

# A Study on the Aesthetic Criteria of Modern Architectural Structures in Developing Countries with Emphasis on Bionic Architecture

## **Abstract**

The skeletal form of the structure is undoubtedly closely related to the form of the carrier structure. However, the relationship between structural design and architectural design can yield many forms. Structures, as the foundation of buildings in all countries, provide a suitable platform for architectural design. In modern architecture, new tools and designs are used, including biotic architecture. In this research, the combined method (descriptive and analytical-qualitative-historical) is applied to study and the collection and analysis is accomplished based on library studies. The results of this study show that bionic architecture is in fact a creative tool to achieve effective and efficient goals. Observance of legal and logical principles in building structures provides the ground for new architecture and appropriate visual vision. The bionic perspective on architectural design takes place in different areas. At times the aesthetic aspect of the project, and at other times the structure, climate issues and the functional solutions have been the goal of the designer of this field. With the results obtained in the analysis of case studies, it can be determined that the interaction effects of structure and architecture from the perspective of bionic architecture are significant and structure and architecture interact closely with each other and the avoidance of any of the mentioned categories can cause irreparable damage.

## **Research aims:**

1. Investigating the interactions of structure and architecture and how they interact with each other
2. Investigating the status of modern architecture and the use of natural instruments (bionic architecture) as a symbol (aesthetics)

## **Research questions:**

1. What is the role of structures on modern architecture and aesthetic standards in developing countries?
- 2- How can the physical quality of space be expanded by using the new technology of the third millennium and the harmonization of structure and architecture?

**Keywords:** structure, architecture, bionic architecture, aesthetics

## **Introduction**

Throughout history, man has continuously built strong and safe buildings. Different materials had to be built in order to protect the structure from destructive factors and forces and reliably identify and control the forces of their structure. Structure in architecture is considered as the first vital issue in setting up space, but it is less considered as an aesthetic issue since aesthetics is often raised in the last stages of design and construction. Architecture has long led to the emergence of various design possibilities, methods and approaches according to certain principles, leading to the formation of new interactions in this field. Bionic architecture is based on the concept of being inspired by nature in the art of design. What is especially evident in engineering designs today is that specialists from various architectural and engineering angles are trying to move in this direction, but what is needed in the design of third millennium buildings is the coordination and interaction of architecture and technology in this regard. Today's architecture needs to reconsider the process of designing and creating space, as in many global examples using the architect's insight and as a result of complete coordination between the knowledge of the architect and the structural engineer, this adaptation has occurred completely. The objective and tangible representation of the needs of the professional community requires the need to process such categories in order to improve architecture. A type of architecture known as bionic architecture is more widely used today. Bionics can be thought of as modeling, inspiring, and extracting creative solutions to problems and innovative ideas from nature, and is a new way of addressing the problems of living things and machines through the collection of biologists' research. Psychologists, mathematicians, engineers, etc., and is a common language of biologists and engineers. Utilizing the laws of nature in the discussion of structure can be in cases such as how to deal with forces, the relationship between structures and materials, quantification in the use of materials to create the most optimal form of structures, the relationship between geometry and structure, hierarchy of power transmission and be a resource for teaching basic structural concepts. Therefore, in this study, the role of structures on modern architecture is discussed.

Regarding the background of the present study, it should be said that no independent work with this title has not been written so far, but articles have been written in the field of bionic architecture. A paper entitled "Study of sustainable architectural design with bionic architectural design approach and their relationship with each other" has been written by Behzad Taghipour Ghasabi and Ahmad Mirza Ahmadi that the authors believe that inspiration from bionic architecture and it can be effective in designing sustainable architecture (Taghi Pourqasabi, Mirza Ahmadi, 1397: 19). Another article entitled "The Impact of Bionic Architecture on Architectural Design and Urban Environment" has been written by Mahmoud Eskandari and Hossein Moradi Nasab. The authors believe that the construction of an artificial environment should be done by considering the existing natural resources and preserving it for the future (Eskandari and Moradi Nasab: 2016). With these interpretations, the present article intends to analyze the subject according to the research hypotheses and the intended goals. Then, by asking special questions and classifying them, they were distributed among experts and the importance of the criteria was categorized and assessed using the Delphi method. The continuation of the analyzes has been done through library studies and finally their summary is presented in the form of specific tables and diagrams.

## **Conclusion**

Bionics is in fact a creative tool to achieve the goal of sustainability effectively and efficiently. All buildings and processes of nature can be considered sustainable because they have existed indefinitely for thousands of years. On a daily basis, humans and their creatures negatively affect the environment as we are abusing our limited natural resources, we must look for processes and forms that have a limited impact on the earth. Nature's affairs and functions originally derive their energy from the sun and recycled waste. By looking at nature, we can expand processes that use little or no energy. According to Biomimicry Guild, "After 3.8

billion years of research and development, nature can suggest what works, what fits, and what lasts." Dealing with sustainable architectural design in bionic designs requires a deeper understanding of the goals of sustainability. Solving environmental, cultural, economic and social problems leads us to an architecture inspired by nature with a sustainable approach. Sustainable development is a movement to do things right and improve the quality of life of future and present generations. Sustainable development is an expansion strategy that manages all assets and natural and human resources to increase wealth in the long run. Many movements that had no value beyond fashion and did not exist and are movements that were initially unpopular with the public and were severely attacked by critics but ultimately failed to lay the foundations for a new movement. It was two decades ago that with the rise of computers, architects such as Lane were able to give new dimensions to architectural design. The tools of these architects are new computer systems that not only enable 3D design from scratch, but also in parallel, they make it possible to compute complex mathematical models, non-geometric forms, and simulate living processes. Lane, meanwhile, was one of the first architects to give computers a creative role. It is the computer that "under the artist" creates new works based on approximate equations. His design begins with the breakdown of a work into subsets. One of the most famous works of this architect is his "Embryonic House". This plan is an attempt to deal with issues such as "diversity", "single production" alongside "mass production" and "flexibility" in construction. This house is a combination of different members, the geometric rules of which are all fully defined and their range of growth, and this shows that fit, beauty and function in its classical sense is very valuable. Evolution itself is not only influenced by raw data but more importantly is built with location. It adapts to popular local styles, climatic conditions, building materials and local perceptions of beauty. As mentioned earlier, bionic designs involve the renovation of a complex of buildings or the use of nature-inspired designs. With a little research and search in bionic architectures done in Iran and other regions of the Middle East, it was seen that in these areas, bionic designs were applied to solve building problems and avoid the uniformity of designs, as well as innovation and motivation and enthusiasm.

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