness (from Latin discrete-separated, interrupted) is a property opposed to continuity, i.e. discontinuity. Digital technologies in architecture make profound changes not only in the design process. They change the system of construction production and, more broadly, they change the economic, social and political conditions of design and its program as a whole. However, we deliberately do not consider these aspects of the issue here.

Let us return to the discrete turn in aesthetics. For the sake of persuasiveness of the new formal trend, the architect needs to engage the professional audience with new aesthetics, new philosophical reflection, and it will certainly require the support of professional philosophers. For more information on philosophical support, please see the third part of this article. So, let us repeat: the rise in the aesthetics of discreteness in architecture is caused by the modern technological breakthrough, which provoked the so-called second digital turn. It seems to us that the unity of artistic intuition with technological knowledge is a very specific social situation. And it can be considered both in terms of the art of architecture and in the optics of the sociology of knowledge. Today we know the book "Social Construction of Reality", created by the Austrian sociologist Peter Berger

together with the German sociologist Thomas Luckmann, which emphasizes the phenomenological aspect of the sociology of knowledge, the primary source of which is the phenomenology of Edmund Husserl. It is argued that the process of internalization – the acceptance of new – is never easy. An individual member of society simultaneously externalizes himself into the social world and internalizes the latter as an objective...reality". In other words, to be in society means to participate in its dynamics [5]. And that is why new aesthetics is always alarming. It also serves to construct a new reality.

Today, we confidently distinguish between the aesthetics of the beautiful, the aesthetics of the sublime, and the aesthetics of affects, highly appreciated at the stage of the rise of digital architecture. Viktor Bychkov, the Russian philosopher and historian of aesthetics, noted that in the 19th century, romantics endowed the artist, poet, musician (composer) with a prophetic gift. In their work, they tried to express with the help of languages of art what opens only to their inner vision. The Englishman William Blake, a poet and artist with a visionary gift, was convinced that the artist was a visionary with a special "spiritual vision" through which God reveals to him a kind of hidden knowledge [6]. Later, Bychkov wrote about "the absolutization of any gesture of the artist as a unique and significant phenomenon" [7].

It seems to us that the new technological information search in architecture even today includes formal and spatial intuition. And this quality of the project can be judged by the quality of the result. And here we tend to object to the famous theorist Mario Carpo, who suggested that the unprecedented power of calculations even favors the ascent of a particular new kind of architectural science because spatial and formal prediction no longer necessarily has to be intuitive [8]. Here we will look at the examples of the ascension of the new aesthetic. Against the background of the exponential development of technology related to architectural design, a new understanding of the aesthetics of architecture – the aesthetics of discreteness – is developing. In professional publications, attention is paid mainly to three figures as representatives of the discreteness movement in architecture, included in the specifics of discrete technology, aesthetically mastering this modern digital line.

III. GILLES RETSIN

Gilles Retsin, a London-based architect and curator at Bartlett School, is working to create a unique and recognizable style of architecture that enables us to begin a conversation about new aesthetics. This is the aesthetic of discreteness, prompted by a breakthrough in digital technology. Gilles Retsin, relying on a new round of digital design and the development of assembly technologies, conducts spatial experiments, very inventively combining planes and discrete elements. As his projects show (always with the participation of a team of technologists), new digital technologies allow creating very refined forms and environments. He uses deliberately roughly processed elements and prefers wooden bars. "Hexagonal Layering", one of his sculptural projects of 2015, is a research project

that has evolved and is exploring new forms of large-scale sculpture.

Another exciting project by Gilles Retsin is *Diamond Strata* (*Diamond Layerings*), 2016. This is an architectural proposal for a residential building. In the project, the boundaries between interior and exterior, and even between classic elements such as the wall, floor and ceiling, are blurred beyond recognition. The structure is mysterious and poetic. Based on the recombination of standard semi-finished beams (bars), this project explores how the discrete installation of these can achieve a great level of difference between the individual residential units. The author strives for more and more refined new experiments. His unfinished project of two exhibition halls is deeply romantic.

