Acta Technica *63* No. 1B/2018, 1–12

Evaluating the impact of light as the main pillar of organic architecture

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Abstract. Organic architecture is a combination of building with nature and not imposing a building on nature. Architects have always come up with an awareness of the role of light, trying to create harmony, fit, and make their works more beautiful, and this is evident in architecture. In this paper, we try to evaluate and analyze the impact of light as the main pillar of organic architecture. For this reason, the examples that have been developed by past scholars such as Lloyd Roith and in the field of organic architecture have been analyzed and analyzed. We put. Accordingly, for example, we study Kermanshah in the field of organic architecture influenced by light. After analyzes and surveys, we have outlined the results for the climate design of organic architecture in the city of Kermanshah with emphasis on light.

Key words. Light, architecture, organic architecture, climate design, light controllers.

1. Introduction

Organic architecture is a combination of building with nature and not imposing a building on nature. Characteristic of shapes and forms with irregular edges, which appear to resemble lines along the facade of plants or animals. The set of components and members that make up an existing object.

From these principles, three traits and essential properties of organic architecture are drawn out:

1. Building as a natural element: This means that organic buildings, contrary to the beliefs of Le Corbusier, are not like light butterflies flying overhead, but constitute a complete, firm, humble component of the environment that is It is also used in the sense that from now on, not only is white color that is rational and neutral and does not represent more than some volumetric experiences, but even the main colors that the school offers is not used anymore.

2. Building as a Specific Element: Every architectural activity, in its program,

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has a unique status in its economic conditions, in its individual and local conditions, and in relation to the psychological needs of its owner and user, and therefore, all aspects should be considered in building design. In this way, this presupposition of syntactic wisdom, which meets the basic human needs of all, is neglected. The point is the importance of emotional components that vary in different ways. Organic architecture does not coincide with rationality in the fascination with technology.

3. Building as a traditional element: Each building should acquire its own personal character, not only through the construction map, the environment and personality of the person who was built for it, but in relation to the country where it was built and the basis of the traditions in which they are rooted. This issue should be manifested in choosing the type of pilgrimage, the construction method, and the expression of the design language [1].

Comparison of organic and non-organic architectures is performed in Table 1.

Table 1. Comparison of organic architecture and non-organic architectures

Organic architecture	**Inorganic architecture**
Formatted art	Beautiful art
Intrinsic allergy product	Thinking product
Ishraqi imagery product	Acquiring constructive imagination
Close contact with nature	Avoid nature
Special Purposeful Digger	Global targets seeker
Filled with many shapes and sticks	Towards the law, system, rule
Naturalist	Style oriented
The result of contact with viability	Education product
Dynamic forms	Static forms

Organic architecture features:

- Has a free plan.
- The pursuit of the continuity of space and the joy and spatial vitality.
- In the interior design of architectural spaces, the original shape rejects the volume.
- Emphasizes the relationship between man, nature and architecture.
- The architecture searches for what it should be.
- Rejects the fixed and immovable and limiting rules and frameworks.
- Among its components there is a natural affinity that is mixed with nature.
- Architecturally looks like a statue.

- In general, organic architecture wants to be linked to nature and has a nature-oriented nature.

2. Case study of Wright's masterpiece of organic architecture

Wright's architectural masterpiece and organic theory can be seen at the Fossil House in Pennsylvania, USA. This house, built in 1937, best describes Wright's ideas about organic architecture. Figures 1–4 show its principal features.

Fig. 1. Creating external spaces between buildings and the natural environment

Fig. 2. Integration of indoor space with outside

Fig. 3. Installing all windows and removing the corners of the room

Fig. 4. Constant display of materials from inside to outside

Wright believed that the nature of materials in the building should be shown in such a way that the glass was used as a glass, stone as a stone and wood as wood.

