

ORGANIC ARCHITECTURE MEANS FOR SUSTAINABILITY GOALS

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Abstract

Organic Architecture is not a style of imitation, but rather, a reinterpretation of Nature's principles to build forms more natural than nature itself. Engineers, designers and architects often look to nature for inspiration. The research on "natural constructions" is aiming at innovation and the improvement of architectural quality. The introduction of life sciences terminology in the context of architecture delivers new perspectives towards innovation in architecture and design. The investigation is focused on the analogies between nature and architecture. From the time immemorial, human beings have been accompanied with the nature and natural organisms. These interactions sometimes lead to different and contradictory paradigms but the natural organisms have always been the inspiring sources for humans. Mother Nature has devoted its countless gifts and resources generously to human beings to be able to develop their civilizations all over the world.

Each with its own culture, beliefs, values, traditions, attitudes and ethics is the element of people differentiation in different societies. In the other hand, we are nature. So, we should respect and learning from nature. However, they necessarily not always successful as degree of their success depended upon their perception and understanding of the nature of organisms. Later, some biological comparisons were introduced focusing on formal and structural aspects to have wider perspective about the nature of the organisms and new rules and regulations. These gave rise to critical faults and disadvantages. Like human beings themselves, their architectures possess integral, united and harmonic system that is demonstrated in the best possible form in the natural organisms.

The present work attempts to introduce some of the principles, rules and regulations related to the natural organism and then describes how to apply those organisms in architecture. Finally, it realizes the ways of going beyond the motional principles in order to attain a multidimensional humanistic architecture. While Organic Architecture does describe an expression of individuality, it also explores our need to connect to Nature [9] (Fig. 1). Using Nature as basis for design, a building or design must grow, as Nature grows, from the inside out. Most architects design their buildings as a shell and force their way inside. Nature grows from the idea of a seed and reaches out to its surroundings. A building (following the principles of Organic Architecture) thus is similar to an organism and mirrors the beauty and complexity of Nature (Fig. 2).

Keywords: Physical order and disorder, Sustainability Goals, Organic Architecture

ОРГАНИЧЕСКАЯ АРХИТЕКТУРА КАК СРЕДСТВО УСТОЙЧИВОГО РАЗВИТИЯ

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Аннотация

Органическая архитектура не стиль имитации, а скорее реинтерпретация принципов природы, чтобы строить формы более естественные, чем непосредственно в природе. Инженеры, проектировщики и архитекторы часто обращаются к природе для вдохновения.

Исследование “естественных сооружений” стремится к новшеству и совершенствованию архитектурного качества. Введение терминологии наук о жизни в контекст архитектуры поставляет новые перспективы инноваций в архитектуре и проектировании. Исследование сосредоточено на аналогиях между природой и архитектурой. С незапамятного времени люди сопровождались природой и естественными организмами. Эти взаимодействия иногда приводят к различным и противоречащим парадигмам, но естественные организмы всегда были вдохновляющими источниками для людей. Природа великодушно посвящает свои бесчисленные подарки и ресурсы людям, чтобы быть в состоянии развить их цивилизации во всем мире.

Каждый со своей собственной культурой, верованиями, ценностями, традициями, отношениями и этикой является элементами дифференцирования людей в различных обществах. С другой стороны мы представляем природу. Мы должны уважать и изучать ее, однако не обязательно всегда успешны, так как степень успеха зависит от восприятия и понимания природы организмов. Позже были введены некоторые биологические сравнения, сосредотачиваясь на формальных и структурных аспектах, чтобы иметь более широкую перспективу по природе организмов и новых правил и инструкций. Они давали начало критическим ошибкам и неудобствам. Как люди непосредственно, их архитектура обладает интегральной, объединенной и гармоничной системой, которая демонстрируется в возможно лучшей форме в естественных организмах.

