

# A STUDY OF THE BIOLOGICAL CONCEPT IN ARCHITECTURAL THOUGHT: A Comparison Between “Der Raum Als Membran” (1926) and “Metabolism” (1960)

## A B S T R A C T

This study analyzes the biological influence on the architecture in the 20th century by focusing on two particular biological architectural thought; “Der Raum als Membran (Space as Membrane)” by Siegfried Ebeling in 1926 and “Metabolism” by a group of Japanese architects in 1960.

First, I discuss “Der Raum als Membran”. Ebeling saw architecture or space as a biological membrane, like skin or a cell, and he proposed a theory of biological architecture. He not only introduced into planning an environment this biological metaphor with its flexibility of a membrane but also incorporated a biological concept like Umwelt. Second, I investigate a manifesto by the name of “Metabolism”, which was produced in 1960 by a group of Japanese architects. They thought buildings and urban designs had an existence and underwent metabolism, which is a basic function of living things, and proposed variable and proliferate architectures having dynamic time spans.

By comparing these biological architectural concepts, I point out three main similarities: 1) the expansion of the biological concept into architecture; 2) the cell as a metaphor; and 3) dynamic buildings or urban design. Although the authors had different backgrounds, all of them introduced new architectural ideas in their own times.

Shiho Hasegawa  
Saitama University  
s.hase14@gmail.com

427

## KEY WORDS

ARCHITECTURAL THOUGHT  
BIOCENTRISM  
BIOLOGICAL ARCHITECTURE  
BIO DESIGN  
MEMBRANE  
METABOLISM  
*UMWELT* (ENVIRONMENT)

## INTRODUCTION

In this paper, I focus on two specific biological architectural lines of thought: *Der Raum als Membran (space as a membrane)* (1926) by Siegfried Ebeling; and *Metabolism* (1960) by a group of Japanese architects. I analyse the effects of these ideas in the field of architecture in the twentieth century.<sup>1</sup>

One aspect of the twentieth century art is the connection between art and engineering arising from the interaction between the social and technical aspects of society. For example, the Futurists focused on objects with speed and power, such as cars and weapons, which incorporated advanced technologies of the time. With Constructivism, the structural model introduced rational mathematical theory and the form influenced mass-produced products developed by modern industries. In addition, the point of actively using new architectural materials at that time, such as glass and metal, reflected the century of engineering and mechanisation. In the last twenty years of research, the movement to revalidate the context of such modern art has been intensified, and the study of the relationship between modernity and art as a *biological era* has been developed.<sup>2</sup> Oliver A. I. Botar, in particular, proposed a need to reconsider modern art as the context of *Biocentrism*, which is the philosophical biocentric movement that appeared with the term *Biozentrik* used in German-speaking regions, and which influenced many cultural fields in the *fin de siècle*.<sup>3</sup>

Studies on the contact point of creation and biology are underway in the field of architecture as well. As a result of recent research, an anthology named *Biology in Art and Architecture* has been published, which has attempted to historically consider the influence of biology in a wider framework, such as architectural history/architectural practice and art history/art practice.<sup>4</sup>

## BIOLOGICAL ARCHITECTURE BY SIEGFRIED EBELING: INTERACTION BETWEEN MAN AND THE ENVIRONMENT

First, I analyse the concept of *biological architecture* introduced by Eberling (1894-1963) by focusing on his Bauhaus dissertation *Der Raum als Membrane* (1926). (Fig. 1) Ebeling, born in Rätzlingen, Germany in 1894, studied philosophy and theology at Heidelberg University. He was then dispatched to fight in the First World War, and upon his return to Germany, he studied theology and art history at the universities of Jena and Leipzig. He then worked at the factory of Junkers followed by studies at the Bauhaus Weimar in 1922-23 and 1924-25. At Bauhaus, he studied design education at the studios of Wassily



Fig. 1. Title page of *Der Raum als Membran* (Ebeling, Siegfried. *Der Raum als Membran*. Dessau: C. Dünhaupt Verlag, 1926. (Reprint: Spector Books, 2016.)), cover page.