2.1. Architecture, light and samples from nature

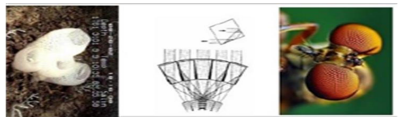
In the realm of architecture, there have been more or less people who have made nature work to achieve their work. But most of these uses were limited to the apparent patterns of nature and the elements in it, for example, architects such as Santiago Calatrava or Bacchimeter Fuller have used many of their designs in their designs. But in recent years, the exploitation of nature has not been limited to the apparent pattern and the architects have tried to apply the principles of nature by expanding their knowledge of biomechanics. One of these architects who lectured on biomarker issues at various symposia and presented one of the first biomime-based office projects, is an architecture called Michael Pline. He is one of the people who worked at the Eden Garden project, Nicholas Grishamau. In one of the sentences, Michael states: "We believe biomimetics are one of the most important tools to facilitate changes from the industrial age to the ecological age" [2].

3. Research method

In this paper, we try to evaluate and analyze the effect of light as the main pillar of organic architecture. Hayman has developed and analyzed the basis of examples that have been made by past researchers such as Lloyd Roith and in the field of organic architecture. Accordingly, for example, we study Kermanshah in the field of organic architecture influenced by light.

Table 2. Natural patterns of light exposure and their use in architecture (Watch, Khairjou Sadat, 1396)

Explanation	Template image	Pattern taken from nature	Describes the mechanism of collision with light	The mechanism derived from nature	Name of work	Architectural representation
Parallel fronts have the least amount of heat with sunlight, which results in very high thermal differences with normal levels of sunshine, causing natural ventilation		Cactus shell surface	In this case, according to the climatic characteristics, the sensitive surfaces of the building are in a way that will have the least amount of nourishment	Parahelotropic	—	
By intercepting it and moving it, the plants achieve the maximum efficiency of light that has been achieved in this building		Sunflower and most plants	This house has a central system designed to connect the entire building and can rotate the building around 180 degrees clockwise	Heliotropic	Heliotropic house (light interceptor)	

Obviously, the temperature of the shadow and sun is not the same, and this temperature difference causes the air to flow	Using reflection and reflection, light can be emitted throughout the day by directing natural light to different parts of the building	The polar bear's skin is designed to prevent the outflow of temperature while allowing light to enter the body
		
Leaves of trees	Insect-spin composite eye system	Polar bear
Solar wall, like the leaf surface, receives the energy of the sun, while the temperature below and below it is not the same, causing a normal flow of air	In this system, which is known as the optical pulse system, daylight is brought to the farthest point of the building using a reflection mechanism focused on a point	The entire wall of the set consists of aluminum blades that act as shading and reflecting indirect light
Absorb	Refraction and reflection	Refraction and reflection
—	—	Singapore Arts center
		

3.1. Location of Kermanshah province

Kermanshah province has an area of about 24,434 square miles in the middle of the western side of the country. The average altitude around the sea is 1200 meters. This province is limited to the north of Kurdistan province, south of Lorestan and Ilam, east of Hamedan province and west to Iraq. The province has 14 districts, 31 districts, 86 villages, 32 cities and 3153 villages. The province's share of the population is 2.59 %, then the population of the province is 3.7 and the urbanization rate is 69.7 %. The city of Kermanshah is located 47 degrees 4 minutes in latitude and 34 degrees and 16 minutes in latitude. The area is approximately 7983 square kilometers and is also strategic as the center of the city of Kermanshah.

3.2. Uses of nature in architecture

The use of nature in architecture is done in three ways:

1. The exploitation of nature, which human beings use of elements and elements in nature, to achieve their purposes. Like the cave period, the cave is an elemental in nature and is exploited by human beings for various uses.

2. Utilizing nature In this regard, human beings, in the elements and elements of nature, manipulate and sometimes alter, to estimate it in their own form and shape, such as the construction of tunnels [3–4]

3.3. Climatic design

Light alone is one of the factors influencing building architecture. Architects have always been struggling to create a calm and secure environment where humans are supposed to live in it. Here is the question: What measures should be taken to create an area of comfort and safety for human beings? In this regard, the architecture compatible with the climate can be the answer to this question. The principles of this peaceful climate and architecture, which include the design of a building with different climatic conditions such as light, wind, rain, etc., are different in each climate. In this climate due to low humidity, water and vegetation levels play a significant role in reducing the temperature and cooling the air using the evaporative cooling properties of the water. Also, these levels reduce the temperature of the environment by reducing the reflection of the sun's rays. On the other hand, the presence of shrubbery, pale-leafed trees can be of great help in reducing the levels of the sunshine of the yard and its adjacent walls in hot weather. In this climate, in order to get light south of the main areas in the northern part of the building. Avon and low-rise openings, Avon in this climate, unlike the central regions of Iran, have no use of living space and their task is to control the arrival of light in the summer and prevent snow and rain in the winter. The low altitude of the rooms in order to quickly heat them in cold seasons, materials and dark colors to absorb light and energy, walls of high thickness, and finally, the small courtyard is a climate of warm and dry climate features.