Представленная работа пытается ввести некоторые из принципов, правил и инструкций, связанных с естественным организмом и затем описывает, как применить эти организмы в архитектуре. Наконец, она представляет способы выйти за пределы двигательных принципов, чтобы достигнуть многомерную гуманистическую архитектуру. В то время как органическая архитектура действительно описывает выражение индивидуальности, она также исследует нашу потребность соединиться с природой [9] (Fig. 1). Используя природу как основание для проекта, здание или проект должны расти, поскольку природа растет изнутри. Большинство архитекторов проектирует здания как оболочку. Природа растет от идеи и обращается к среде. Таким образом, здание (следуя принципам органической архитектуры) является подобным организму и отражает красоту и сложность природы (Fig. 2).

Ключевые слова: физический порядок и беспорядок, устойчивое развитие, органическая архитектура



Fig. 1. Milwaukee Art Museum (2001), Milwaukee, Wisconsin in Architect S. Calatrava

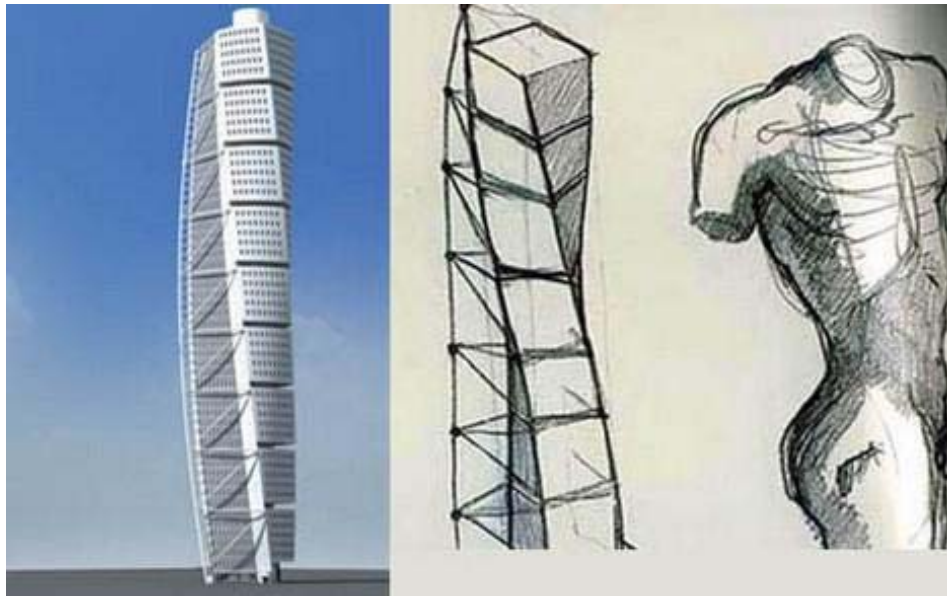


Fig. 2. HSB Turning Torso (2005), Malmo, Sweden Architect S. Calatrava

Introduction

More than green, beyond individual, Organic Architecture describes a way of thinking about design that transcends the common, everyday buildings around us:

Ecological + Individual = Organic [8]

Although the word **"organic"** is now used as a buzzword for something that occurs naturally, when connected to architecture, it takes on a new meaning. Organic architecture insight is rooted in Romantic philosophy romanticism is a literary , artistic and philosophical movement in the late 18 and 19 century in the northwest of Europe which transferred to other parts of America and Europe. This movement was reaction to rationalism of modern wisdom. In this opinion all natural forms are dynamic. Organic architecture can be defined in nine phrases: Nature, Organic, The function performance, Delicateness, Tradition, Decorating, Spirit, The third dimension and Space. In Wright's opinion, Organic means combining the whole assemblage and about Organic building believed: It is built by people from inside of the earth with consideration of their arrangements and with time. Place, environment and aim.

Max Bense, who is one of the founders of informative aesthetic, believes that, order has three degrees: chaos, being structured and being shaped. When we consider complete chaos that there are no regulations for connection between different components. In this case the possibility of prediction equals zero and innovation in maximum [1]. Definition of being structured is one organized order with a structure that might have different forms. Bense calls the third part of order as a "chaos or disorganize order". In all three factors above replacement of components affected by a general organization whatever the rate of order is more and this order is more complicated, the informative content is less [9]. In this paper first we have introduced this style briefly, we described order and disorder in the architecture and we have analysed Evidences of order and disorder in this style.