Fig. 2. The German Pavilion of International Exposition Barcelona in 1929 by Ludwig Mies van der Rohe. (Photograph: Berliner Bild-Bericht. Gelatin silver print. 16.3 x 22.4 cm. In Mies van der Rohe Archive. Gift of the architect. (From Zimmerman, Claire. "Mies in Photos," *MoMA*, Vol. 4, No. 5. The Museum of Modern Art, 2001. 4.)

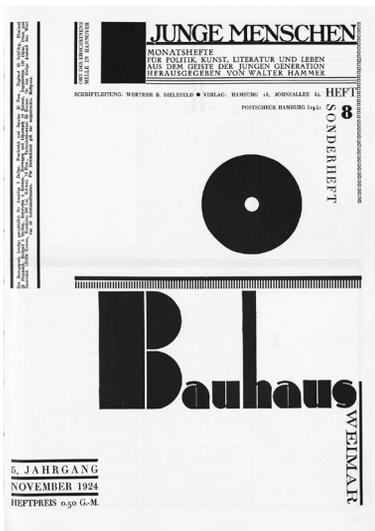


Fig. 3a. Front page of *Junge Menschen*, H. 8/1924 (Hamburg, 1924. Reprint: Kraus Reprint München, 1980.), front page.



Fig. 3b. Title page of Siegfried Ebeling's "Kosmologie Raumzellen: Ideen zur Ethik des konstruktiven Denkens", *Junge Menschen*, H. 8/1924 (Hamburg, 1924, S.173. reprint: Kraus Reprint München, 1980.), S.173.

Kandinsky (1866-1944) and Marcel Breuer (1902-1981), and worked at the Junkers factory.<sup>5</sup> He was an architect who lived in the era of Biocentrism. To begin with, I describe the basic concept of his *biological architecture*.

In order to have a measure with which to assess the existing or future impact of architecture, it is useful to envisage its original condition – the construction of the house – as its basic form. We would like to characterise it more or less as such:

In a world where things and experiences are fantastically mutable the house remains a relatively rigid, multi-celled spatial entity. Its base is either fixed or loosely connected to the ground through which manifold forces flow. Its remaining surfaces come into contact with a thinner medium that is penetrated by rays of light of variable quality, alternating periodically. The friction between these two sets of forces plays out in the hollow space of the house, entering into a law-governed interaction – mental and physiological – with the inhabitants inside. The degree of harmonious balance between these three components determines the character and the quality of the architecture.<sup>6</sup>

In Eberling's argument, the *membrane* is considered as the medium for a productive exchange between internal and external space. *Architecture* can be assumed to describe a *house* or a *room*, and to him the house is a multicellular body considered to be tightly or loosely connected to the ground. When considering the impact of climatology and the environment on the mind (the mental health), while giving examples of space using glass and solar energy, it is necessary to consider the equipment that captures the energy related to the human ecology in the world outside. That is, man is able to think of the house itself as a kind of energy source, he suggested.<sup>7</sup>

In the eyes of Friedrich Wilhelm Nietzsche (1844-1900), the first chapter of Ebeling's work, in which he presented a highly philosophical argument, appeared to reflect vitalism theory. It should be noted that Ebeling's architectural plans had never been built. It has been pointed out that the only realised case reflecting his ideas at the time was the German Pavilion at the International Exposition of Barcelona (Fig. 2), designed by Ludwig Mies van der Rohe (1886-1969) in 1929.<sup>8</sup>

However, in his thesis, Ebeling pointed out that the background to the concept of *biological architecture* was based on 'partly practical and partial sociological considerations', and he noted the challenges in the realisation of the concept (in the third chapter).

