

# Natural Architecture Exploring the Possibilities of Future Architecture

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**Keywords:** Component; super nature era; machine building; metabolism; information era; human and nature.

**Abstract:** How people treated Nature, effect the relationship between humans and building has a very big impact on how we design our buildings. Start from the 1910s, modern architecture has already developed for over 100 years, the leading architects such as Le Corbusier, Walter Gropius, Mies van der Rohe, etc. Had defined the key feature of modern architecture. It effects for over 100 years, urban skyline today still looked like Corbusier's Radiant City. We hope to define a kind of nature Architecture. In the beginning, we will discuss the relationship between nature and building in a different era, and what is going to happen in the future. We will describe the development of modern architecture in the past 100 years, and the new changes in the past ten years, finally, we use the future nature perspective to guide our villa design. Finally, we hope to define a new kind of architecture design direction in the future.

## 1. Introduction

This paper hopes to discuss the relationship between man and nature, architecture and nature, and reveal the world outlook and existence state between architecture and nature in history through the different ways of interaction between architecture and nature in the history of architecture. The last, through the establishment of the concept of natural architecture, this paper discusses a way to release the freedom of future architecture and feasible direction suggestions.

### 1.1 Freedom forms of architecture

From the perspective of Junya Ishigami, in his book, another scale of architecture [1]. This is an unprecedented era; virtual information can have a physical force on our lives. The movement of the atmosphere creates a kaleidoscope of weather phenomena, and as the earth is gradually weathered, the physical shape of things changes. Similarly, information is compressed into a vast number of tiny "units of meaning" that travel back and forth across the world, profoundly influencing our times. Therefore, not only the knowledge system but also our life and behavior (patterns) do not remain fixed and take on a state of impermanence and constant change.

### 1.2 Freedom from environment

Today we think of architecture as something that no longer distinguishes between natural and artificial environments. The artificial environment that we create expands so dramatically that it changes the natural environment, and the natural environment has a huge impact on us. The boundary between natural and artificial becomes increasingly blurred, and new environments are gradually derived. I tried to think about creating architecture in an environment that was neither natural nor artificial. Clearly, in the future, we humans will not be able to distinguish between natural and artificial environments. The interaction between the two is one of the most interesting issues of the day, and the solution strategy is pinned on the architecture.

## **2. The evolution history between nature and architecture**

### **2.1 Derivation of relationship between nature and human**

According to the different stages of human productivity development, the relationship between man and nature can be roughly divided into four different stages.

### **2.2 Primitive civilization: harmony in chaos and ignorance**

Primitive civilization period, the people, because the human understanding of nature can only see the surface of the natural phenomena, and unable to see the natural essence behind the phenomenon, so can only blindly, machinery to adapt to the nature, let the master of nature, to survive, they can only through the turn in the natural and human external things, turn to the magic, They prayed to the nature to enrich their lives, thus forming the nature-centered concept of worship in the form of natural mythology, religion, and totem worship. To nature, man and nature are the unity of nature, the original coordination, the harmony of low level. As far as culture is concerned, humanities culture is far higher than science and technology culture. It can even be said that science and technology culture has not been developed and is not enough to disturb the ignorant harmony between man and nature [2].

### **2.3 Agricultural civilization: dynamic balance and harmony**

After the primitive man crossed the primitive civilization of gathering and hunting, he began to enter the agricultural civilization represented by farming. Phase in the agricultural civilization, human beings have to nature active on a large scale, but the use of resources by human production and consumption, mainly in the natural climate resources, land resources, biological resources, and social products are just agricultural products and primary manual processing products, production and consumption of waste are still can degradation of nature. The form of interaction between man and nature belongs to a type of dynamic balance and coordinated development, so the relationship between man and nature at that time is generally harmonious.

### **2.4 Industrial civilization: the mutual abandonment of man and nature**

Industrial civilization is a civilization characterized by modern classical science and technology. In this civilization period, humanistic culture is completely marginalized and scientific culture becomes the substitute for human culture. Science and technology have become the most effective tool to create wealth for human beings, but it also makes the dynamic harmonious and balanced relationship between human beings and nature collapse in the age of agricultural civilization, resulting in the mutual abandonment of human beings and nature. Nietzsche, the 19th-century German philosopher, once exclaimed, "God is dead!" It conveys the fact that the industrial revolution has expanded, that man's ambition is to replace God as master and decide his destiny like God.

