

## The Perceived Interaction of Sensory Processing in Internal Space, Architectural Surrounds, and Endless Space

**Amira Fawzy Helmy Almaz**

Associate Professor of Interior Architecture, Architecture Department, Faculty of Engineering, Horus University (HUE) aalmaz@horus.edu.eg

**Amr Ahmed Mohamed Zeina**

Assistant Professor of Architecture, Architecture Department, Faculty of Engineering, Horus University (HUE) azeina@horus.edu.eg

### Abstract:

There is a relationship between design and the natural law of growth as well as a relationship between design and life. The concept of nature no longer refers to those appearances and external relations of forms. but rather to specific systems that take place within the forms, including the lines, spaces, shapes, touch, colors, and space, etc.

Humans' relationship with nature is thought to be based on an infinite void, and when a man enters a small, closed space or a height barrier, he loses this connection to the earth. However, glass technology has made it possible to turn glass windows into fully glass walls, allowing the interior space to blend seamlessly with the exterior. Thus, the internal space's scope broadens both physically and aesthetically. Through structural construction, the interior space is also turned into the exterior, adding it to the interior and creating a sense of spaciousness and release. However, the membership of the current century has adopted a handler in which it attempts to fulfill Wright's request in a novel manner named Inside Out.

### Keywords:

Sensory process, perceived interaction, Spatial perception, and interactive architecture.

Paper received 12<sup>th</sup> March 2023, Accepted 22<sup>nd</sup> May 2023, Published 1<sup>st</sup> of July 2023

### Introduction:

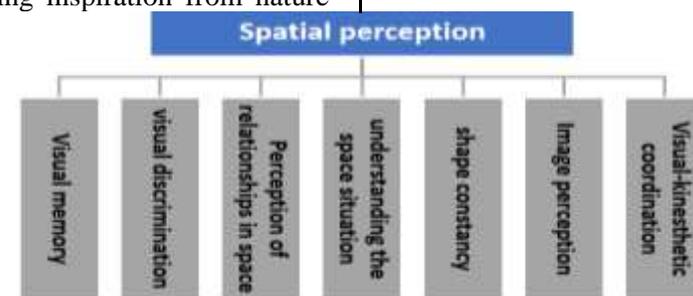
Nature is the source of everything that surrounds the designer and architect of influences that he thinks about and contemplates. No one can imagine something that does not exist. Rather, what he does is reflect his imagination on the information that he derives from the natural environment in which he lives. Which itself is an integral part of its components. The designer expresses his own style and his distinct view of nature by making types of modification, alteration, reorganization of elements, and selection. From this interaction between the designer and nature, his own artistic style or style crystallizes, which is the result of his culture and experience. The designer often draws inspiration from nature for his elements and symbols. These elements are in the light of the laws and systems of growth possessed by nature, and that system appears in the elements of nature in all their diversity. The design begins when chaos turns into order and order. Design in itself is a word that denotes the limits of the human mind and the lack of facts that it perceives, and that a person gradually gets rid of chaos as his knowledge increases, as it is replaced by order and order, and in the process of drawing inspiration from nature

with its richness, the designer goes through two processes: [1]

- **The first:** is internal, related to his cognitive abilities, including culture and temperament.
- **The second:** is external, represented in its relationship with nature, where the design process depends on the visual organization and on how to see nature and extract engineering systems that achieve rhythm, unity, balance, and diversity in nature.

### 1- Spatial perception and visual vision of space:

Spatial sense is usually meant by spatial perception or visual vision by which the recipient perceives patterns, shapes, location, and movement of objects through his eye located within the space when preparing the brain for specific visual information. The perception of the recipient of his environment and the things that surround him unites and integrates sensory data to help him discover the external world for him, and there are many researchers such as "Brennan" claiming that spatial perception is not only a single ability or skill while it is a compound of five to nine skills, of which we will present seven of them below, which Gradually developing at the recipient:



### 1-1 Visual-kinesthetic coordination:

The capacity to synchronize and match an object's vision and movement is referred to as visual-kinesthetic coordination. Due to the difficulties of these procedures, visualizing geometric ideas and concepts at various abstract levels can be tough. Scientists discovered a link between motor

impairments and spatial awareness in the receiver, although the nature of this link is yet unknown. The clarity of space is intimately tied to the ability of the individual's mental picture of its components, and this mental image is the process of producing a mental image.