3.4. Lighting elements in architecture

Architects have always come up with an awareness of the role of light, trying to create harmony, fit, and make their works more beautiful, and this is evident in architecture. Lighting elements in Iranian architecture are studied in two directions, the first group of light controllers, whose role is to adjust the amount of light entrained by the building, and the second group, the lighters, whose role is lighting the building.

Light controllers

The porch is a space consisting of a ceiling and a column that is at least one side blocked and protects a person from contact with rain and sunlight, and in areas where the intensity of the light and heat of the sun is high light emitting light. In this case, we will have indirect or indirect lighting, which will be seen in the temple of Anahita.

Radiation of the strap: Radiation of the strap or strap of the thin sunshine blades was carried at a depth of 6 to 15 cm, which surrounded all windows, ramps and doors, to shade them. Those that worked above the portholes or windows were called "shading heads". Radiation of the stand or the vertical were either brick or gypsum blades that worked between the two windows or the door to a width of 60 to 70 cm and a depth of 10 to 15 cm. For example, Beagle's reliance on strap irradiation has been used. Awnings: Creating a shadow on windows prevents direct sunlight to the window surface, and as a result, the heat generated by sunlight in the back space is significantly reduced. The shades are different and depend on the colors and their location relative to the window as well as the natural ventilation conditions in the building. The shadows are divided into stationary, movable, and natural shades, such as trees. In the Syrian house, the shadows are used to create shadows on the windows of the canopy.

saradag: A canopy was spread over the edge of the curtain that spread over the mosquitoes over the top of the shed, thereby preventing the radiative radiation of the sun into the siege.

saabat: Indoor alley, which is also seen in tropical and chilly cities. In tropical cities, we have to stretch the alley and lift the wall and create a shadow of a sabbaz. Old neighborhoods around the traditional Kermanshah market have been used.

Curtain: Using thick curtains to prevent and adjust sunlight for entering the building from the Safavid era was commonly used as well as during the Qajar period. These curtains were usually made of beads or silk, they were used in a single and double pane, and were typically installed to prevent the porches or windows and sashs. Raise these curtains by spools and bands, which unifies all the parts uniformly, because these curtains are usually thick and heavy, and, above all, they cannot be raised.

Lighters

Jabak: Iran's changing air, the bright sunshine of wind and rain, hurricanes and whirlwinds, and special national and religious beliefs required the building to have, in addition to two windows, a curtain or a shaft for protection inside the building. Inside the building with wooden rattles and windows. The curtain was protected

and covered with clay or tile nets, these networks absorb the intensity of the light and produce a weaker light from it. The deviations of the light beams were caused by collisions with the dotted edges of the light grid and contributed to the smoothness of the light. Meanwhile, despite the fact that the entire outside space was easily visible from outside, you did not see anything inside the day. These shagules are well visible on the basis of biodiversity.

Reaper lattice windows: The window is usually used to give light, airflow and sightseeing outside without disturbing the privacy of the house. In areas where sunlight is intense, the window should be made in proportion to the intensity of light. The interlacing windows create a balance between light inside and outside, a balance that, when viewed from the inside, shoots sunlight and prevents the eye from getting tired from intense light. The designs used to make lattice windows are often in a way that adjusts the light inside the room. The lattice windows distort the light from the outside and modulate it, and when the light is out, not all of it passes through the room. Sometimes it is used for window and window lattice glass. It is worth mentioning that the door latches, doors and windows are called. In the windows and windows of wooden lattice, pottery and gichin in the winter covered with oiled paper, and opens in the summer.