### **2.5 The core of ecological civilization: harmony between man and nature**

Facts have proved that "the basic structure and operation mechanism of industrial civilization determines that ecological crisis is the inevitable outcome of industrial civilization". And "within the basic framework of industrial civilization, the environmental crisis cannot be fundamentally solved". Therefore, "only by realizing the transformation from industrial civilization to ecological civilization can mankind completely solve the ecological crisis threatening human civilization as a whole. The transformation of the civilization paradigm is the only way for mankind to get out of the ecological crisis. There is no doubt that human civilization develops from a lower level to a higher level. The history of civilization is the evolution of the relationship between two cultures. Human beings find that the more industrial civilization develops, the more wealth increases, but their fun becomes less and less, emptiness, fear, anxiety, but like flies chasing the smell of people around. Since modern civilization has many disadvantages, it is inevitable to find a new form of civilization that can replace industrial civilization and take the harmonious development of man and nature as the core -- ecological civilization.

### **3. What is the position of building in nature**

#### **3.1 Man is the bloom of nature, and architecture is the significance of nature**

One of the natural attributes of human beings is the animal nature of human beings. As the soul of the earth, human beings have evolved over hundreds of millions of years. The human was born as a product of nature, and the material basis of human civilization and wisdom is also nature. Architecture, as a shelter from wind and rain, protects human beings from various threats and challenges of nature, and obtains comfort and comfort in endless nature, reflecting the crystallization of human wisdom. In particular, the city built by the accumulation of buildings, all kinds of infrastructure interwoven, various levels of mutual penetration of human cities, is a leap and separation between human civilization and nature.

#### **3.2 A house is not a machine for living -Modernism isolated architecture from nature**

As Robert Fishman said in "From the Radiant City to Vichy: Le Corbusier's Plans and Politics" [3], Le Corbusier's ideas began and ended with the concept that industrial society had an inherent form, an objective order derived from the nature of man and the nature of machines, an ideal structure, which—if realized—would bring prosperity, harmony, and joy. Capitalism or socialism might under different circumstances be better equipped to reach this ideal, but both must submit to the requirements of industrial society or risk chaos. For Le Corbusier, any industrial society must be centrally controlled, hierarchically organized, administered from above, with the most qualified people in the most responsible position. He believed that the industrial era would be an age of triumphant rationality, and, as Max Weber had already observed, the rule of reason in Western society means the dominance of bureaucracy. Le Corbusier did not shrink from this conclusion: he embraced it. His ideal city is above all a City of Administration. "From its offices come to the commands that put the world in order."

#### **3.3 Eastern philosophy view of nature—Architecture is part of a natural system**

Japanese culture is largely determined by its natural conditions. Japan is far away from the continental plate, relatively short of natural resources, and has an obvious maritime climate. Sudden typhoons, tsunamis, earthquakes, and other natural disasters often occur, so the Japanese people often have a sense of impermanence and fate of the world. They believe that even good things are fleeting. In the face of irresistible natural disasters, the oppression of life and their smallness were magnified, and the Japanese people's sense of worship for the creator of nature was greatly enhanced. This sense of impermanence and loneliness penetrated the aesthetic consciousness of The Japanese nation and met with the Zen aesthetics, which produced a strong spark.

### **4. The Mechanism, Different ways of Nature Architecture in design history**

#### **4.1 Cave and Grass tent**

Different from animals, 200,000 to 40,000 years ago, the primitive began to find some caves to live in, they learned how to arrange for their living space. In Occasional accident, some of them have lost their cave, and then they learn to use woods to build their grass tents. By this time, they became to find out the preliminary geometry like Triangle, square, circle, etc. And in this time, they try to build the house like the cave intention. the cave is a natural concept that primitive want to reproduce by other material, but at the same time, they created a different outcome cause the material like branches limits their results. This is the Initial relationship between nature and architecture.



Figure 1. Ancient people-built houses on the prototype of caves

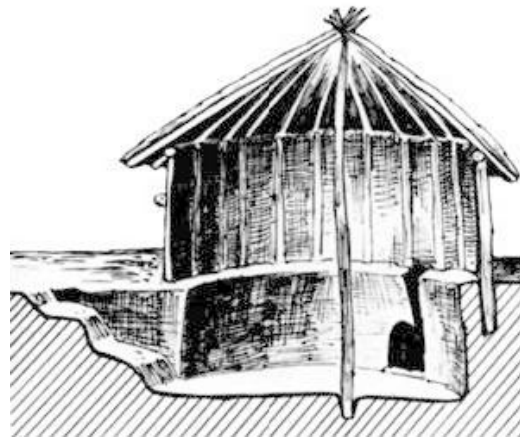


Figure 2. Homes built from raw materials inspire geometric structures

#### 4.2 Classical architecture and Symbolic decoration

By Md. Akhtaruzzaman, in “the Golden Ratio and the Baroque of Nature” [4], no matter Greek, Roman, and Asian antiquity, people build their buildings in different materials, but all of them like to use natural elements like animals, trees, flowers, and leaves to decorate their buildings. This is a kind of relationship between building and nature [5]. The Golden Proportion is considered as the most pleasing to human visual sensation and not limited to aesthetic beauty but also be found its existence in the natural world through the body proportions of living beings, the growth patterns of many plants, insects and also in the model of the enigmatic universe. The properties of the Golden Section can be instituted in the pattern of mathematical series and geometrical patterns.)