Org .Arch. Strives to integrate space into a unified whole. Frank Lloyd Wright used the word "organic" to describe his philosophy of architecture. Wright popularized the phrase "form and function are one," claiming Nature as the ultimate model Frank Lloyd Wright was not concerned with architectural style, because he believed that every building should grow naturally from its environment. Nature has been a source of inspiration for many architects, one of them being Frank Lloyd Wright. He re-interpreted the principles of architectural design by searching nature and uncovering its hidden dimensions to introduce his idea called organic architecture, at the

onset of the twentieth century. This thesis aims to discuss the offspring of this idea in Turkey, with the awareness of the fact that the Turkish examples of Vernacular and Local architecture have always displayed great concern towards nature [6].

A house should look part of the hill, not perched on it and comes from nature, and belongs to that the hill and the house live together and happiness of each one depends on the existence of the other. Organic architecture can be defined in nine phrases: Nature, Organic, The function performance, Delicateness, Tradition, Decorating, Spirit, The third dimension and Space. In organic architecture three principles are being discussed as follows:

1. Building is like a natural element and it is one complete component of environment which has been grown up from and all warm and colorful spectrums which have harmony with environment being utilized! [6]
2. Building is like a particular element in a purpose that each architecture and construction in its location and individual and in connection with psychological needs of its owner and user has a unique situation and all these aspects should be considered in designing of building [4].
3. To building should be considering like a traditional element. Each building has its own special personality and not only has been built for him by house plan or individual personality but the connection with traditions of country which has in there the building being build. Finally we can say that organic architecture trend to natural order (Fig. 3).

DEFINITIONS

Dictionary Definitions

The Webster's New Collegiate Dictionary defines organic in the following manner:

Organic [10]

1. Of or pertaining to an organ of a system of organs; specif., pertaining to the internal organs of the body; as, organic changes in emotion.
2. Having systematic co-ordination; organized; as, they formed an organic whole. Pertaining to, or inherent in, a certain organization; constitutional; not secondary or accidental.
3. **Biol.** Pertaining to, or derived from, living organisms; exhibiting characters peculiar to living organisms.
4. **Chem.** Pertaining to or designating the branch of chemistry which treats of the compounds of carbon.
5. **Law.** Designating, or pertaining to, the law or laws by virtue of which a government or organization exists as such.
6. **Med.** Affecting the structure of an organism.
7. **Philos.** Possessed of a complex structure comparable to that of living beings.

Organ is defined in part as:

8. **A wind instrument**, in its complete modern form the largest, most powerful, and most varied in resources of musical instruments, consisting of from one to many sets of pipes, sounded by compressed air, and played by means of one or more keyboards.

A part or structure in an animal or plant adapted for the performance of some specific function or functions, as the heart, kidney, etc.

9. An instrument or medium by which an important action is performed or ends accomplished...



Fig. 3. Ample of Organic inspiration in Architecture

Organism is defined in part as:

10. Philos. Any highly complex thing or structure with parts so integrated that their relation to the whole governs their relation to one another [11].

Organism is defined as:

11. Philos and Biol. The doctrine that life and living processes are the manifestation of an activity possible only in virtue of the state of autonomous organization of the system, rather than because of its individual components...[11]

It is clear that the phrase that represents organic architecture, “relation of parts to the whole”, is represented in these definitions. The analogy of a business or some type of “organization” (club, team, etc.) is appropriate in that there is a common objective that each of the participants are striving to obtain. The basketball team is practicing to execute plays efficiently in order to play to its potential and win games. The business firm is organized in such a way so as to provide the best product at the most economical price. And the group or club may be centered around the study of a certain topic for common enrichment in a chosen subject area. In all these models there is a single goal that is the organizing catalyst and as a result a hierarchy may be established [11].