These and other considerations, some of them practical and others sociological, ultimately led to the global conception of ‘biological architecture’; the essential point here is that our time seems mentally ripe for a methodical attempt to adapt three-dimensional space, as crudely defined by physics, into a three-dimensional membrane – biologically defined – between our body (as a plasmatic weak substance) and the latent minute forces of the spheres (which are as yet unharnessed by any bio-structure).<sup>9</sup>

Ebeling had already thought about the architecture as a membrane in 1924, when he was a student of Bauhaus.<sup>10</sup> (Fig. 3a and 3b)

In other words, by creating new structural relationships (using new technical processes), the room, which today is still massively porous, will become a membrane between our body as a nucleus and the plasma energies of the big world.<sup>11</sup>

For Ebeling, the human body in the house or room is the nucleus, and it was a membrane allowing circulation with the plasma energy to the outside world. In the 1926 dissertation, he described the importance of Raoul Heinrich Francé, one of the proponents of biocentric thought, and his book *Die technische Leistungen der Pflanze* (1919).<sup>12</sup> Speaking of Raoul Heinrich Francés, Moholy-Nagy László (1895-1946) who was a Bauhaus’s meister, quoted Francés’s word in his book titled *von Material zu Architektur* (From Material to Architecture) in 1928.<sup>13</sup> He discussed *biotechnik*, which was a fusion of engineering and biology, as a valid method of the creative activity in his book. Moholy-Nagy taught at Bauhaus from 1923 to 1928, when Ebeling was studying there. In another research, it was also pointed out that Ebeling was influenced by the concept of *Umwelt*, proposed in 1909 by Jakob von Uexküll, who was a biologist at the same period.<sup>14</sup> Uexküll’s theory regards the environment as the world where each creature finds meanings, not as the world where living organisms as it is given. It is recognised that this ecological point of view influenced the assumption of Ebeling in terms of the circulation between the outside world and the living thing which is the nucleus in the house.

Under these concepts, he included the concrete tasks of sunshine and light supply and a system of thermal efficiency and air circulation as a subject of his discussion. In this way, his biological ideas could be realised by using new materials, such as glass and metal, as a building materials based on the ecology of a human being, while retaining the concept of nature and life on a cosmic scale. The idea of creating an interaction between control of the environmental and physiology of the human body was raised.

## METABOLISM: THE IDEA OF A MOVABLE CITY

Second, I describe the thoughts of Metabolism, which is one form of *biological architecture*, presented in the era when modernism was coming to an end.<sup>15</sup> Metabolism appeared in 1960 in the form of a publication (Fig. 4), but its origins date back to before 1959. It was the year after the dismantling of CIAM; it seems that it was a turning point for (modern) architectural theory.

Four architects (Kikutake Kiyonori (1928-2011), Kurokawa Kisho (1934-2007), Otaka Masato (1923-2010) and Maki Fumihiko (1928-)), two designers (Awazu Kiyoshi (1929-2009) and Ekuan Kenji (1929-2015)) and one critic/editor (Kawazoe Noboru (1926-2015)) made up the Metabolism group, which organised for the World Design Conference Tokyo in 1960. This was an international conference held in Japan for the first time.<sup>16</sup>

Kawazoe named the group *Metabolism*, which represented direct, vital and biological activity.

As I say, in Japanese the word is *shinchintaisha*, he said. In the Japanese edition of Friedrich Engels's *Dialectics of Nature* there's a line that says something to the effect of 'one of the most essential feature of living things is *shinchintaisha*.' That's where I got the term. I was wondering what a good equivalent for *shinchintaisha* might be, so Kikutake looked it up in a Japanese-English dictionary and said the English word was "metabolism".<sup>17</sup>

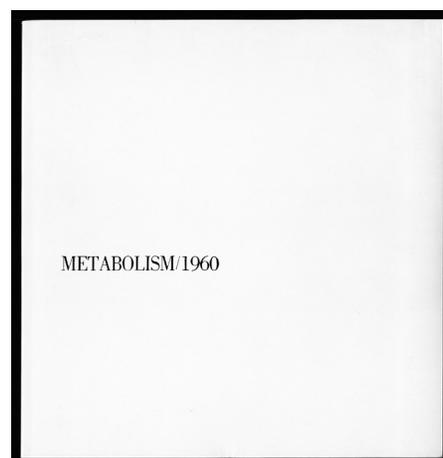


Fig. 4. Cover of *Metabolism 1960*  
(Bijutsu Shuppan-sha, 1960, reprint: Mori Art Museum and Echelle-1, 2011.)