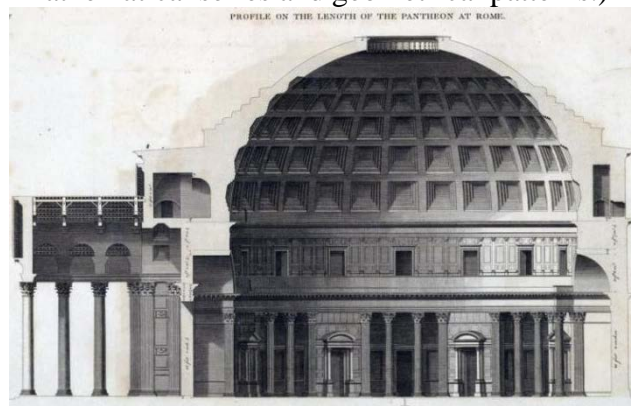


Figure 3. Geometric order of the universe

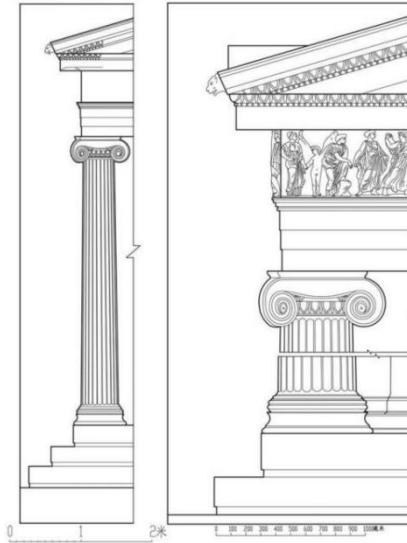


Figure 4. Natural patterns in Greek architecture

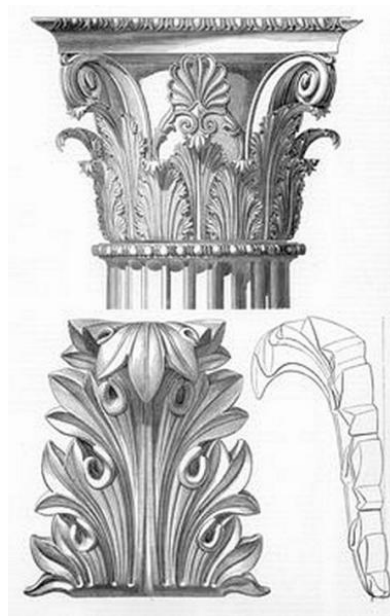


Figure 5. Mimicking the nature of the column

#### 4.3. Modernist architecture and Multiple natural tendencies.

In the modernist era, the Exploration of nature architecture show the diversity.

#### 4.4 Fallingwater Villa

Frank Lloyd Wright is one of the most famous architects in history, his design Fallingwater house expressed his attitude on nature architecture. The house was built partly over a waterfall on Bear Run in the Mill-Run section of Stewart Township, located in the Laurel Highlands of the Allegheny Mountains. The house was designed as a weekend home for Liliane and Edgar J. Kaufmann, the owner of Kaufmann's Department Store. Wright wants to simulate a cave with interior stone materials, and the villa looks like grows from the rocks. It created a kind of new relationship with nature. To copy the feeling of a wild cave.



Figure 6. Fallingwater imitates stones in the forest



Figure 7. Artificial materials imitate stone

#### 4.5 Farnsworth House

The Farnsworth House is a historical house designed and constructed by Ludwig Mies van der Rohe between 1945 and 1951. The house was constructed as a one-room weekend retreat in a rural setting in Plano, Illinois, southwest of Chicago's downtown. The steel and glass house was commissioned by Edith Farnsworth. It employed another strategy to deal with nature. Make it the most Highly transparent to let the natural environment come into the interior. It likes to live in a wild space. Nature is only cut off by transparent French windows.



Figure 8. Farnsworth House interpenetrate the nature environment





Figure 9. Farnsworth House let the natural environment come into the interior



Figure 10. Farnsworth House let the natural environment come into the interior



Figure 11. Farnsworth House let the natural environment come into the interior

#### **4.6 Nakagin Capsule Tower**

Nakagin Capsule Tower is a mixed-use residential and office tower designed by architect Kisho Kurokawa and located in Shimbashi, Tokyo, Japan. The building is composed of two interconnected concrete towers, respectively eleven and thirteen floors, which house 140 self-contained prefabricated capsules. Each capsule measures 2.5 m (8.2 ft) by 4.0 m (13.1 ft) with a 1.3-meter diameter window at one end and functions as a small living or office space. Capsules can be connected and combined to create larger spaces. In this project, Kurokawa's reference to the metastasis concept of the creature, and used mechanization to the imitation of nature. He hopes to create a machine-like nature.