One of the few projects implemented by Gilles Retsin is particularly curious. These are wood-based installations, inserted directly into the interior of the Royal Academy of London. Installations are unique: subordinate to the algorithms, they start a dialogue with the interior of historical architecture. Gilles Retsin comments on the installation project: "...it's becoming clearer and clearer that timber will be one of the most important materials for construction in the 21st century. The emphasis is often on the sustainable aspects of timber, but what is underestimated is also the degree to which timber construction can be automated and therefore reduce the cost of construction. Combined with digital technologies such as AR (AR – augmented reality scanner – I.D) and robotics, timber construction can give us a completely new kind of architecture that is both exciting, sustainable and accessible to the many"[9]. Each integrated structural block has a number of benches and other surfaces on which visitors can relax. The plywood blocks are bonded together by internal steel rods. Gilles Retsin tested this method during the construction of the pavilion for the Tallinn Architecture Biennale (2017) and an apartment building in Wemmel, near Brussels (2015). Such experiments reveal his formal search for development and prove the main thing – that the architect Retsin has an original signature.

IV. MICHAEL CASEY REHM

Michael Casey Rehm is a designer and consultant in algorithmic design for the past ten years and the head of the Kinch multidisciplinary practice in Los Angeles, California. Rehm is a profoundly advanced philosopher in the field of the digital potential of architectural form and certainly is a gifted artist. His works show not so much the eye-catching aesthetics but the possibilities of the language of numbers. And that is why his works are aesthetically diverse, demonstrating unexpected and vast possibilities of digital reflection on the form itself.

At the same time, Casey Rehm is not a transparent figure. His reflections are on the verge of working with artificial intelligence. As we become acquainted with his work, we feel a specific tension, knowing that it predicts the inevitability of strange changes in the theory and practice of architecture. Artificial intelligence is almost central to the work of Casey Rehm. In his articles, he focuses on the increasing number of inhuman agents operating in our

society. He writes: "If we are to produce an architecture which embraces the potential of these agents to access a more sophisticated understanding of the world, we need to understand the specifics in how they view it. [10] And further, "As automated intelligence continues to expand its presence, architecture should leverage it to produce new cultural meaning while at the same time allowing it to reshape how we understand value in the discipline"[11]. Using a mathematical model of the neural network, Casey Rehm achieves unexpected effects. For example, his "Automatic Ginza" project is a video frame that translates the qualities of one city facade onto another. Neural network maps have been used to study the aesthetics of a number of facades photographed in Ginza, Tokyo, and another one in downtown Los Angeles. The video was shown in June 2018 at the A+D Museum "3-Ways" exhibition.

Malevich once assumed that Suprematism would move from plane to space, believing that Suprematism could change "the entire architecture of the Earth". Today, the idea of neural networks as a planetary hypertrophied dream attracts not only Casey Rehm, but the whole new generation of thinkers - from the digital designers' cohort. To the same planetary hypertrophied dream of the "stylistic unity" of the entire planet, and therefore the indistinguishability of the architecture of the entire planet we will add the Patrick Schumacher's concept of "Parametricism". What attracts enthusiasts in both cases is the speed of the "conversation" in the language of numbers, the speed of the implementation of the plan. And what does not confuse society is the voluntary refusal of the artistic role of the designer in the organization of the environment, and therefore – absolute indifference to the humanistic needs of man.