Fig (1) The Diesel Denim Gallery Aoyama store in Tokyo, designed by Chikara Ohno, used rolls of aluminum sheets suspended from the ceiling and pushed the middle parts of each other towards the top.

Glass surfaces were used to display the goods, taking advantage of the solidity of the material and the smoothness of its surface. However, the strength and position of the design of the sheets negatively affected the user's acceptance of the design.

### 1-2 Image perception:

It is the visual ability to distinguish a particular compound in a polymorphic setting with complex backgrounds and intersecting shapes.

### 1-3 Shape constancy:

Perceptual stability, or form stability, which involves separating geometric shapes exhibited with varying dimensions (lengths, areas, and sizes), by placing them in the space, and identifying it from among similar geometric shapes, is what enables us to adapt to our environment.

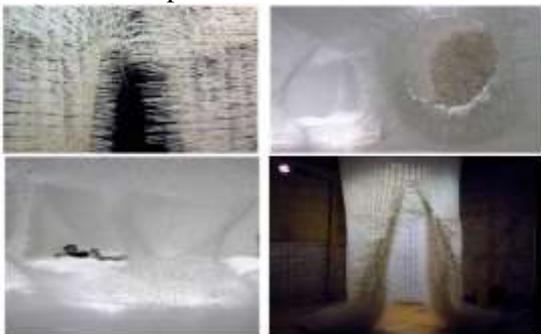


Fig (2) Space and the designer's role in the presence of perceptual deception of the relationships between the vocabulary of space, a new weaving of the internal space for students of the Academy of Fine Arts in Munich, Germany, installing more than a million optical fiber cables in a new sensory experience for the recipient; two components of seating spaces that resemble bird's nests such as a cocoon, and standing under A shower of light (within 200 square meters) the microscopic

### 1-4 Understanding the space situation:

The capacity to interact with a target within the space depends on the perception of the situation there. When a recipient has the capacity and high competence to perceive space, he or she regards themselves as the center of the universe and takes in everything around them.[2]

### 1-5 Perception of relationships in space:

The ability to see two or more objects in relation to the recipient, or one object in relation to another, requires the ability to perceive relationships in space. This is accomplished by teaching spatial symbols, such as estimating the distances between nearby objects.

### 1-6 Visual discrimination:

Visual discrimination is the ability to notice the similarities and differences between two things. The difference between visual discrimination and position in the space is that visual discrimination is not related to the position of the object in the space. ...). [3]

### 1-7 Visual memory:

Visual memory is the process of accurately recalling and interacting with unseen items from memory. most of these recipients only store small amounts of information in their short-term memory; instead, a person must store a lot of information in their long-term memory in order to remember it. [3] As Frank Lloyd Wright used to say, "**The inner space is the reality of the structure as the basis for the sense of the building.**" Dividers are included in this category (curtains). The outcome has been dropped. The whole interior partitions are non-opposing, spaces, an atrium phenomenon of twentieth-century architecture. Wright gave dynamism to the previously unheard-of empty continuity between the spiral slopes in the Morris Shop for Jewelry in San Francisco, California (1948), and the atrium attained the pinnacle of the physical spatial continuity in the Guggenheim Museum in New York (1959). Wright said of this structure: "Here for the first-time architecture seems fluid, each level flowing into the next (like a sculpture) instead of the typical accumulation of layers one on top of the other cut and punctured by the construction of the column and beam."



Fig (3) The Tree-ness House tower raises Wright's slogan, "The human connection with nature is a connection with an endless to the bottom and to the top," to give the architecture organic structural layers, which have the ability to link the complex ecosystem with the city.

This sensitivity to the material continued in Hassan Fathy's works (1900-1989 AD) with clay and Louis Kahn and Paul Rudolph with reinforced concrete. It also continued to the environmental cycle in the late twentieth century in the works of Tadao Ando with wood.