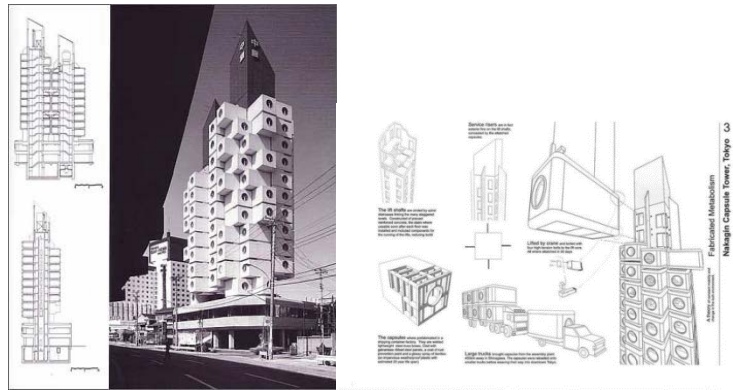


Figure 12. Nakagin Capsule Tower

#### 4.7 Sendai Mediatheque

The Sendai Mediatheque held its official opening in January 2001. Ito also refers to Mies' Barcelona Pavilion and Le Corbusier's Dom-ino house as precedents for his work, and indeed, the Mediatheque appears to mix concepts from the two projects, combining le Corbusier's play with slab and column structure, with Mies "fluid" spatial effects achieved through combined transparency and reflectivity of materials. The new building used natural structures like seaweed to support the floors and archived a new stage of nature building.



Figure 13. The Sendai Mediatheque

#### 4.8 Ken Yeang's green tower

Ecology and architecture are not directly compatible, and we need to understand how they interact. Ecology must always come first. Humans are part of nature, and our buildings are like anthills or beehives. But what distinguishes humans from ants and bees is that they have a far greater impact and power on nature than ants and bees and all other species, rather than the fact that most human activity takes place in a vacuum isolated from nature. It is this attitude of denial that has led to the large-scale destruction of nature we see today.



Figure 14. Ken Yeang's green tower



#### 4.9 TOD's Omotesando Building

TOD's Omotesando Building, Tokyo, Japan (2004), was built by Ito, and try to use a natural structure that simulates a tree to support to hold the building. This is the important moment that the Japanese try to deconstruct modern architecture by natural-like structure system.

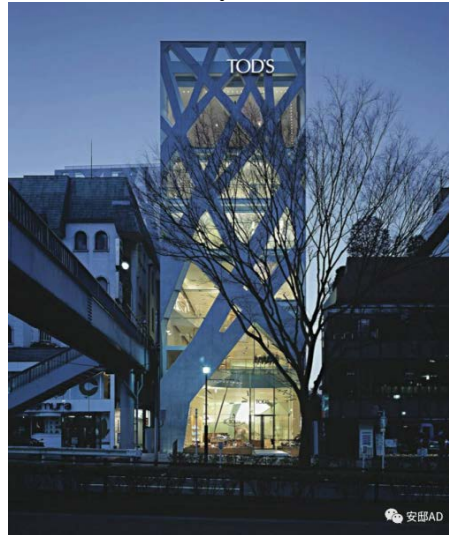


Figure 15. TOD's Omotesando

#### 4.10 The Rolex Learning Center

The Rolex Learning Center and library for the École polytechnique fédérale de Lausanne (EPFL), in Lausanne, Switzerland. Designed by the winners of the 2010 Pritzker Prize, Japanese-duo SANAA, it opened on 22 February 2010 [6]. Beyond Ito, Kazuyo Sejima employs another natural system to deconstruct the modern building. She used a big hole to separate the function area. And at the same, defined different functional by high level and was linked by rampway. She used the abstract method to support space and divide space, and reach a new level of natural architecture.



Figure 16. The Rolex Learning Center

Over 100 years modernists regard nature as one of the most important features of buildings. Different pioneers had tried various ways to engage with nature.