12. Parts to the Whole. The generating idea is reflected in the end product (whole) and each step (parts) along the way, each component of the composition, adheres to the framework of the generating idea. Thus, each component is important and also is related to other components. The example of a family will illustrate this principle. Each member of a family is an individual and unique, yet there will be certain physical features that will cause one to say, “they must be related”. Location can be an indication of a family. A family is a unit where all members may be in one place.

A family is also identified by its common last name. The generating idea is the “common last name” among the individual parts and is the glue of relatedness that the observer can

comprehend [7]. This relatedness can provide a base from which a project of integrity can grow. The question concerning design in this discussion is the choice of medium to use in order to express this relatedness. According to this definition, organic architecture is not necessarily “of the earth” with respect to materials, shape, or proportion. Bruce Goff defined organic architecture as “that which grows from within outward through the natural use of materials so the form is one with function as directed and ordered by a spirit”.

13. Nature – of the earth

Under this definition, organic architecture is an architecture that is derived directly from nature in the following ways:

- Materials - using materials from nature without significant alteration. These materials include wood, stone, soil, sand, and water.
- Forms - creating forms that reflect the form of the surrounding landscape and its features.

For example:

Landforms are expressed in the form of the Prairie houses and the houses at Sea Ranch in northern California. The structure of a building can be derived from studying trees.

The geological structure can be imitated and extended into the building such as in Falling Water by Frank Lloyd Wright.

Laws - obeying the laws of physics (do we have a choice?). There are certain parameters that cannot be transgressed in order to construct a built structure. These laws can be studied to gain insight into new solutions to design. There also exists the consistency of time expressed in the cycles of nature. Without our trust in these laws there could be no progress.

Nature is a combination of infinite variety (suggesting no rules) and rigidity (the result of laws). I would propose that nature is primarily made up of rigid elements and it is in their various combinations that variety is attained. This is also reflected in life in the need for absolutes. Without absolutes there is chaos [2]. These absolutes are a direct derivative of the nature of God.

William Curtis states the following: “... [Antonio Gaudi] believed that the material qualities of architecture must be the outer manifestations of a spiritual order. He intuited the presence of this order in structures of nature that he felt to be a direct reflection of the divine mind. The ‘laws’ of structure, then, were not mere laws of materialist physics, but were evidence of the Creator.”

Human’s connections with nature can be divided into four historical periods [13]:

Organic Pattern (Hunting or Stone Age)

During this period, man was under the direct influence of nature and their whole living patterns were dominated by nature. Human beings always try to safeguard their needs i.e. security and survival.

Ultra organic

Level of human desires reached from security domain to luxurious domain. Man is incapable of adverse patience and intends to coordinate nature with them or vice versa. This period is divided into two sections -- animal husbandry (migratory life pattern) and cultivation (settled life pattern).

Dominance on nature (Age of Industrial Revolution)

During this stage, human desire crosses over more than security and luxury and followed comfort and pleasure. Man intends to maximum benefits from the nature and lays ground to damage the nature. Genetic engineering and dominance of automobile can be referred to this age.

Quasi-industrial organic pattern

Similarly, comfort impulse also existed in this period but understandings to environmental damages have gone up. International community has planned industrial adaptation to the environment.[3] Although, networks and new methods today propounded in conforming and adapting architecture with nature as recent architecture attempts to model with nature but naturalism has been merely in its form and has led to the emergence of imaginary environment. This period can be known as mechanical, exterior and figurative. The actual reason of the absence of exact modeling from nature is the inaccurate yield from natural geometry. Therefore, this identification is necessary from natural organism substance and natural geometry [Kosheshgaran, 2004:21].