V. TOM WISCOMBE

Tom Wiscombe's works make an explosive impression. For example, the Wiscombe's project for the New Wing of the Museum of Art in Lima, the capital of Peru, on the Pacific coast of South America is essentially an independent structure, with its own life, but at the same time subtly interacting with the existing historical exhibition, presented in the main building of the Palace Museum. The project creates tension between the historical exhibition and the modern one and immediately puzzles with the vision of the building going underground. The new building – an underground gallery – is a continuous space without columns, but its roof has a number of light towers – "lanterns". Tensions arise at the points where the so-called conditional tesseract – a four-dimensional super cube – is cut into the tunnel space as a construction of a lantern. "The complex figure that pokes through the ground plane in his design for the Lima Art Museum in Peru (2015) is one of a series of closely related forms that Wiscombe calls 'tesseracts': that is, cubes caught in the process of four-dimensional becoming"[12]. And further, "These highly crystallographic components form the micro-discretenesses that structure the developing tesseract. The individuation at work in the Lima Art Museum project has little to do with unit-based modular systems". [13]

The design proposal for the Guggenheim Museum in Helsinki attracts the attention of architecture theorists. Here, Wiscombe makes us forget about human proportionate tectonics. His task is to create an affective work of architecture, frightening and intriguing at the same time – not only some bizarre object in the city, which understandably holds the "figure-background" gestalt principle, but also a kind of an attraction for those who dare to visit it. This project for the new Guggenheim Museum establishes a special relationship with the local context of Helsinki, playing an affective role and moving away from this context, creating a new discrete world for the perception of art. Several floors of museum galleries – are located in the heart of the building (in the "nested" object). Shell-pattern galleries also play a museum role. The intermediate space between the nested object and the outer shell is the space of transitions. Here is an example from the responses to the project in the press: "Circulating through the museum, visitors find themselves momentarily suspended above a deep, almost geological chasm. Rather than experiencing a fluid continuum of art, visitors must leap between worlds, culminating in a sense of there being no ground". [14]

In our opinion, of the three authors, it is first of all Retsin who has a sense of form and space sufficient for the architect and retains the ability to create an appropriate and sometimes romanticized mood for a person who gets in the field of influence of his construction or contemplates his sculptural creations. Casey Rehm has an aesthetic flair but is also obsessed with digital play with fragments of form and the playing principle of neural networks. It is clear that, for example, the specificity of the place in the city is not important for him. Wiscombe creates the effect of immersion in another world, people fall into the "trap" of his giant prickly aliens.

What have we considered above, if we consider the assembly of discrete elements in architecture? The first is an assembly of three-dimensional discrete elements based on digital models, inspired by modern technology (Retsin); the second is an assembly of planes, which are close to each other on the canvas or a conditional facade, inspired by the omnivocality and undemanding nature of neural networks (Rehm); the third is a paradoxical assembly of giant sharp "wedges-shells", put one into another (Wiscombe). It seems obvious to us that the purely architectural discreteness claiming formal novelty, supported by technology, is mainly the work of Retsin.

VI. PHILOSOPHICAL BASES OF DISCRETENESS IN ARCHITECTURE

How do you explain the resurrection of discreteness in architecture? At the beginning of the 21st century, against the backdrop of a technological boom, a philosophical interpretation of this turning point as a whole is required. It seems surprising, but an adequate explanation today is formed from philosophical reflections of the first half and middle of the 20th century – the period of the rise of cybernetics. Today it is already possible to distinguish a group of thinkers discussing the topic of the significance of technology in the general structure of human development

and, what is especially important for us, in the sphere of architecture and its theory. Such philosophers as Siegfried Giedion (1888-1968) and Peter Reyner Banham (1922-1988), Gilbert Simondon (1924-1989) have raised attention to technology in architectural theory.

In 1948, Giedion's work "Mechanization Takes Command" was published. It became a philosophical interpretation of the history of industrialization and mechanization of society. And in 1969, in the foreword to his book "Architecture of the Well-Tempered Environment" Benham wrote: "The main topic of the present study has therefore only impinged upon the attention of architectural historians when it has incontrovertibly affected the external appearance of buildings, the most notable case being that of the Richards Memorial Laboratories in Philadelphia, by Louis Kahn". [15]

Philosophical circles of our time are gradually making the central figure in the development of thinking as such, the French philosopher Gilbert Simondon, who in the middle of the 20th century declared the need to move away from the principle of gilemorphism ("matter is form"), which has been known since antiquity, which he believes has lost that the main driving force behind the development of human thinking – ingenuity. Simondon's ingenuity equates to scientific knowledge. Simondon writes that invention is not a labor and it does not imply psychosomatic mediation between nature and the human species. Invention is not only adaptive and protective behavior, it is mental operation, mental functioning, which belongs to the same order as scientific knowledge [16].