Although Otaka, being the oldest, was the group's leader, it was pointed out that Kawazoe, Kikutake and Kurokawa all actively promoted its activities.<sup>18</sup> The linguistic expression of the philosophical outline of Metabolism, in the movement's founding act, was largely based on Kawazoe's words. He wrote the following preface:

“Metabolism” is the name of the group, in which each member proposes future designs of our coming world through his concrete designs and illustrations. We regard human society as a vital process – a continuous development from atom to nebula. The reason why we use such a biological world, the metabolism, is that, we believe, design and technology should be a denotation of human vitality.

We are not going to accept metabolism as a natural historical process, but we are trying to encourage active metabolic development of our society through our proposals.

This volume mainly consists of the designs for our future cities proposed only by architects. From the next issue, however, the people in other fields such as designers, artists, engineers, scientists, and politicians, will participate in it, and already some of them are preparing for the next one.

In future, more will come to join “Metabolism” and some will go; that means a metabolic process will also take place in its membership.<sup>19</sup>

As stated above, the important point was that they regarded society as a sustainable development having vital processes, and that it captured design and technology as an extension of human life. In 1977, Kurokawa pointed out that the above was important to Metabolism:

First, it reflects our feelings that human society must be regarded as one part of a continuous natural entity that includes all animals and plants.

Secondly, it expresses our belief that technology is an extension of humanity. This belief contrasts with the Western belief that modernisation is a repetition of a conflict between technology and humanity.<sup>20</sup>

In fact, apart from the preface and his essay, there was no use of the word *metabolism*. What was consistent was the concept that became the core of *metabolism*, the idea of *adaptation to change*. This is involved the presentation of architecture, which was considered to be basically fixed, in a dynamic way. The idea of Kikutake's *movable* is remarkable. While he did not use the word *metabolism* as such, in the illustration titled “Order of Metabolism in the City”, Kikutake presented an image of cell division and supplemented it with the following:

As the city grows, it divides into two parts like a cell division.  
 There are (a), (b) and (c) on how to divide.  
 It depends on whether the production is the main part of how to divide,  
 or whether the residence becomes the main part.<sup>21</sup>  
 4/16 (Fig. 5)

And in the case of the “Sky-house”, which had already been completed and unveiled in 1958, it was described in terms of “the three movable things”, which were as follows:

Human life	Move-net
Family life	Movable house
Urban life	Mova-block <sup>22</sup>

Move-net was divided according to the function of the living space. Movable house could be altered according to a family style and life stages. Mova-block expanded the way of thinking of cities as dynamic adaptations of buildings arising from life cycle or city changes. These were the plans that embodied the concept of metabolism.

The longest development of the concept of Metabolism was carried by Kurokawa, who joined the group at the age of 26, and went on to develop this idea throughout his life, eventually trying it to the idea of *symbiosis*.

From metabolism to metamorphosis and symbiosis, the flow of thought over the last 33 years may seem to have been inconsistent at first glance, but in fact the principle of the machine has been revolutionised and replaced by the principle of life. It has been penetrated by this way of thinking, which started with the Metabolism movement in 1960.<sup>23</sup>

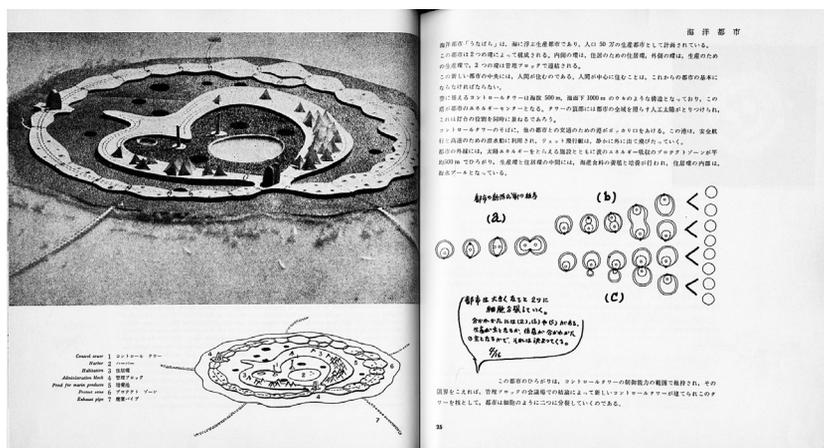


Fig. 5. A part of Kikutake Kiyonori’s article in *Metabolism 1960*, (Bijutsu Shuppan-sha, 1960, reprint: Mori Art Museum and Echelle-1, 2011), 25.