As a whole, aspects of common independent and well-organized natural structures can be counted as follows:

1. With the gradual evolution of natural organisms, order and systematization govern more on their structure in a way that independent geometry, in the non-living being, is more than the plants and as such it is more in the plants than the animals.
2. Natural independent geometry does not rise coincidentally rather from the need and behavior of their components. In reality, independent geometry is based on existing corresponding behaviors that utilize from the independent geometry in order to accommodate with the environment. With due attention to the fact that non-living beings don't divulge from their behavior, their independent geometry result from their surrounding and limitations.
3. Withdrawing from natural complexities, merely must not consider to a figurative and exterior withdrawal. The most important is to understand the essence and reasons of this complexity and as such, geometry should be selected on the basis of need and structural system. Architectural and urbanization patterns may be the perfect examples related to organize and independent geometrical patterns [Jenkes, 2004:68-70].

Organic Physical Order and Disorder in Architecture

The architecture is composed of different part. The connection between these components has been organized. It means that all these components are subsystem of an organism. This system or organism might be very simple or complicated. Max Bense who is one of the founders of informative aesthetic believes that, order has three degrees: chaos, being structured and being shaped. When we consider complete chaos that there are no regulations for connection between different components. In this case the possibility of prediction equals zero and innovation in maximum. Definition of being structured is one organized order with a structure that might have different forms. Bense calls the third part of order as a "chaos or disorganize order". When we talk about this order that in which all materials have been replaced that displaying the choices have been picked up freely and in united system [5].

In all three factors above replacement of components affected by a general organization whatever the rate of order is more and this order is more complicated, the informative content is less. But we should not think that more complication equals chaos automatically. This order couldn't be recognize easily and could even cause mistake. More order equals less innovation. In complete chaos the probability of all components are equal, so squandering information equals zero and in consequence the possibility of new combination or maximum creation is

possible. Continuing of a style is in connection with order and squandering information and not to be with innovation. The contrast of styles comes from the difference of its components and its dominated order. In this case they have been more or less complicate and by means of that they have been connected by viewer or user.

For example in Indian temples in India there is an order that they are not identifiable at the first glance because their components are almost complicated. Order means obligation automatically. Whatever this order is severe the open space is less so it could be remained for the variety of components. And each part should obey these rules more and more. In a case that some these parts couldn't even do their main task and in reverse a kind of complicated order creates more freedom and this freedom creates more open space for forming the components and causing opacity. The two kinds of orders, of course, have some exceptions just in a condition that the main factors of organism stay stable and without changing. Buildings which are in order and are not flexible give us less freedom.

In the other word changing one factor in this system could hardly possible. But in the opposite, these architectures give us their messages very clear and straight and nothing for personal interpretation for buildings with complicated order the issue is something else. Here in this case, we are completely free to act. Personal interpretation and opacity are possible. Such building expects us to be more active. We ourselves should discover the order of that and also search for its system. We can compare this building with Picasso's painting named Guernica. In there also this is viewer wants to comprehend the painting and this is also the viewer who is obliged to search about the organism and thoughts, problems which lay behind of the painting.

Architectural styles of Mies van der Rohe and Venturi are eventually the same (Spectrum). The contrast between the two even influenced the choice of materials. But which one of these two styles is better or more beautiful? For answering this question it would impossible find a definite answer. As we will see the value of aesthetic of objects could be measured or adjusted. This value equals with the consequence of the division of order by complication. Whatever a building is more complicated its organism should be more expanded that we will be able to find a measurement for its aesthetic. Buildings with severe order like many of Mies van der Rohe's works, either gives no opportunity to complication or it ends to chaos. In the other words, the Robert Venturi's open order needs complication that wouldn't be naively [12].

The important note is that in each style should be equivalent between complication and relevant order the comparison between two styles is impossible. We couldn't consider any style as the best in architecture absolutely. But which or who make it clear that how the dominated order should be, simple or complicated? In T. Munro's opinion that: the complication in an organism continuously being increased in an art till it makes studying harder occasionally. The consequence of this hardship is the general turning point and return to a more simplified organism. The trueness of this Munro's idea could be confirmed by informative theory.

