

Design with Nature in Bio-Architecture With emphasis on the Hidden Rules of Natural Organism

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Abstract

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; are the elements 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.

Keywords: Bio-Architecture, Nature, Rules and Modeling, Organism

1. Introduction

It is common that architects, designers and artists take inspiration from nature. During the course of history, human being endeavored so that they can dominate to nature and acquire advancements. However, they not only lacked considerable advancement in terms of understanding the idealistic dimension of nature, but also faced downward movement (mahmoudinejad, 2010, P. 378). 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; are the elements of people differentiation in different societies (Ansari and Mahmoudinejad, 2007, p. 103). In the other hand, we are nature. So, we should respect and learning from nature. The Traditional architecture is full of aspect regarding to nature; lessons from the past will not only improve energy conservation but will also result in pleasing architecture in harmony with nature (pourjaafar & Taghvaei, 2002). Human's connections with nature can be divided into four historical periods:

- **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. 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].

2. *Natural Geometry*

Geometry is an important part of the architectural laws. Formation of different specialties of natural systems arising from the following variation: a) elements, b) arranging elements or their geometry [Hamzehzadeh, 2006:117].

To form specialty of every structure, the manner of relation and arrangement of elements are important than the element itself. Because, without common elements, diverse evidences came into being and this arises from different geometry and manner of their arrangement.

From the most important geometrical patterns in the structure of each four order of being (Man, animal, plant and dead) are mixed with two kinds of geometry--independent and well organized. Secret of differences of structures in different behavioral and performance elements are such that has admitted special features.

For instance, roots and ribs of plants possessing independent geometry whereas flower, fruits, stems and whole its shape possesses well-organized geometry [Ibid: 119-120].

2-1.Well-organized (inherent) natural geometry: Inherent geometry is the same established and elevated principle that is referred as ‘innate geometry’ or ‘sacred geometry’. This principle is constant and widely unaccepted [Lawlir, 1989: 64 –70]. Since, these shapes exist in the form of potential and tendency to internal ability in a substance, this geometry is believed to be under the influence of internal forces.

2-2.Independent natural geometry (corresponding geometry): In all kinds of beings, internal forces are inclined to geometry and a particular form; however, external forces (environmental) accede based on the actual conformity with the environment. In this domain, ratio of the predicted essence, variance and abundance of impossible prediction are propounded. For instance, variation and abundance of people despite having common specialties in a way is indicator of this specialty. For every thing in the architecture and urbanization like house, temple, mosque etc, a group of inherent and innate geometry forms essence and exterior forces (bodily and constituent) causing variety and abundance.

3. *Nature as model, measure and mentor*

While many businesses are going “green” by taking basic steps to conserve resources, a host of others are taking the back-to-nature idea one step further. They’re learning how to design products for energy efficiency from the original designer herself: Mother Nature. For example, engineers have discovered a way to keep buildings naturally cooler by studying the way termites build mounds, and chemists have developed a self-cleaning paint by mimicking the unique texture of lotus leaves. The scientists, engineers, and product designers promoting this idea call themselves “bioneers,” and their growing field is dubbed “biomimicry,” which literally means, “to imitate life.” Thanks to the flourishing practice, companies are approaching product design and sustainability in new ways — and learning it’s not always necessary to reinvent the wheel Biomimicry is a new way of viewing and valuing nature, based not on what we can extract from the natural world, but on what we can learn from it.