#### 5. Result design—Multi-dimensional, multi-value application

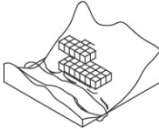


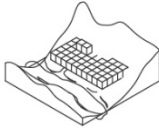
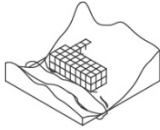
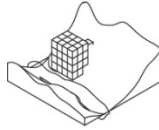
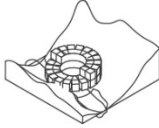

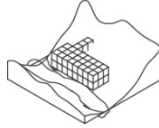


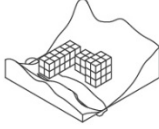

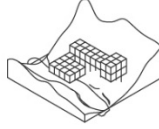
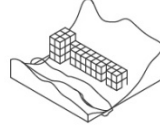
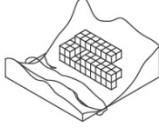
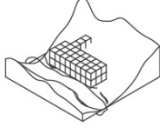

We use a design to express our concept on the attitude of nature. First, we choose a site in the Primitive ecological environment. We start by analyzing the Intrinsic properties of nature sites.

After analyzing the history of natural architecture. We could have a clearer value on estimating nature and buildings.

## 5.1 Response environment condition

Our design was placed in a valley terrain where the natural element is the main feature of the site. We first used different massing tests to occupy the site, and later, we use the Site properties which are visual sense and auditory sense to define the final scheme.

**FIGURE-6 GROUND PLAN DIAGR**

Base operating method test				
Shape concept	 <b>Box</b>	 <b>Hook face</b>	 <b>polygon</b>	
Vertical type	 <b>Single-story</b>	 <b>Two-story</b>	 <b>Multi-story</b>	
Horizontal type	 <b>Single Piece 01</b>	 <b>Single Piece 02</b>	 <b>Single Piece 03</b>	 <b>Single Piece 04</b>
	 <b>Curves Alone Isoheight</b>			
	 <b>Separate Block 01</b>	 <b>Separate Block 02</b>	 <b>Separate Block 03</b>	 <b>Separate Block 04</b>
Relationship with site	 <b>Touch the Surface</b>	 <b>Float above</b>	 <b>Embedded</b>	

**FIGURE-GRO UN D PLAN DIAGR**


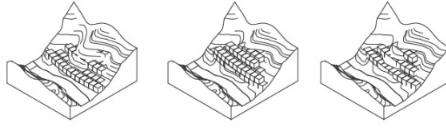
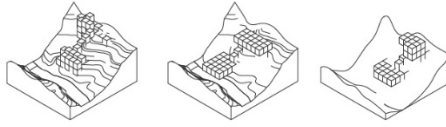
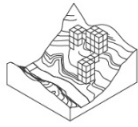
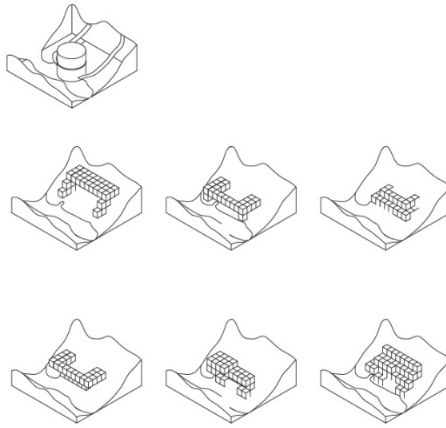
<p><b>Integrated</b> <b>1D (curve)</b></p>	<p>Dig a cave out in the mountains. Along the Contour lines provides a great view of the surrounding environment. Part of the building becomes a long corridor. It can be both private and public: the public corridor and the private functional area inside the mountains. Some Semi-public areas can serve as living rooms and so on.</p>	
<p><b>2D (surface)</b></p>	<p><b>Silly putty (3 iterations)</b> Imagine a layer of flexible material that is like water. It can adapt to the surface of the ridge.</p>	
<p><b>3D (volume)</b></p>	<p><b>Terrace</b> Go up like a person stepping on a staircase. The building goes up to the zenith. The biggest advantage is that the convection of the air in the mountain area can provide great air refreshment. Q-Svt Private and public space again. This time, the view platform is a huge integrated one. A huge french window of 16:10 or 16:9 can be applied, giving an impression of a cinema screen.</p>	
<p><b>Integrated</b> <b>Larger Modular</b></p>	<p>Several linear shapes formed by 9-10 basic blocks.</p>	
<p><b>Different test on the Site</b></p>		

Figure 17. Different massing test to occupy the site

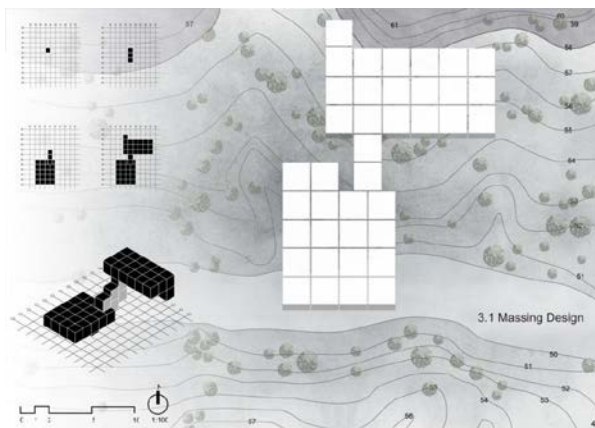


Figure 18. We use the Site properties which are visual sense and auditory sense to define the final scheme.