Peter smith proves that during architecture history, one phase with three steps is really recognition which has been repeated several times. A severe and distinct order dominates in first step. Coordination and simplicity has basic role in this era. The main characteristic of second step is tension. Lack of clarification and seduction are the main traits of third step. Order in here is that complicated which we are approaching to the maximum capacity of our conceptual. There is a direct connection between the rate of regularity and division of information to semantic and aesthetics quota of semantic information and with the same ratio the effect of wisdom on emotion will be more and vice versa: when aesthetics information has had more quota or order is more complicated emotion dominates on wisdom.

An introvert person who is rationalist basically prefers the clear order and extrovert person is more emotionalists and prefers the complicated order more. A house should look part of the hill, not perched on it and comes from nature, and belongs to that the hill and the house live together and happiness of each one depends on the existence of the other. Organic architecture can be defined in nine phrases: Nature, Organic, The function performance,

Delicateness, Tradition, Decorating, Spirit, The third dimension and Space. In organic architecture three principles are being discussed as follows:

1. Building is like a natural element and it is one complete component of environment which has been grown up from and all warm and colorful spectrums which have harmony with environment being utilized! (Fig. 4, Fig. 5)
2. Building is like a particular element in a purpose that each architecture and construction in its location and individual and in connection with psychological needs of its owner and user has a unique situation and all these aspects should be considered in designing of building.
3. To building should be considering like a traditional element. Each building has its own special personality and not only has been built for him by house plan or individual personality but the connection with traditions of country which has in there the building being build.

Finally we can say that organic architecture trend to natural order.