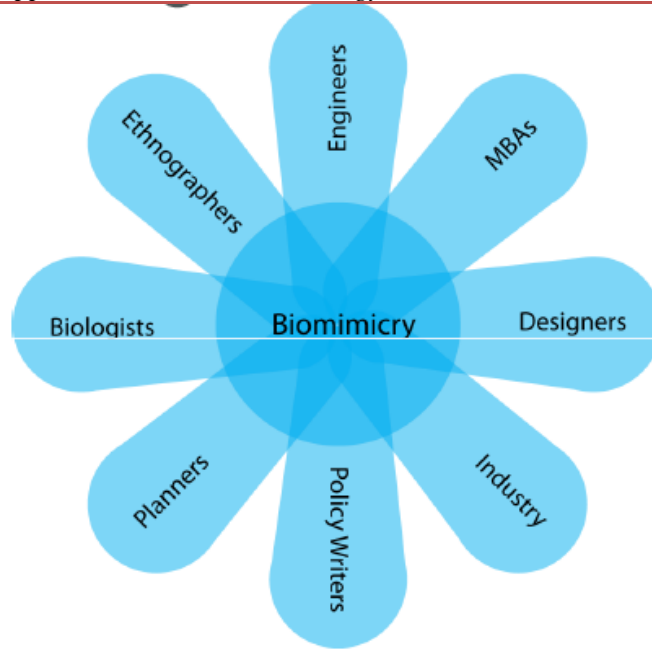


Figure 3: Creating the Conversation between nature and human science

There are several general steps involved in the biomimicry process. First, a scientist or engineer will think about a problem and what he or she wants the solution to be able to do. For example, perhaps doctors need a better way to deal with certain kinds of surgical wounds. Regular sutures and adhesives don't work, and they need something stronger. Scientists and engineers will then look at how the natural world deals with this problem. They first think about where such natural models might be found. For example, in looking for strong suturing materials they would look for animals or plants that have incredibly strong "threading" qualities, such as the spider. They then brainstorm different ways to emulate or modify this natural model so that humans can use the spider's design. The best solutions must serve a purpose and work better and be cheaper than other possibilities. The end result in this case might be a synthetic spider silk that can be used as a biomedical device. Not only is spider silk stretchy and flexible, but a strand of it is stronger than the same diameter strand of steel. In fact, engineers are currently at work on this synthetic material. The hope is that not only will it be useful as a suturing tool, but it might also work as fabric for lightweight bulletproof vests and biodegradable fishing.

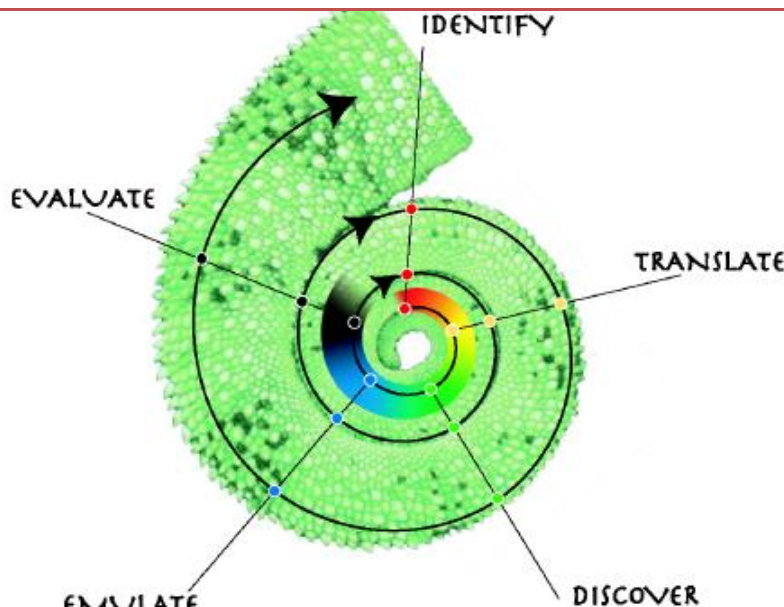


Figure 4: the biomimicry design spiral

4. Systematic view of nature's organisms

In the last few decades, there has been a tendency towards vernacular and general systematic view in different fields of science. In a systematic view relationship and syntaxes have identity and genuineness rather things and phenomenon. At the same time, systematic view not merely emphasizes on relationship, but on the discipline and order as well as the hierarchical order dominating existence and non-existence. In the systematic ideology, every creature has one organism and rank of existence. Human societies and the whole universe are outcome of same ranks, which in relation to each other and in reciprocal relation generate a complete and unified system [Farshad, 1989:112].

Organisms generally can be divided into two groups of living and non-living. The phrase anti- combination is the most important characteristic of non-living organisms, the word combination can be known as the most important characteristics of living organisms, and under any circumstances, organisms are in close contact with the nature. The present study aims to achieve a systematic and ordered unison towards the nature, increasing the power of understanding and analysis and perception of ordered structure and exploration and withdrawal of the recreation of ordered tools such as variation and diversity while having unity and solidness in art and architectural creations [Aliabadi, 2004:60].

A) Unity and solidness in variation and diversity: A system that does not need similarity of different parts to achieve unity and solidness rather different parts can have unity with following aim and ordered structure.