Tokyo-based business Akihisa Hirata built an organic residential complex in Tokyo, the Tree-ness House Tower, to provide residents of the flat structures a more dynamic experience as if they were a tree with their spaces hung in the air. To accomplish this, Akihisa Hirata's architects paved a set of boxes, some of which have apertures that initially appear to be folded. These boxes are covered from the outside with terraces or even interior areas open to one another and encircled by glass, and they include sleeping chambers within. In order to remove the lines dividing the interior from the outside, green areas were added around these folds, which helped to create three-dimensional gardens. [4]

## 2- The relationship between interactive architecture and spontaneous architecture:

Vernacular Architecture is one of the local cultural environmental trends, which expresses traditional societies, and the compatibility with the local environment, that environment that represents the most important factor influencing the recipient's perception of his space, and it is the result of a collective process that is formulated through spontaneous and continuous activity between each group with a working and effective heritage through A unified and joint collective experience, and the design product is compatible with the natural, ecological and built environment, with the recipient's thought and traditions, and the environment that has arisen over the years and develops until it settles on a comfortable situation physically, visually and intellectually, often organically based on natural shapes and facilities and simple local materials. [5]



Fig (4) the principles of engineering, which are composed of geometric patterns of straight lines yet produce three-dimensional curved surfaces, were inspired by nature. Antonio Gaudi used these principles to build vaults, walls, and columns.

Christopher Alexander's concept of popular production as "creative self-aware civilizations" calls this the timeless method of construction: groups form their buildings by the knowledge of their members for many centuries using the languages of systems. This language gives its user the power to create new and unique buildings without borders 3, due to which the task of formulating forms and then the popular design process is attributed by means of the modern design language, which is said about the heritage that Hassan Fathy said about it "is similar to Adding a microscopic crystal to a saturated solution, which suddenly transforms the solution into other crystalline formations." He called for the necessity of restoring the language of social and cultural systems, with which their buildings died. Environmental architecture has returned to dialogue with a designer on the basis of environmental, social, human, and psychological values. It has made man the focus of work. [6, 7]

The design expresses in a true way the local environmental reality, and in this, it represents continuity with the inherited materials and forms, which endears them to the recipients because of their memories with them at the subconscious level, which is what is known as the approach of Appropriate Technology led and initiated in the forties by the architect Hassan Fathy, and many others followed in that. International architects such

as Christopher Alexander, Amos Rabopur, John Toner, and others, considered the natural environmental sources of sun, wind, soil, and water, in addition to human thought, among the resources that humanity possesses equally to a large extent, based on local data. In this context, calls for a return emerged. To the materials and methods of traditional construction with load-bearing walls of mud, hay, mud bricks, clay, reeds, bamboo, natural stones, and others. These materials and construction methods proved their ability to adapt to the local climatic conditions and provide appropriate environmental solutions at all levels. [8]

In a structural system in which the stresses are simple compression stresses, whether in solid block walls or in ceilings of domes or vaults, and from the same materials the surfaces are finished with whiteness and the work of seats, beds, closed and open fences, and mashrabiyyas, Hassan Fathy adopted at an early age globally this environmental thought centered on bricks Adobe from clay as a basic material for the reconstruction of rural villages and the Egyptian desert, using local builders to create local architecture with distinct formations that are considered one of the most important schools and trends that contemporary with modernity, and later influenced it towards a



Fig (5) The Grand Egyptian Museum was designed by the Irish engineering firm Peng Architects, who took into consideration the height of the walls up to the dimensions of the Great Pyramid so that if we build a straight line from the end of the museum's walls, it will reach the highest peak of the Great Pyramid in the area of the pyramids. The design philosophy expressed the Nile River with the beam that connects the museum to the pyramids, and the pyramids were also represented in the lines divided into four sections prominent decorative cornice, and the woven material that is widespread in the coastal cities. [11]

2003 to design the building of the Grand Egyptian Museum- tended to bury their buildings in the sides of the surrounding hills so that they do not interfere with the space surrounding the pyramids themselves. This relationship between man and product has continued to this day in Egypt in many cities and villages. The Nubian style is in the mud dwellings, with walls of little inclination, with roofs of vaults close to semicircular around heavenly basins. The walls are rich in surface and stereoscopic decorative treatments around the entrance, with the wall ending with a perforated or

clear popular environmental architectural trend, and for centuries the farmer invested, wisely and deliberately, The apparent building material, and this wisdom is not mentioned in modern educational programs, and there is no doubt that the houses of the peasants may be cramped and dark and do not meet the needs of modern comfort; However, this is not the result of an error in the building material itself, but rather a weakness in design and good choice. [9, 10]