We used a not very typical design method that we started from outside to inside because we have already had a rough idea about the spatial arrangement inside the building according to the theme. This led to the consequence that the most difficult thing is the generation of the outward appearance and the volumetric form.

We tested more than 20 times on the massy model including linear, scattered, emissive, and so on. But normal types do not match our concept and site well. We finally decided that the whole building be two separated platforms which are connected by an escalator.

### 5.2 A state of living close to nature

The architecture is mainly composed of three parts: the upper platform, the lower platform, and the access that connects them. We classified different spaces according to different principles and integrated quiet and private spaces, which are meditation spaces. The lower platform is a cantilever structure above the creek, so it can capture the most beautiful scenery and provide a quiet space for meditation. The other spaces, known as living spaces, were put together on the higher platform. Also, we stress the sight and hearing respectively by putting the Tea House on the upper platform and the yoga room/meditation room on the lower level, because when we drink tea, we need to expand our horizons and observe the view below, just like what ancient Chinese literati usually did; but while we do meditation, we usually close our eyes and want a quiet space where we can amplify our auditory sense. During this time, we can hear the creek while feeling inner peace.

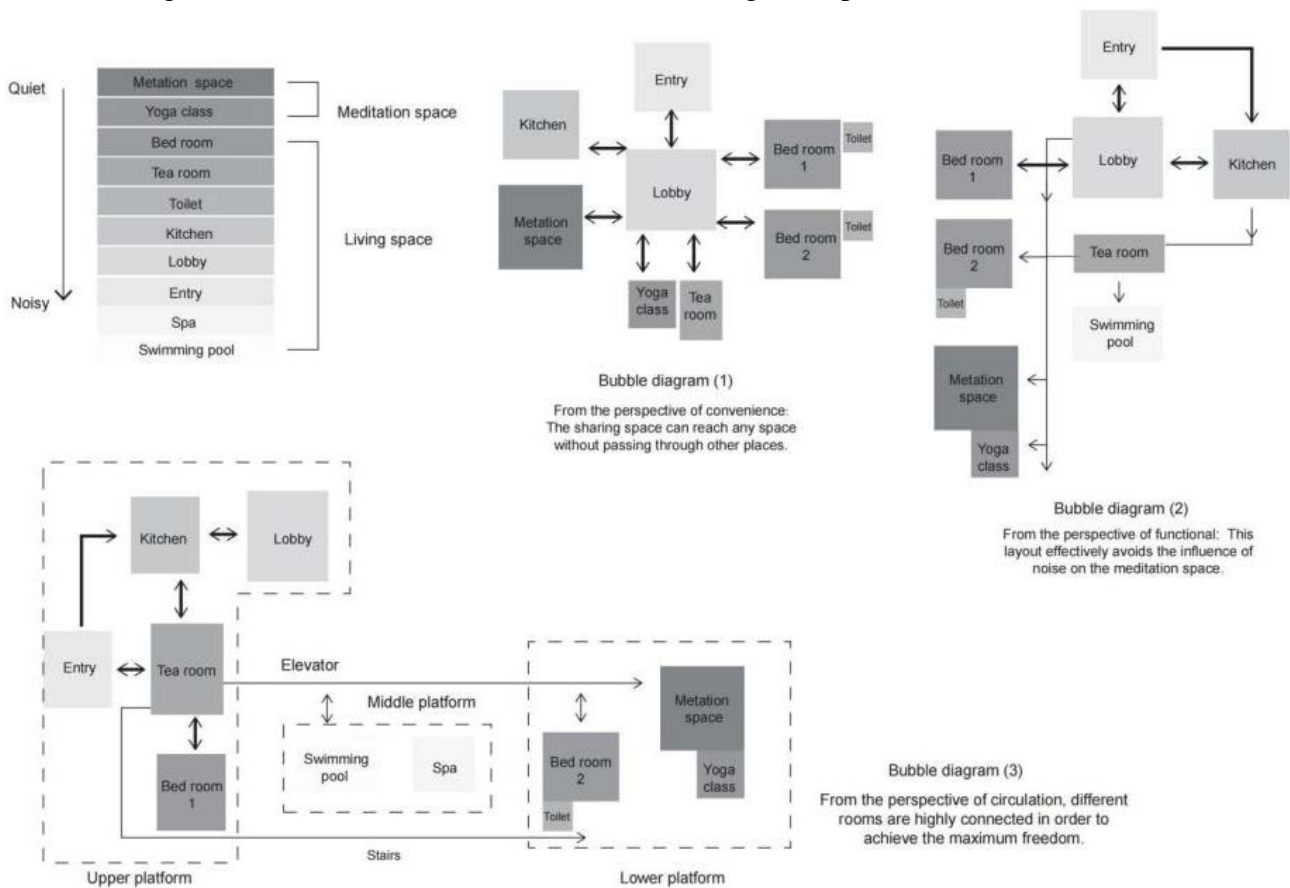


Figure 19. The upper platform, the lower platform, and the access that connects them...



Figure 20. Space emphasizes the relationship between man and nature



Figure 21. Column-free Spaces emphasize the vision of horizontal landscape



Figure 22. Tea House on the upper platform



Figure 23. The meditation room is a semi-public space that can provide sheltering and more connections to nature.

### 5.3 Imitation of natural forms

Our geometrical form was inspired by the idea of the texture of the multi-layered cliff from the site so we use a multi-layered ample platform to mimic this.



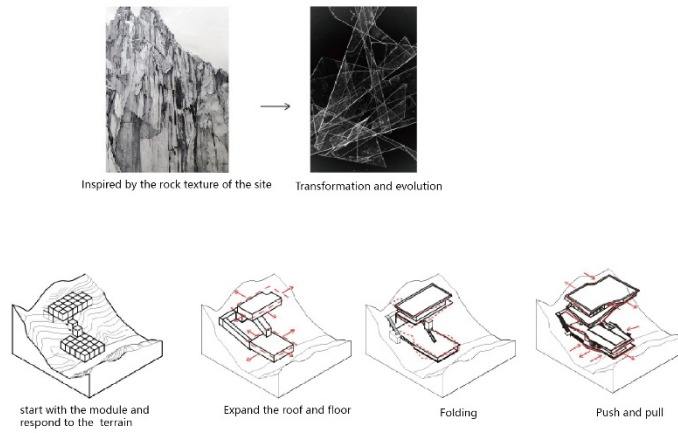


Figure 24. Inspired by the idea of the texture of the multi-layered cliff from the site