B) Reciprocal needs of the systems and unity of the leadership: Indigence and the relation between parts of a system is one of the most fundamental factors that cannot be omitted that shows the presence of order in the systems. Unity in the management is necessary for the uniqueness of policy and managing any system.

C) Symmetry of form with the function: The form of any part results from the effective forces in its design and creation in the nature, which is symmetrical to the different functions from any point of view.

D) Symmetrical and simultaneous growth of parts in a system or natural order: One of the most fundamental criteria which make the existence of a system possible is the remains and maintenance of symmetry and balance between different parts of a system.

E) Measurement of the system parts: The measurement of any part and order of the system is a fundamental factor, on the basis of which any part with its special scale and special structures are related to each other and meet the system's needs (Every part in its own functional zone).

F) Unity or plurality of parts in the systems: Every part has unity and polarity based on function, capability and demands.

G) Hierarchical order of the system parts: Any part in a system is ordered on the basis of the functional process of the system.

H) The growth control: The control of the actual needs of parts and proper nourishment are important for the harmonious growth control of a system.

Taking into the account of organisms, "Unity" and "Diversity" are the most exact and constant fundamental factors of the life aesthetics [Ibid: 65-75].

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].

With respect to various external factors like topography, impediment, condensation of the city can have fluid and independent architectures. Since there exist fine buildings, it must possess systematic construction. If our cities are planned systematically based on geometry, modulated and inorganic behavior have applied on them.

On the other hand, if the houses are planned in fluid and independent manner, they are far away from inherent geometrical and organic planning.

Table 1: Hierarchical order of the systems [Hamzejadeh, 2006:112]

Level and grade	Medium to identify and their specialties	Identification method	Acquired awareness	global
Symbolic systems (cultures)	Mystical insight (direct, revelation, intuition)	Spiritual insight	Total knowledge (intuitive)	
Materialistic systems	Experience, understanding, rationalism (indirect)	Scientific method (modeling, syllogistic)	Partial knowledge (educational)	

5. Organic and ultra-organic principles in architecture

Till now, numerous researches have been conducted in order to describe the principles and specialties governing native architecture and reasons of these being valuable and constant. Naturalistic specialties of organic architecture make it evident that this architecture has also been perceived as organism and as such all the construction that emphasizes these specialties can be named as organic architecture [Calinez, 1996:183]. Organisms notwithstanding variety, complexity, elegance, richness and beauty have formed and come into being on the basis of real survival and proclivity to continue life and thus structural form and perfection in the nature is the vigilant reaction for survival. Actually, form and natural structure is the outcome of contiguous flow compatible to environmental forces. Specialties of organic architecture, in reality, are important principle governing upon natural organisms that are the secret of their being valuable and enduring. In this architecture, human attention merely is in their natural aspects and human being have perceived partially from natural ingredients and architecture are being shaped higher in grade from other animal and that are proportional to their environmental perfection.

However, human and natural existence do not summarize to their external organism rather important, deep and to some extent the more hidden layer is observed as an ultra-organic layer in human being and nature that in reality, differ human being from animal. On this aspect, new group of ultra-organic specialties are evident in most of the native and traditional architectures. Today, large part of world’s architectures confronting to organic flow are ultra-organic but in most of these architectures, the systematic natural principles have been ignored with the claim of absence of nature. By this way, this architecture can be named as infra organic rather ultra-organic. Exploitation of nature in most of the architectural writings today merely is in segregating process.

By this way, global architectural arena can be classified into following three layers:

1. Infra Organic: Emphasis on overpowering nature and ignoring their principle (machine and mechanized architectures).
2. Organic: Emphasis on naturalistic and attention to natural principles.
3. Ultra-Organic: With naturalistic preservation and attention to natural principles, restoring ultra-natural layers in the human existence [Hamzehnejad, 2006:168-169].

Architectural analysts and researchers portray previous architecture mostly from the viewpoints of organic and ultra-organic but most of them do not classify or present perfect and exact definition regarding such architectures. On this basis, introducing natural systems is the most important aspect to an architectural organism of natural pattern as in the ultra-organic system this man is this particular aspect. Metaphorical patterns of architecture: “Filling water House” is the lofty isotropic sample coordinating to nature and architecture.