It should also be noted that Kurokawa later said of his architecture, which used biological terms, as follows:

I never understood my architecture as biologicistic or biological. Sure, both metabolism and symbiosis are biological terms, but in my architecture it is more a matter of the whole principle of life underlying them. [...] Metabolism and Symbiosis as architectural terms really did arise with me in connection with such social questions, incidentally “Symbiosis” earlier than “Metabolism”. However, Metabolism was the first to become known as a catchword for my architecture in the 1960s. In the process it was most often linked with the then developing High-Tech because of the idea of interchangeability of components, that simply replaced old with new. However, with me recycling or ecological thinking was in the foreground from the beginning, something that has become current today thanks to the general interest in global environmental problems.<sup>24</sup>

Based on this, Metabolism was not an architectural group with a firm idea, but rather something in the mind, a means of disseminating Japanese design to the world and developing new architecture theory in advance of the realities of population growth and a high technology society. It was a construction concept that showed a gradual similarity to what a young generation of architects was thinking about how to face the contemporary problem of the living environment of human beings.

#### COMPARISON OF TWO BIOLOGICAL ARCHITECTURE LINES OF THOUGHT IN THE TWENTIETH CENTURY

As mentioned above, when comparing these biological architectural thoughts, three main similarities can be discerned: 1) the expansion of the biological concept into architecture; 2) the *cell* as a metaphor; and 3) dynamic buildings or urban design.

##### 1) The expansion of the biological concept to architecture.

Regarding this point, biology is assumed to be a concept that is the opposite of physical, but it is not a bio-morphism or a bio-mimicry methods that imitate the form or function of a specific organism, but the architecture(s) of a city itself that can be considered as a biological architecture, something which has been considered as a kind of integration with a life process, a human life process.



## CONCLUSION

It has long been acknowledged that the Earth has entered a geologically new epoch called the *Anthropocene*. In recent years, many artists and designers have created work and activities called *bio art* and *bio design* using biological theory and biotechnology. However, human beings are increasingly frustrated by biological and environmental problems. This is a remarkable situation as we are at a crossroads when it comes to our living environment. By seeing the demands of the contemporary, it is possible to reconsider the architectural thought of Ebeling and Metabolism as predecessors of bio design.

Ebeling's biological architecture was devised at a time when biology as academia was established, and it was devised in a society where industrialisation was increasingly progressing in the post-World War One period. He devised a building plan as a utopian futuristic membrane that came from working at Bauhaus and the Junkers factory, and by using the new industrial materials he encountered as architectural materials.

Metabolism was born at a time when the Japanese society had gradually achieved post-World War Two reconstruction, and the relationship between human life and nature was considered during a period of rapid economic growth.<sup>26</sup> The movable building and city concepts for the growing population were possible by relying on the development of technology. (It was) understood that the changes were coming thick and fast and that the city itself needed to have the ability to metabolise like a living thing. (Fig. 7)

Both of these biological architectural thoughts evolved at the turning points in global trends in their respective eras. Therefore, in terms of creative inspiration coming from the encounters with different fields of study, these cases should be examined in the current era.



Fig. 7. Cover of *SD: Space Design Journal of Art and Architecture*, No. 52 March 1969.  
Feature: Expansion of Capsule Concept. (Kajima Institute Publishing Co.Ltd., 1969).

## NOTES

N.B.