Rosen: Rose and window cannot be separated. In fact, a rhonen can be considered a small window, usually on top of and sometimes on both sides of the open air to receive light and open air for closed spaces. In other words, the rumen refers to the holes used in the stigma or shoulder arches. Rose sometimes is sometimes made with gypsum and pottery and has often been stationary. In buildings that have central and intrusive tissue and are provided with oversleep or opaque ceilings or elsewhere, they are placed at the top of the entrance to the rack. Rosen was used at the house of Khaje Baruch.

orsi: An arched grid that rises instead of the round heel method and fits into the chamber that is intended. Arboretum is usually seen in the mezzanine of the slopes, the forehead and the pedestal of cold stores. The role of a sash network is usually like a window and wooden rattan. The best example for this option is to rely on Deputy Governor.

Freeze and khowan in the building: The bells are a decorative role that has been painted with brick chips and mosaics, then dyeing into it with its dirt and colors, dissolved in water, in various colors. And on the forehead of the building, the middle of the pillars and the freezer is arranged. In order to enter the lighting and air, the rooms pierced the gichine pillars and created roles and placed the slabs on top of the doors and windows.

goljame: The small and colorful glass that worked inside the plaster and placed it at the highest part of the room to provide light to the building. The gypsum grill and the glassware used on top are also termed.

Tehrani: Sparks in the sun that have an ax. On the northern side of the house is Mingin Kottab, Tehran.

Marble: The use of such a rock is used for lighting in the underground and underground rooms due to lack of light, and part of the courtyard was made of marble so that light could enter the nave in the underground.

Workstation and Mogharnas: In spaces that are exposed to light through the ceiling. The light enters the space directly and illuminates only part of it. Works and Mogharnas are also used in addition to the beauty to make even greater use of sunlight. By causing it to divert its path in different directions and let it into the form of a spread, then inside the building will be uniform and decentralized lighting. Which includes more volume.

3.5. The role of the vestibule in the renovation of the building

After the entrance to the building, due to the light becoming extinct, the light should be broken, so that the interior of the building does not have an adverse effect on the entrance. One of the important factors in the architecture of splitting and breaking light intensity is the input vestibules that are made of round or polygon. At the top of the oven, there is usually a lightning that transmits light centralized light at different times of the day, using this method to adjust and balance the light and temperature of the architectural features, especially on the margin of the desert. Different types of tiles, arches, and pillows also have a significant contribution to the lighting of the building. The presence of the blanket has led to the creation of three distinct building areas in the dome area (Navab mosque). The third area is the main dome, which sometimes opens in small windows and helps to light the building.

4. Conclusion

As stated in this world, architects are also looking for new solutions to human life. Since the strengths and weaknesses of the design of a building will affect the ecosystem of the universe, the critical task in this regard lies with the architects. . Hence, in addition to environmental conservation measures, architecture must play its part in nature. Architecture in nature must work in harmony with it, this harmony cannot be harmed by the use of organic architectural ideas, as defined by Frank Lloyd Wright, and try to make it as beautiful as possible. Undoubtedly one of the factors influencing architecture is light. The light that created a new place in the name of a fire temple in architecture was a place to worship its deity, where it has its own style of design. Another light effect in the design of the climate is architecture, which means how to create an environmental comfort for humans. In this regard, the necessary measures for designing a climate in Kermanshah with emphasis and attention to light are as:

1. Winter in the north, summer in the south.
2. Intra-oriented buildings with a central environment.
3. Use the porch and the small yard in the building.
4. Building the building between 20 degrees west and 45 degrees east and in the shadow of each other and outside the shadow of the sun on the north-south axis.

5. Multiple woops spreading on the southern foot to use sunlight.

6. Small openings on other fronts.

7. Use of water, plants and trees in the yard.

And in the end we come to the lighting elements in the organic architecture, which are divided into two categories of light controllers and lighters, listed in Table 3 below.

Table 3. Lighting elements in organic architecture

Light controllers		Lighters	
Ravagh	Shabak	Pachang	Roshandan
Tabesh band	Door and lattice	Pacholaghi	Freez and khowan
Shelters	Hole	Baajeh	Goljam
Sardagh	Orsi	Tehrani	Palkaneh
Sabat	Jamkhaneh	Marble	—
Curtain	Horno	Workshop and mogharnas	—

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Received June 15, 2018