Thus, the works of the philosopher also equip architectural thinking with concepts that help to reveal and expand the meaning of the very scientific subject of architecture at the present stage of its development. Thus, using the of Simondon's philosophical construction, we can consider the concept of a technical object in a very broad sense, in the optics of invention, the basis of which and the condition for its feasibility, in general, is the act of invention. Ingenuity has always accompanied the profession of architect. According to Simondon, the ability to invent is closely related to the development of individuation. This concept is already related to the peculiarities of personality development. Individuation must be understood on the basis of the pre-individual field that precedes it – a certain chaotic state that appears at each stage of the formation of a personality and contains a bundle of possibilities for the subsequent stage of individuation. Thus, the psychological support of such a shift in the consciousness of the individual – and in our case, the consciousness of the architect in his formation – is found in Simondon's philosophical ideas about individuation. According to Simondon, "In an individuated person, there is a pre-individual and over-individual component, but it is a singularity itself, not a part of any unity"[17].

Why did we need a philosophical digression? Considering discreteness as a phenomenon in architecture on the example of three persons, we also adhered to the point of view of modern philosophy, which affirms the principle of

inventiveness. The singularity of an individual-architect in his stage-by-stage individuation is the basis for the ascent of individual signature within the framework of the general formal tendency. The architect, working with form and at the same time with the product of technology, brings ingenuity to the subject of his care – together with the search for the novelty of form; he is looking for special timbres for the sound of new aesthetics.

That is why relying only on Big Data, which came into the sphere of architectural knowledge in the 21st century, is not conceivable for architectural thinking. As it is known from the works of Alfred North Whitehead, the data is a quantitative assessment. "Whitehead stressed, forcefully, that data is not actuality, but quantifiable records of it"[18]. This position is reflected even clearly in James Gibson's theory of affordance: "The digital is not responsible for any style. Although it offers certain affordances, it has no agency"[19].

VII. CONCLUSION

For the sake of efficiency, to estimate the structure of relations in the changed program of designing, developing in the modern period of the rise of digital technology to us, we addressed in the previous section to non-standard, but actual today conceptual framework of French philosopher Gilbert Simondon. So, what becomes clear, then? A stressful situation of a dense contact with digital logic indeed promoted a leap of individuation (according to Simondon) of the architect-designer. And it would seem that formally similar ideas should appear in specific frames of discreteness. However, the energy of individuation manifests itself in different ways when working with form and space.

We have grasped and considered three different ways in the treatment of form and space, which in their own way constitute a single impulse of discreteness, psychologically prompted by the very idea of discreteness, born directly in modern digital technology. The three different formal approaches to the discrete described above confirm the individual specificity of the formal vision of the architect as an artist. Therefore, the formal aesthetic value of architectural experiments of discreteness is assessed according to different criteria in each case.

Digital technologies of the 21st century have created a new specificity of programming and production of architecture in the new economic, social and political conditions. While the paradigm of formal integrity of architecture did not allow the idea of assembling until now, then today the integrity of the object is questioned by some members of the new generation. Is such an ontological break of consciousness possible? There are still a lot of unresolved questions, for example, whether it is possible to mix the aesthetics of architecture as a spatial art with the aesthetics of multidimensionality, provoked by artificial intelligence for digital games like neural networks. We believe that the inconsistency of undertakings is the result of the absence of a unifying theory, a conceptual structure capable of giving perspective and at the same time, a well-grounded assessment of discreteness experiments. We do not rule out that differences in approaches can be quite acceptable and inherent in the phenomenon as a whole.

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