- This research was conducted in part by a grant-in-aid for Topic-Setting Programme to Advance Cutting-Edge Humanities and Social Sciences Research by the Japan Society for the Promotion of Science, and 2018 DNP Foundation for Cultural Promotion Graphic Culture Research Grant.
- 1 Additionally, there is another biological architectural thought after the 20<sup>th</sup> century, such as Frank Lloyd Wright's organic architecture and the flow of Baubiologie in German architectural history.
  - 2 For example, Oliver A. I. Botar and Isabel Wunsch eds., *Biocentrism and Modernism* (Burlington, VT: Ashgate Publishing Company, 2011); Anja Zimmermann Hg., *Biologische Metaphern: Zwischen Kunst – Kunstgeschichte und Wissenschaft in Neuzeit und Moderne* (Berlin: Dietrich Reimer Verlag, 2014); Charissa N. Terranova, *Art as organism: Biology and the Evolution of the Digital Image* (London/New York: I.B. Tauris & Co.Ltd, 2016), and so forth.
  - 3 Oliver A. I. Botar, "Defining Biocentrism," in *Biocentrism and Modernism*, eds. Oliver A.I. Botar and Isabel Wunsch (Burlington, VT: Ashgate Publishing Company, 2011), 15-33.
  - 4 Charissa N. Terranova and Meredith Tromble eds., *The Routledge Companion to Biology in Art and Architecture* (New York: Routledge, 2017).
  - 5 Research about Ebeling's work is relatively new. His dissertation from 1926 was re-published in 2010 in English (the German version of the reprint was published in 2016). Reporting basic research by Walter Scheiffele in 2015, a book was published. (Walter Scheiffele, *Das leichte Haus: Utopie und Realität der Membran-architektur* (Leipzig: Spector Books, 2015)). In his later days, Ebeling lived in Hamburg and worked as a painter. An exhibition of his works was held at Freundeskreis Künstlerhaus Maetzel from 21-27 February.
  - 6 Siegfried Ebeling, *Der Raum als Membran* (Dessau: C. Dünnhaupt Verlag, 1926), S. 10 (Reprint: Spector Books, 2016/English translation: Spyros Papapetros ed., *Space as Membrane* (Architectural Association London, 2010), 8.)
  - 7 Siegfried Ebeling, *Der Raum als Membran*, S.16. (English translation: Spyros Papapetros ed., *Space as Membrane*, 3).
  - 8 Mies van der Rohe was supposedly praising Ebering's thesis. Meanwhile, Gropius was said to hold a critical attitude.
  - 9 Siegfried Ebeling, *Der Raum als Membran*, S.20. (English translation: Spyros Papapetros ed., *Space as Membrane*, 16).
  - 10 It is pointed out that this writing may be the first mention of the concept of the membrane in architectural history. Walter Scheiffele, "Nachwort," in Siegfried Ebeling, *Der Raum als Membran* (Dessau: C. Dünnhaupt Verlag, 1926), S.43.
  - 11 Siegfried Ebeling, "Kosmologe Raumzellen: Ideen zur Ethik des konstruktiven Denkens," in *Junge Menschen*, H. 8/1924 (Hamburg, 1924), S.173. (reprint: Kraus Reprint München, 1980).
  - 12 "Moreover, in this connection, one should note Raoul Francé's splendid book on *Die technische Leistungen der Pflanze (technical accomplishments of plants)*, which is bound to attract greater attention from the architectural science of the future," Siegfried Ebeling, *Der Raum als Membran*, S. 31 (English translation: Spyros Papapetros ed., *Space as Membrane*, 25); Raoul Heinrich Francé [1874-1943] published this book in 1919.
  - 13 Laszlo Moholy-Nagy, *Von Material zu Architektur* (Passavia Druckerei AG: Passau, 1929), S.60 (Reprint: Florian Kupferberg: Mainz und Berlin, 1968).
  - 14 Anja Zimmermann Hg., *Biologische Metaphern: Zwischen Kunst – Kunstgeschichte und Wissenschaft in Neuzeit und Moderne* (Berlin: Dietrich Reimer Verlag, 2014), S.207-208.
  - 15 In 1977, Charles Alexander Jencks in *The Language of Post-Modern Architecture* (New York: Rizzoli, 1977) pointed out the post-modern in the field of architecture. But in the area of design theory, post-modernist practice as anti-modernism emerged from around the 1960s.