6. Comparison of Biological architecture

Architecture being important organism has attracted much attention with the usage "biology" in the early 19th century by "Lamarck". Generally, the only important biological reality with regard to modern architecture was the relation between form and function. As the functional analogies, the relationship between form and function means "existence" [Aminzadeh, 1996:18]. This fact that "form follows function" or "function follows the form" was first brought up in biology and debated for more than half a century. And this eased the propagation of biological analogies because the only way to compare architecture and the city, from the body point of view, with a living creature is to rely on the relation between form and function. The other expression, which has been borrowed from biology in architecture causing discussion on form, shape and relation, is the word "organic" that can be used in studies and researches about the structure and skeleton of animals and plants.

The biological discussions interpret the relations of small parts to the same organs that create a thing [Calinez, 1996:126]. The beginning of such biological analogies can be attributed to "Wright" and "Sullivan". While "Sullivan" first put forward these analogies, "Wright" created a kind of organic architecture by designing non-symmetrical plans, creating movement, using the environment's materials, and composing the architecture with the nature. According to him, organic architecture has to be devoid of useless and superfluous forms [Wright, 2003:77]. A biological analogy is one of the most fundamental bases of theoretical functionalism in modern architecture. However, it has ever been formal and substantial who's every organ is compared with the other, without paying attention to the soul and concept inside the organ.

7. Patterns from natural subsystems in architecture

External forces that try to have highest rate of functioning while being formed affect a nonliving natural form. For example, soap bubbles are always connected in the form of irregular triangular grids.

Triangular grids are the basis of the natural organism's geometry, which function on the minimum parts and maximum operation inspired from plants:

- **Formal patterning**
In this type of patterning imitation, there is no attention to fundamentals of structure. For example the earth's layers can form the force that affect it and takes its form while the architects omit these forces and use just the layers forms.
- **Metaphoric patterning**
Here, an abstract form of nature is used for equilibrium and sustainability. Metaphor keeps us from being superficial towards extents and we know it as a way towards creativity in architecture [Antoniades, 2002:63].
- **Pattering from natural rules:**
Application of natural rules is the best for getting natural inspiration.

8. Bio-Architecture

Bio-Architecture is the principle ideas and key applications of organic architecture, comparing built structures to forms and patterns found in nature. It includes an exploration of local history, tradition, and cultural roots that have influenced organic architecture. In the other hand, Bio-Architecture studies the natural principles of animal and human constructions from several different perspectives, and presents a great part of the knowledge that gives origin and shape to built form. Organic architecture offers a design approach arising from natural principles, bringing us back to local history, tradition, and cultural roots to give us built forms which are in harmony with nature (mahmoudinejad, 2010, p.276).

9. Ways to Bio-Architecture

For evaluation of the approach to bio-architecture, we suggest the aspects, which are viewed necessary to consider for planning of the intended projects of functional use under the bio-architectural criteria. Ten key vectors and four axes of views on creation of the living environment are taken into consideration (environmental, economic, urban planning and social views), which were determined according to results of the developed survey, as the leading direction of sustainable architecture as well as the quality of life, based on which scores were assigned to individual vectors according to their importance.

10. Rules governing on natural organisms and way using them in architecture

Correct use of organism rules is in a way that probably there may be no formal similarities between organism's structure and the building. Thus we must look into the essence of organism and rules that dominate them. Here, we bring some natural orders that are used in architecture:

- **Behavioral method against forces:** The behavior against the imposed forces and loads is one of the most important reasons of existing structure. The strategies of organisms against these forces are so interesting and make one think deeply. In architecture too, we can find so many using these strategies. Resisting the forces by pressure and tensile stresses and evading bending stresses are the usual way of the structure resisting by bearing the stress in its parts. Attention to the type of stress is useful in making the structure more efficient. Organisms always try to make use of compressing tension stresses to the larger possible extent in their structures and use bending stresses merely if structures possess layer essence. The gradual perfection of structures from bending towards compressing and tension like tents and shells is in this direction. Flexibility and deformation in order to resist the forces in natural structures is much obvious.

It is for this reason that birds build their nests on fragile and flexible branches. Using structures with less materials and more flexible is the example of those architectural works. Use of obtrusive forces against each other or against themselves is seen mostly in plants. As an example, during windy hour trees store some of the wind energy in their stems and release it during the fluctuation in the movements. This strategy is often seen in traditional architecture that is defined as "contradictory forces" that we may see in neutralizing the forces of vaults.