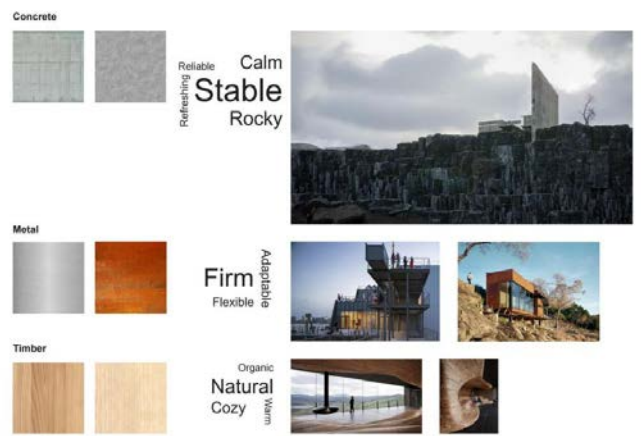


Figure 25. Choose natural material to bring the nature elements into interior



Figure 26. Fair-faced concrete is used to respond to the natural stone texture



Figure 27. Fair-faced concrete is used to respond to the natural stone texture



Figure 28. Fair-faced concrete is used to respond to the natural stone texture

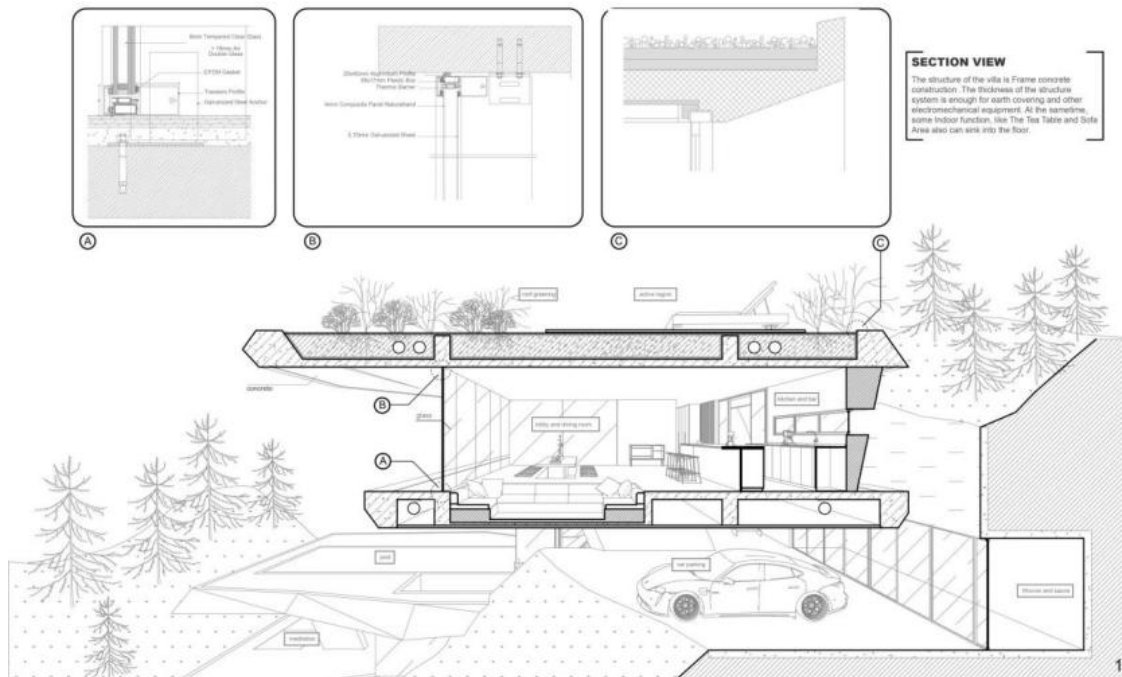


Figure 29. The thickened floor collects all kinds of mechanical and electrical equipment and green soil

## 6. Conclusion

As a result of the discussion, we advocate a new concept “Super Nature Era” Architecture which built a new relationship between architecture and the world, should have the follow characteristics:

a) *Designed for energy and ecology*

*We aim at the architectural design with the theme of "symbiosis with nature".*

b) *Symbiosis with nature*

*Architectural design is the catalyst for the diversified relationship between nature and man.*

*c) Maximally accept and coexist with the power of nature*

*to create a space that evokes the sensuous and physical feelings of nature that people originally have.*

*d) Organic space experience*

*The architecture that integrates the order of nature and coexists with nature contains soft and organic Spaces. It evokes the rich sensibilities of modern people living in cities surrounded by artifacts and creates vivid experiences.*

*e) Connection to the environment loop*

*Network with the earth's natural circulation systems, such as water and greenery. The building is not a single independent existence, but a continuous existence with a broad climate, edaphic condition, and ecosystem, and the design should be considered as part of these networks.*

As Zongzhe Xie, Said in his book 《Japanese contemporary avant-garde architecture——Natural style》. On the other hand, such a declaration, further leads the architectural operation to break away from the habitual thinking that was regarded as man-made in the past, and to thinking closer to the essence, that is, architecture is also regarded as a part of the natural system. To establish a new understanding through the logic and principles prevailing in nature: to break