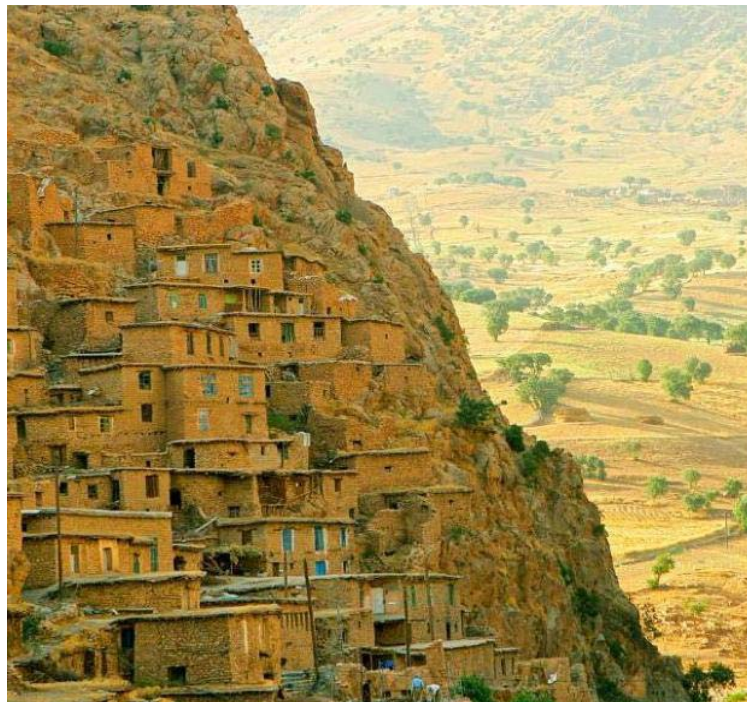


Fig. 4. Organic texture of Hawramane-Takht

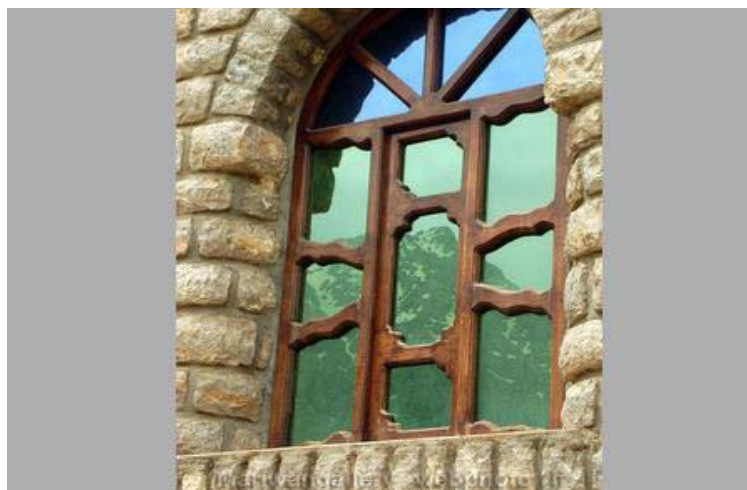


Fig. 5. Inspiration of nature formed organic patterns

Evidences of Order and Disorder in this Style

Characteristics:

- The design approach is inspired by nature & the built form grows out of the site, emerging like an organism from the seed of the nature.
- It is visually poetic, radical in design, multifaceted & surprising, distinctive but flexible & environmentally conscious.
- Organic architecture is said to be the mother of all architecture- sustainable or bio architecture, alternative architecture or any other.

Some examples of this movement are: Kaufman Residence "Falling Water" (Pennsylvania), Sydney Opera House (Sydney), Casa Mila (Barcelona), Lotus Temple (New Delhi).

Approach:

- A respect for natural materials (wood should look like wood).
- Blend into the surroundings (a house should look part of the hill, not perched on it).
- An honest expression of the function of the building (don't make a bank look like a Greek temple).

New age, architects have taken the concept of organic design to new heights by employing newer materials & technology in the application of natural shapes, rhythm & composition to their buildings. The re-emergence of organic design represents a new freedom of thought. This is affecting most fields of design- products, furniture, lighting, textile design, architecture, landscape and interior design. More liberated and imaginative forms, unacceptable to major corporate clients a few years ago, are now being encouraged & accepted [5, 17].

Conclusion

The aim is to accede systematic and organized compare to organisms, to increase the power to understand existing systematic structures, to acquire and extract principles and recreational tools of this order and other hidden values in it and to use these valuable perfect ions in architecture. The principle such as the manner to confront the natural forces, some of the characteristics include: selection of material, proper geometry, relation between parts, selection of the quality of the parts according to their necessary application, the way to join them together, the way to arrange in axis, hierarchical order of the system, differentiations in scales, forming factors and so forth. Natural organisms that are the outcome of million years of gradual perfection, in a way give very instructive samples of such relationships between the parts are arise from the systematic essence of organisms. The essence that has had a total outlook and not the things and individual phenomenon; but orders, relationships and combinations find identity and genuineness in it.

Inspiration from natural organisms can be useful in achieving a unified and aimed architecture. The objective of such bodily and formal comparisons and inspirations are not the comparison between organism and architecture because different insight of this scale and inspiration encounter deficiency. Architecture and its design is the process to choose the parts and reach to a unified generality, which have an essence beyond the nature. In other words, human architecture like human being is a solid, unified and harmonious generality. And the basis to understand this phenomenon is deep insight on the architectural methods. In order to acquire a general outlook of architecture with a fixed aim, acquaintance of parts and their interrelations are necessary. The real aim is to identify natural characteristics and organism as well as rules and regulation governing on their structure.

However, it must be kept in mind that human beings besides physical and substantial dimensions, has got spiritual and intellectual dimension too and concepts such as attention to metaphysical spaces, nature's completion, symbolism, time and being timeless and eternal are the most fundamental features of architecture, which is some how is meaningless in organisms. Therefore, to achieve to such metaphysical needs, merely study about structural characteristics of the organisms is useless as principles dominating natural systems becomes important. And, this would be possible only by studying and monitoring the characteristics of organism, besides recognizing spiritual and intellectual dimensions of human beings themselves [15].

To sum up, Just as in Nature, Organic Architecture involves:

- 1) respect for natural materials (wood should look like wood);
- 2) blending into the surroundings (a house should be of the hill, not on it);
- 3) an honest expression of the function of the building (don't make a bank look like a Greek temple) [17].

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