In order to minimize the amount of forces affecting the structure, natural structure especially plants respond with bending to natural obtrusive forces. However, there is very less probability of reaching to this phenomenon. Still, the reflexive buildings that take aside against external forces have not been observed. Natural design is done by load weighing and correction cycle. In an area where strong winds blow; roots of plants generally grow thicker against the direction of wind. In the form as well, plants grow in conical condition and their stems during the growth, bend towards the direction of wind. On the rear side of wind, rings of the trees are more compressed whereas on the opposite side they are more tensile. In the other words, environmental structure compare to the mechanical tensions especially effect with the wind. Mobile structures of Calatrava can be named for these kinds of buildings.

- **Material selection:** Organisms often reach to the best structural form with the least amount of materials. For example, the foot's bones have the best structural form with the least material. Organism's structure always looks for making use of the least possible material. In the traditional Iranian architecture, minimal use of material has always been of a great importance. This principal in modern architecture was revived by Mies van der Rohe in an exaggerated way with the dictum "less is more" and their "Glass House" demonstrates this view.

This principle is most often observed in the works of some architects like Frye Otto, Calatrava, and Fowler. Nature possess some recognizable patterns of energy relations that can be changed into utilitarian forms. Nature builds the structures in a way that internal forces always searched for the least energy and as a result nature makes the most possible use of the least amount of energy. Sometimes this is remembered as "principal necessity." This means that humans mind relaxes while facing necessary things and feels uncomfortable while facing superfluous and superficial things.

Organisms chose materials on the basis of performance and conformity with natural forces and in harmony with form.

- **Choosing geometry of parts:** Organisms choose their geometry on the basis of performance and coordination with their other parts as well as to respond the functional, economic and firmness circumstances. For example triangular grids are seen in nature repeatedly that is an organizing pattern. Examples of this architecture can be seen in Geodesic Dome.
- **Hierarchy:** Priority and hierarchical order in form and proportion are the manner to transfer force transfer and distinguish its course is important and determining principle.
- **Contiguity of parts:** Parts define and control each other. In most cases, nature uses an intermediate part at the place of junction and as such these joints act in the best way as the hierarchy in living creatures. Parts of a natural structure are in harmony with each other and absence of any of them confuses the whole system. Since, organism's parts are complimentary to each other and thus should be in complete junction and fastened neatly. In other words, omitting any part damages the whole system. According to majority of world's thinkers, all parts have got such connection that partial or total organisms are in attachment with each other and any type of change might affect the system. Wright and Sullivan have used the best manner in using and joining different scales to each other.
- **Unities and solidness of parts:** In structures, since aim is to reach a defined and unified goal, unity will be understandable in all parts. Of course, being simply one piece (one thing) doesn't mean unity of structure; rather it is achieved by harmony and solidness. In natural organisms, parts with joining each other make a complex, in the way that it has real unity. In nature's diversity, branches and leaves around the main axis of a plant are not by chance but its something foreseen and in harmony with functional details and arrangement.
- **Uses of combined structures:** Existence of combined structures is one of the fundamental principles of organisms, which is used to face different forces. Human beings too, are multi structural in addition to live in a multi structural world.

- **Putting on an axis:** There are two kinds of axis in any living organism: primary axis and secondary axis. Primary axis is one where actual elements are settled symmetrically whereas secondary axis is one where nonsymmetrical parts are settled. Primary axis in plants is vertical and in animals it's horizontal, but in human beings it's vertical either.
- **Effective factors in organism formation:** Gene is the main hidden factor, which is effective in the characteristics of shape and form, and this factor deals to sustainability of a natural creature. Changes in different generations are so small and genetic characteristics in all of them are fixed, predictable and can be foreseen. In architecture, every subject can have a genetic definition such as garden, housing, mosque, and temple etc.

But its not just internal factors that affect the form or structure, but external factors too have vital role in forming any creature. In human dwellings, external factors contain frame and containing factors and body factors contains climate, materials, construction, and technology and containing factors contains culture, thought, religion and tradition. External factors cause verity and diversity because it is unnecessary that every part of an organism be of the same shape but every other detail regarding its characteristics and functions find its own geometry.

Today, the corresponding effect of internal and external factors on the basis of the forms of living species proved sustainability towards nature and has had effect on the genes.