- 16 Tange Kenzo [1913-2005], vice chairman of the World Design Conference Tokyo, appointed the organisation of the young architect group for the conference with Asada Takashi [1921-1990] (a member of the Tange laboratory and the right-hand man of Tange). who was a director of the conference office. Asada started talking to Kawazoe, who worked as an editor of *Shin-Kenchiku (new architecture)* until 1957, and the foundation of the Metabolism group as envisaged by Kawazoe, started from this time.
- 17 “Interview of Kawazoe Noboru,” in Rem Koolhaas and Hans-Ulrich Obrist, *Project Japan: Metabolism Talks...* (Taschen, 2011), 235.
- 18 Yatsuka Hajime and Yoshimatsu Hideki, *Metabolism: 1960s: Avangard of Japanese Architecture* (INAX publishing, 1997), 29.
- 19 Kawazoe Noboru, ed., *Metabolism 1960: The Proposals for New Urbanism* (Bijutsu Shuppan-sha, 1960) (Reprint; Mori Art Museum and Echelle-1, 2011).
- 20 Kisho Kurokawa, *Metabolism in Architecture* (Littlehampton Book Services Ltd, 1977), 27.
- 21 Kawazoe Noboru, ed., *Metabolism 1960: The Proposals for New Urbanism* (Bijutsu Shuppan-sha, 1960) (Reprint; Mori Art Museum and Echelle-1, 2011), 25.
- 22 Ibid, 28.
- 23 Kurokawa Kisho, *Kurokawa Kisho Note: Shisaku to Souzou no Kiseki (The path of thinking and creation)* (Doubun-shoin, 1994), 32-33.
- 24 Kennosuke Ezawa, “Western thinking will lose its influence a conversation with Kisho Kurokawa,” in *Kisho Kurokawa: Metabolism and Symbiosis* (Berlin: Jovial Verlag, 2005), 21.
- 25 Kawazoe Noboru, ed., *Metabolism 1960: The Proposals for New Urbanism*, 51.
- 26 After that, in the Japanese society, more serious pollution problems arose in the 1970s. The idea of metabolism, that repeated the concept of activity, encouraged changing the old one for new, and the growth of society, influenced the subsequent Japanese architecture, with the words such as capsule and membrane gaining prominence.

## BIBLIOGRAPHY

- Botar, Oliver A.I. and Isabel Wunsch eds. *Biocentrism and Modernism*. Burlington, VT: Ashgate Publishing Company, 2011.
- Ebeling, Siegfried. *Der Raum als Membran*. Dessau: C. Dünhaupt Verlag, 1926. (Reprint: Spector Books, 2016 / English translation: Papapetros, Spyros. ed., *Space as Membrane*, Architectural Association London, 2010).
- Ezawa, Kenosuke. "Western thinking will lose its influence a conversation with Kisho Kurokawa." In *Kisho Kurokawa: Metabolism and Symbiosis*. Berlin: Jovial Verlag, 2005.
- Jencks, Charles Alexander. *The Language of Post-Modern Architecture*. New York: Rizzoli, 1977.
- Kawazoe, Noboru, ed. *Metabolism 1960: The Proposals for New Urbanism*. Bijutsu Shuppan-sha, 1960. (Reprint; Mori Art Museum and Echelle-1, 2011).
- Kurokawa, Kisho. *Metabolism in Architecture*. Littlehampton Book Services Ltd, 1977.
- Kurokawa, Kisho. *Kurokawa Kisho Note: Shisaku to Souzou no Kiseki (The path of thinking and creation)*. Doubun-shoin, 1994.
- Moholy-Nagy, Laszlo. *Von Material zu Architektur*. Passavia Druckerei AG: Passau, 1929. (Reprint: Florian Kupferberg: Mainz und Berlin, 1968).
- Scheiffèle, Walter. *Das leichte Haus: Utopie und Realität der Membran-architektur*. Leipzig: Spector Books, 2015.
- Terranova, Charissa N., *Art as organism: Biology and the Evolution of the Digital Image*. London/ New York: I.B. Tauris & Co.Ltd, 2016.
- Terranova, Charissa N. and Meredith Tromble, eds. *The Routledge Companion to Biology in Art and Architecture*. New York: Routledge, 2017.
- Yatsuka, Hajime and Yoshimatsu Hideki. *Metabolism: 1960's: Avangard of Japanese Architecture*. INAX publishing, 1997.
- Zimmermann, Anja Hg. *Biologische Metaphern: Zwischen Kunst - Kunstgeschichte und Wissenschaft in Neuzeit und Moderne*. Berlin: Dietrich Reimer Verlag, 2014.