away from the established concept of being simply a container for living, and to open up architecture, so that it can become a [medium] for human beings to interact with nature. This is also the reason why the author uses Logia, an ancient Latin name that refers to all the principles of life and the root of various phenomena in the world, to try to open a new level for the posture of architecture in the future.

Today, with the continuous development of architectural technology, the natural environment is being introduced into the city and architectural space by people in various ways, strengthening the connection between people and nature, and constantly improving and enhancing the quality of people's environment and life. At the same time, the concept of sustainable development and environmental protection are increasingly valued by people today, introducing the natural environment into the interior of the building is an effective way to solve this problem. In our design work, we should introduce nature into the building in an appropriate way according to the actual situation, so that the building not only has a perfect function, advanced technology but also harmoniously coexist with nature. (Toyo Ito, 2012)

## **References**

- [1] Junya Ishigami, Another scale of architecture, 2010
- [2] Wangsih, Wangguiyue, On the Function of Science and Technology in the CoOrdinating DevelOpment Between man and Nature, Apr, 2005
- [3] Robert Fishman, From the Radiant City to Vichy: Le Corbusier's Plans and Politics, Apr 23, 2021
- [4] Md. Akhtaruzzaman, Amir A. Shafie, Geometrical Substantiation of Phi, the Golden Ratio and the Baroque of Nature, Architecture, Design and Engineering, 2011;
- [5] TAKING SHAPE, A new contract between architecture and nature, 2001
- [6] Koh Kitayama, Yoshiharu Tsukamoto, Ryue Nishizawa, TOKYO METABOLIZING, 2010
- [7] Zongzhe Xie, Japanese contemporary avant-garde architecture——Natural style, 2017
- [8] Lin Xuejun, From the relationship between man and nature, the root of technological alienation and its transcendence, Aug,2008
- [9] Wang Shu, we are in need of reentering a natural philosophy, Apr, 2012
- [10] Toyo Ito, ANOHI KARA NO KENCHIKU, 2012