### 3- Minimalist Architecture Thought inside the Space:

#### 3-1 The subterranean architecture space's perceptive system

To totally remove a structure's existence as a visual obstruction or to scale it back as a participant in urban group blocks, one portion of the building may be buried while another may rise above the surface. The Sun Boat Museum's architect made the error of depicting the entire structure as being attached to the Giza Pyramids, one of the Seven Wonders of the World and transforming it into a civilized distortion. Visual architecture is a crucial component of the architectural form and its internal spaces. With a contemporary sense of this overlap, many of the contestants- in the international competition that was held in

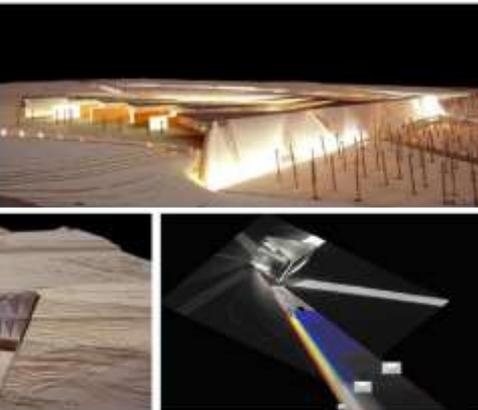


Fig (6) The museum's buried architecture emphasizes light and movement in space, dividing the site into three domains: the lower level, the ascent to the plateau, and the upper plateau. The architect used symbolism, as the statue of

Ramesses II serves as the first point of reference at the museum entrance and aids in directing visitors as an entrance to the conference center. The architect also used transparency in the transparent stone wall at the gate of the main building to stimulate sensory perception. During the day, the stone wall transforms into a wall of transparent stones. Transparency of the entrance achieves the



Fig (7) the architect used symbolism to direct visitors to the museum entrance, and transparency to stimulate sensory perception without interrupting visual contact with the surrounding environment.

#### 4- The perceptual system of the space of Minimalism architecture:

The Miss Vendor School's architecture, which adopted the design direction of deletion and "less is more beautiful," claims that as a reaction to the material and constructive exaggerations in advanced modernity, the trend returned to the lack or fading - influenced by the Messianic principle of deletion. Mays (1886-1969) wanted to emphasize the freedom of movement inside the interior spaces as well as between the inside and the outside, but the exterior glass of Dr. Farnsworth's and Philip Johnson's homes in Neukanen presented nature as a panoramic vision seen from inside a crystal capsule. develop with the intention of showcasing the renewed concern for the environment that was wiped out by postmodernism's architectural pluralistic trends in the latter half of the twentieth century and the first few decades of the third millennium ignored this trend, but there is now renewed interest in blending with the surroundings and the idea that the structure is a natural extension of the landscape. [13]

With fading, the style transitioned to furniture and interior design. As there were few colors available, white and dark grey predominated with one contrasting hue of the primary colors, such as yellow, blue, and red. The smooth, supple feel was also included, and advancements in production technology and the use of adhesive materials allowed the details reach fading through pasting procedures and the continuance of the design trend by erasing and amplifying it. [14]

When designing a residential building in Uruguay, Rafael Fenoli used water on the roofs of the six graded floors and walls of sliding glass shutters to open the entire space to the outside. He also announced interior spatial treatments of wall colors and white furniture pieces designed with minimalism to avoid getting in the way of this

transition to the spaces of the Nile Garden and the Children's Gallery through the spatial frequencies present in the entrance without interruption. The entrance is made of transparent "alabaster" stones, with a luminous façade at night that lights up the courtyard and the museum itself. without interruption of visual contact with the surrounding environment. [1, 12]

integration with the outside. Match the living function by using the warm brown hue. [15]



Fig (8) Residential buildings in Uruguay, designed by Rafael Vinoly

This movement was adopted by many designers, including Tadao Ando, who coined the phrase "endless architecture," rejecting the notion that architectural voids are equivalent to abstraction and dismissing the function of art as a depiction of reality. He emphasizes nature as a historical focal point, stating, "It is best to design buildings without roofs so that nature stays alive and tangible," as well as the movement towards real materials, particularly concrete." Abstraction is an aesthetic movement focused on purity of logic and transparency of substance," according to Tadao Ando, "while creative expression is concerned with historical, cultural, climatic, environmental, urban, and living contexts." Nature, which occupies a distinct plane, enters the contradiction between abstraction and expressiveness. Tadao Ando's propensity in this was to challenge modernity's environmental denial with a modified form of modernity's vocabulary. Tadao Ando forcibly directs the viewer's gaze through a glass wall and concrete walls that define the space without providing any details or obstructions. In a commanding, brilliant posture, Ando accentuated the presence of light and shadows. [16]