- **Multifunctional organism:** Every part of a system doesn't have just one aim, rather have some secondary aims, in order to help other parts. As an example a part should help taking into account structural, functional, and aesthetic points of view [T.Scholer, 2005: 143]. Organism's parts besides structural role have some other responsibilities as well. For example, plants vessel, bird's feather have different functions. The "Big Eye" stadium in Japan, work of "Kisho Korokava", is as example of this kind of structure.
- **Internal connection of parts:** A kind of inter-connection and flexibility in interior parts of organisms, in architecture, this is achieved just not by creating special forms, but through continuity and connection.
- **Evolution of abilities of the parts:** Outwardly invaluable parts would be efficient when they are put in a system, beside each other. As an example, we can name the use of reed in traditional architecture. Although reed is weak and invaluable outwardly but with a good structure and right joints, can strengthen the structure, or, using clay in clay and that leads to its high strength [C. Muller, 2004: 226-323].
- **Variance of scales in organisms:** There are different scales in nature and behaviors would shape on the basis of these scales. For example, the velocity of particle in very ting scales or very big ones is different. Also in the urban scale passages have hierarchical order based on the needed speed, and the house, which is the fix place, needs a kind of geometry symmetrical with tranquility and the high speed geometry of galaxies or atoms would connect and be helpful for it. We can make use of this important principle in architecture and the amount of details and ornaments related to the surface can be defined on the basis of the viewer's perception.
- **Quality of parts:** Every material based on its essential characteristics, is proper for a special task. With regard to the characteristics such as hardness, long life, resistant, flexibility, Nature defines the quality of each part. Moreover, form and function of parts slaps corresponding with their essence.
- **Capability of growth, change and permanent conformity of parts with generality in organisms:** The ability of growth and change, as a whole, are the characteristic of parts making every natural form. As an example, trees during million years of process have found unique method for encountering coldness and the seasonal change. They drop their leaves in winter and after passing severs cold and put on leaves again as soon as the environmental conditions is favorable. They are partially or wholly are related to each other and any change leads to generality changes. In architecture, the building is fixing but changing substances of it can be human.
- **Layering essence of natural organisms:** Fundamentally, most of nature's organisms have layers. This means their surfaces and volumes are made by putting layers alongside each other. Layer essence cases that these forms take effect of these rules, have axial deformations and tensile or compressing reactions. So that amount of local, which can be born, is carried and the rest is not used.
- **Vernacularism in organism's behaviors:** In nature's organisms, every part is provided by nature and is being used in another shape after consumption and imitation. Nothing disappears in nature nor comes in to existence, but is always changing in shape and form [Jenkes, 2002:39]. Use of vernacular materials in architecture highlight this point however; the most contemporary architectural styles destroy nature by applying non- recyclable materials, and reparation of parts. It means that the organism starts to amend the part and the whole system continues its way to the preconceived goal, in collaboration with the other parts.

- **Preservation of the identity of organisms' parts:** In natural realm multiplying and producing maxim is limited and any special relation is merely accomplished through it or relatives. We should pay attention to the species and their typicality in architecture also. In this field and culture, self-consciousness is the most important individual factor and tradition is the most important social factor that refuses every unknown phenomenon, even though, in an imposed way.

Duality is one of nature's clear and important principles. All kind of nature has been transformed into two complimentary but different parts. These two parts have essential relation with each other and face inexpressiveness without each other. Duality has also been given importance in theoretical, philosophical and religious writings. To define the duality, Yin and Young in oriented religions or contemporary "Fuzzy belief," can be forwarded. In plants, by putting one part in the growth condition, one can make the whole plant as whole property exists in any portion of it. In animals, some have the same properties. In culture, containing and frame should have such relation and any part represents the whole culture.

- **Economy of nature:** With a statistical look on the inventions and discoveries during the course of history, it's obvious that the models inspired from nature have been more economical, and more useful than the products arising from human endeavors and thoughts. As an example the system in "Halofit" plants from the energetic efficiencies and maintenance expenses is much more economical than human made systems. In natural economy there is no sign of reducing the resources and devastation of environment alone but also malfunctioning and low profit resources and environments are repaired and can work as a productive and useful part. By "nature's economy" means those functional aspects of ecology, which are in close relation with economy of human race.

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.

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