STUDIJA BIOLOŠKOG KONCEPTA U ARHITEKTONSKOJ MISLI:  
 POREĐENJE „DER RAUM ALS MEMBRAN“ (1926) I „METABOLIZMA“  
 (1960)

**Shiho Hasegawa**

Ova studija analizira biološki uticaj na arhitekturu u 20. veku fokusirajući se na dve posebne biološke arhitektonske misli; „Der Raum als Membran (Prostor kao membrana)“ Zigfrida Ebelinga (Siegfried Ebeling) iz 1926. godine i „Metabolizam“ grupe japanskih arhitekata iz 1960. godine.

Prvo se razmatra „Der Raum als Membran“. Ebeling je arhitekturu ili prostor video kao biološku membranu, poput kože ili ćelije i izneo je teoriju biološke arhitekture. On nije samo u urbano planiranje uveo ovu biološku metaforu sa fleksibilnošću membrane, već je ugradio i biološki koncept poput *Umwelt*-a. Nakon toga istražuje se manifest pod nazivom „Metabolizam“, koji je 1960. pripremila grupa japanskih arhitekata. Oni su mislili da zgrade i urbani dizajni postoje protkani egzistencijom i metabolizmom, što je osnovna funkcija živih bića, i predložili su promenljive i raznolike arhitekture sa dinamičnim vremenskim rasponima.

Upoređujući ove biološke arhitektonske koncepte, ističem tri glavne sličnosti: 1) širenje biološkog koncepta ka arhitekturi; 2) ćelija kao metafora; i 3) dinamične zgrade ili urbani dizajn. Iako su autori imali različite biografije, svi su u svoje vreme uveli nove arhitektonske ideje.

KLJUČNE REČI: ARHITEKTONSKA MISAO, BIOCENTRIZAM, BIOLOŠKA ARHITEKTURA, BIO DIZAJN, MEMBRANA, METABOLIZAM, *UMWELT* (OKOLINA)

OD BIG MEK I IKEA DRUŠTVA DO ESTETIKE ŽIVOTNE SREDINE,  
 PAMETNIH GRADOVA I *STORYTELLING* ARHITEKTURE

**Irena Kuletin Čulafić**

Danas živimo u globalnom društvu koje se suočava sa različitim izazovima dvadeset prvog veka. Naši gradovi se nalaze u procesu neprestanih transformacija uzrokovanih uticajima urbanizacije, globalizacije, naprednih tehnologija, ekoloških promena i promena u domenu životne sredine, društvenih, političkih i ekonomskih kriza. Dok korporativni kapitalizam cveta, svetska populacija raste i naši gradovi se šire, arhitektura dostiže gotovo utopijske vizije, a granice estetike postaju sve propusnije i labavije. Danas naše savremeno društvo živi i deluje estetski. Počevši od umetnosti, arhitekture, muzike, religije, politike, komunikacija, tehnoloških geđžeta, naših domova, vrtova, odeće, kulinarnstva, pa do sporta i *life coaching*-a, sve može biti predmet estetskog razmatranja.

Estetsko promišljanje arhitekture i urbanizma u svetu koji se stalno menja zahteva kritičke i interaktivne pristupe, koji neće podrazumevati samo teorijska, već i praktična estetska delovanja. Shodno tome, ovaj rad nastoji da razmotri estetske probleme savremene arhitekture i urbanizma sa globalne, ekološke, tehnološke i sociološke tačke gledišta. Priroda se danas više ne doživljava kao paradigmatički objekt estetskog iskustva, već kao naše jedinstveno kolektivno okruženje od kojeg mi kao ljudi direktno zavisimo. Iz tih razloga arhitektura nastoji da objedini etička i estetska gledišta u cilju ponovnog preispitivanja tereta koji nose naši gradovi i sagledavanja mogućnosti njihovog budućeg razvoja.

KLJUČNE REČI: ESTETIKA ŽIVOTNE SREDINE, *STORYTELLING* ARHITEKTURA, GLOBALIZAM, ODRŽIVOST, PAMETNI URBANIZAM I PAMETNA ARHITEKTURA, LEPOTA GROTESKNOG