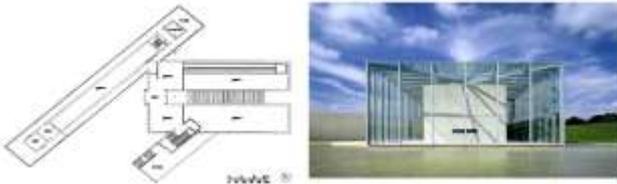


Fig (9) Tad Ando and Langen Neuss Foundation, Germany "2004" The building is designed with two parallel wings of concrete, six meters deep in the ground, the main entrance in concrete, and the glass envelope, supported by steel beams, around the concrete design where sunlight is through narrow skylight windows with adjustable slats.

Architect Robert Venturi was interested in proving that excellent architecture generates several levels

of meaning and different visual focuses, since its spaces and features may be interpreted in a variety of ways at the same time. so he suggests the idea of information condensation, in which the recipient encounters information in a very brief period of time with a rapid flow that reflects the complexity of reality; in other words, architecture is intended to accumulate intellectual events and concepts and to concentrate them in intense foci.

We see this cumulative idea in the design plan for the South Korean city of Ansan, created by ID Office, which was adopted by numerous design schools up to the third century. [17]



Fig (10) Cumulative concept and design of "Ensan city" in South Korea, designed by the ID office in cooperation with the BIG office and INABA, and mass studies, and this design was displayed at the Gyeonggi Museum of Modern Art in the city 2009

The plurality in cultural disciplines was represented in architectural production and interest, and pluralism dominated architectural works and diversity, difference, abundance, and enrichment. The change in architectural performance has always had its own reasons, which may be restricted to:-



Fig (11) Twists In the center of Haxifei, Guiyang, China A group of separate buildings that seem to have grown from nature to be put together in a way that represents the cultural difference of that region

1. Scientific developments: in the field of computer and software systems, and profit from the most recent computer simulation techniques Computer simulation of the physical and environmental pressures that can affect a certain structure, in order to achieve an optimum structural form by integrating the shapes created by the various forces, rather than via the eligibility of the architectural solution. Taking use of emerging disciplines such as current cosmology and the so-called sciences of complexity, which resulted in a special interest in wave motion, which in turn influenced the emergence of these

Contemporary architecture, such as Waves and Twists. [4, 18]

2. Employment of informatics and globalization: Because of the rapidity with which communication and information are transferred between regions of the world, the latter appears to be a comparable universe. Such a sentiment fosters a sense of distinction while also heightening the sensation of devotion to people's privacy. To the degree that the urban environment and its terrain are homogeneous, this produces a significant awareness of each region's privacy. By increasing awareness of the distinction. [2, 9]
3. Doubts about the credibility of recent studies: the normative postulates and criteria that were eventually used to define and address building architecture Climate comfort, for example, demonstrated its failure by establishing specific criteria for producing a (micro-climate) within structures. This is because more than 90% of the residents of those buildings prefer natural ventilation and lighting conditions over the designer's "micro-climate" model, and by utilizing the computer's and simulation method's capabilities, the architect is able to design a three-dimensional model of an appropriate and ideal environment, and that this model is inclusive. On a "space", that meets a wide range of human requirements. [19]

## Conclusion:

- 1- The visual perception of the recipient, which is his means of recognizing his space, is a mental process related to and affected by many behavioral and psychological factors for him. Recognizing and distinguishing colors depends on the characteristics of objects and surfaces represented in the reflection of light rays from them, or the absorption or absorption of one part of it and the reflection of the other part.
- 2- Perceived design beauty is the best use of the method of construction, employment, and best arrangement of the vocabulary of formation and visual composition, achieving the foundations and principles of plastic and formative, expressing the functional, social, and cultural content, fulfilling the psychological and environmental needs of the individual, and representing the modern technology to which he belongs.
- 3- The spatial and temporal environment is one of the most crucial elements that determine the vocabulary and standards for the visual assessment of architecture and interior architecture. This environment can be given a degree of objectivity and scale its relativity, and from here a group of design trends and schools emerged to suit the place (environmentally, Minimalist Architecture, subterranean architecture...) and temporal, which keep up with the technology and techniques of the age. Deconstruction, and digital design.
- 4- The suggestive process of designing within the space entails an assessment of the formation values because the assessment process is based on an analysis of the values of the spatial formative relations of this space and its connections with the recipient human inside it and its human needs.

## Recommendations:

- 1- Intensifying studies that would define the architectural vocabulary and urban features of each residential area, so that it is possible to formulate the architectural and urban formative frameworks for it so that the foundations and principles of beauty are achieved through working with these frameworks, which is directly proportional to the design treatments.
- 2- Standing at the limits of formal abstraction of elements and vocabulary, as well as the tendency to strip the architectural heritage of the various civilizations that passed through Egypt of all historical and ideological connections, then re-read it stripped of these connections and then subjecting it to interact

with historical conditions and current ideological trends.

## References:

- 1- Behrmann, M., Visual perception and spatial awareness. 2010, London: Henry Stewart Talks.
- 2- Zeina, A.A.M.A., The use of mathematical modeling in architectural design to provide sustainable housing. Port Said University, Faculty of Engineering, 2022. 26(1): p. 10-20.
- 3- Timothy F. Brady, W.A.B., Visual memory. *Frontiers of cognitive psychology*, ed. T. Francis and EBSCOhost. 2022, New York, NY: Routledge.
- 4- Antony Radford, S.B.M., Amit Srivastava, The elements of modern architecture: understanding contemporary buildings. 2014, New York: Thames & Hudson. 344.
- 5- Šā'igh, A., Sustainable vernacular architecture: how the past can enrich the future. Springer eBooks. 2019, Switzerland: Springer Nature: Springer, Cham. 437.
- 6- Islam Rafaat Mohamed, A.F.H.A., Design Engineering Humanistic and Interactive Methodology in Architecture as a Design Indicator for Human Space. *Design engineering (toronto)*, 2021. 2021(9): p. 2398 - 2415.
- 7- Almaz, A. F. H., the Impact of Anthropometrics on the Functional Design of Office Furniture. *International Design Journal*, 2022. 12(5): p. 21-30.
- 8- Zeina, A.A.M.A., The impact of the development of modern technologies on the sustainable development of urban spaces. *MEJ. Mansoura Engineering Journal*, 2021. 46(1): p. 24-30.
- 9- Farshid Moussavi, M.K., The function of ornament. 2006, Barcelona, Cambridge, Mass: Harvard University, Graduate School of Design,.
- 10- Awad, I.R.M., Factors affecting contemporary architectural design and its relationship to the Pharaonic architectural heritage (In order to establish evaluation criteria for the architecture of different civilizations. *Arab Association for Islamic Civilization and Art*, 2020. 5(24): p. 15-25.
- 11- Estela Schindel, P.C., Space and the memories of violence: landscapes of erasure, disappearance and exception. 2014, Hampshire: Palgrave Macmillan, Houndmills, Basingstoke. 265.
- 12- Iwamoto, L., Digital fabrications: architectural and material techniques, ed. A. briefs. 2009, New York: Princeton Architectural Press. 144.
- 13- ain Jackson, J.H., Maxwell Fry, Jane Drew,

- The architecture of Edwin Maxwell Fry and Jane Drew : twentieth century architecture, pioneer modernism and the tropics, ed. eBook. 2016, London: Routledge.
- 14- Nel, M., Pentecostals and the pulpit: a case study of the Apostolic Faith Mission of South Africa. *HTS: Theological Studies*, 74, 20180301, 1, 2018.
- 15- Biagi, F., Henri Lefebvre's critical theory of space, ed. E. Marx, and Marxisms. 2020, Cham, 2020: Palgrave Macmillan. 235.
- 16- Yann Nussaume, T.A., Tadao Ando. 2009, Basel: Birkhäuser. 191.
- 17- Robert Venturi, V.S., Christopher Curtis Mead, the Architecture of Robert Venturi. Vol. 1st ed. 1998, Albuquerque: University of New Mexico Press. 115.
- 18- (Firm), A., ACA Architecture Competition Annual. *Archiworld (Firm) Vol. 4*. 2015, Korea: Archiworld Co.
- 19- Pearson, D., New organic architecture: the breaking wave. 2001, Berkeley: University of California Press. 223.