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CLASSIFICATION OF NATURE-INSPIRED ARCHITECTURAL PRACTICES

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ABSTRACT

Nature from ancient times to today; It has been seen as a source of inspiration for architectural designs in terms of order, form and aesthetics. Many architects make their designs using a number of sources of inspiration. These are sources of inspiration; Some objects found living or non-living in nature are trends and architectural approaches that were formed in earlier periods. After all, these designs either resemble a one-to-one inspiration or conceptually fit into it. The concept of analogy forms the conceptual basis of these inspirations. Analogy is a form of representation and expression that extends from the visual impressed by the architects to the product they produce. In this study, reference objects included in Analogy and how these objects are used in architecture are discussed. For this purpose, analogical classifications from past to present have been examined and a new analogy classification has been made within the scope of the study. In architectural structures that use analogies formal in their designs, analogies such as Venturi's Duck Structure in Vegas; In addition to being used directly, concretely and literally, examples of using them conceptually by loading abstract meanings are frequently seen. This has led to the necessity of examining the new classification under two headings as 'formal analogies' or 'conceptual analogies'. In addition, it was determined that the architects were inspired by the 'living nature' and 'non-living nature' in the 'structure design' and 'shell design' of the building, based on the idea of being inspired by nature in analogical designs. In the field study, recent modern buildings with iconic features were analyzed by taking into account the new analogy classification table. In the architectural examples chosen, the sources of inspiration from nature and the form of inspiration of the architects were reached by making a literature review and the type of analogy classification of the buildings was determined. With this study, a new analogical classification has been made and the purposes for which architects use the analogical way of expression have been analyzed.

Keywords: Inspiration from nature, Analogical design in architecture, Analogical classification, Iconic buildings.

1. INTRODUCTION

The act of architecture has been for centuries; Since the existence of human beings, it has emerged as a phenomenon that leaves marks in our minds. This adventure, which started with the need for shelter of human beings, has sometimes become a philosophy of life. The concept of architecture, regardless of which dimension one looks at, essentially conceals human life. Architecture is a physical container of human activity, and besides, architecture is not only a shelter or a protective umbrella, but also the physical record of human existence, a cultural legacy left to the future. People build structures in order to meet a need and to survive. But even while making these structures, they give

importance to values, feelings, and beliefs and realize them with the structure they make. They describe what they believe to be vital and important through these structures, whether it is a small hut or a cathedral. Architecture is the easiest to visually convey. Communication exists between architecture and people as in every concept. Communication is established with the formal and symbolic values of visual elements (Yüksel, 2004). Denotative meanings that reflect the essence and form with a certain content and convey messages are extremely important in architecture. Meaning in architecture is a hybrid concept that is open to various perspectives, varying from person to person, and that can be discussed on separate levels. Many different relationships are established in architectural designs, from formal constructions to semantic constructions, from functional requirements to historical and environmental references. Being able to interpret these complex relationships requires deciphering the formal and conceptual essences in a sense. At this point; "**Analogy**", one of the concepts frequently used in architecture, can be referred to as a reference for communication in architecture. It is an affinity between things that have similar characteristics, although they have differences in substance. The main logo in Greek: "*according to a ratio*" is the similarity in proportional relationships. This similarity can be between two shapes in different scales (example: two triangles) or between two separate quantities. The contents of the concepts of metaphor and analogy are similar. However, there are small nuances that distinguish these two concepts from each other. Metaphors describe the possible pattern of parallel relationships, while analogies describe one-to-one concrete and abstract relationships. Like analogies, metaphors indicate relationships between objects. These relationships are more abstract than exact.

In this study, it is aimed to reveal how analogy is used in the race to be original in architectural designs. For this purpose, the classifications of analogy from past to present have been examined in this study. Analogies in architecture from the past to the present have been researched by experts in this field and divided into various classifications. In this study, a new analogy classification is made by taking these classifications as reference. In this context, building samples showing analogical features in the world were investigated first. In the selected architectural examples, how the architects use the analogy in their designs was investigated, and in line with the information obtained, the analogical feature of the building was classified under the specified classification titles. The examined building samples were classified under three main headings, according to the way they were perceived, according to the reference object, and the way they were applied in architecture.

2. ANALOGY CONCEPT IN ARCHITECTURE

The Great Larousse Dictionary and Encyclopedia (1986) defines the analogy as follows: "*Analogy is a comparison between things that have similar characteristics, but differ in substance.*" In another dictionary is Analogy; It is reasoning in the form of transition by analogy from the special to the general. It is said that it is an inference reached on the basis of the similarity between two things.

The analogy is to argue that what is said for one is also for the other, based on the similarities between two different things. It is a method of solving a problem or reaching a result through similes, which is used in more fields of knowledge such as astronomy, anthropology, and psychology (Mason, 1994). Analogy is a phenomenon that most evokes or most closely describes an object, object, existence with another similar concept. Many architects make their designs using some sources of inspiration. These sources of inspiration; Some objects found alive or non-living in nature are trends and architectural approaches that were formed in previous periods. After all, these designs either resemble a one-to-one inspiration or conceptually fit into it. The analogy is to argue that what is valid for one object is valid for the other object, based on the similarities between two different objects (Mason, 1994). The simple analogy in architecture can be expressed as the similarity of the object in its purpose and appearance. For example, a simple analogy for a hot dog shop is in the form of a hot dog. Architects sometimes stayed on the basis of signs while emulating objects, In this architecture, which is defined as the architecture of signs and contains signs on it, the synergy of sign-space and function trio could not be achieved. Although it is found interesting by the public, the fact that it remains on the basis of visual signs causes reaction by the architects (Table 1).

Table 1. Examples of formal simple analogy

	
Kansas City Library, America	Big Basket Building, America
	
Toilet Museum, South Korea	Meitan Tea Museum, China
	
National Fisheries Development Office, India	Piano Building, China

Simple analogies are simpler to understand and contain more formal elements. In formal analogies; The concept discussed in the analogy is directly applied to the design without any process (Demirkaynak, 2010). But the analogy is not a pure or simple similarity. It is to arrive at a decision based on the similarity that exists between two things or situations, by saying what is said for one within the other. In other words, an analogy is to draw conclusions from one or more thoughts to another thought (Stands, 2012: 26). A hot dog should not be a preferred form of analogy for a business in the form of a hot dog. In other words, the most valuable analogy in architecture is that it makes various associations and produces fictions while describing an object, object, existence with another concept that most evokes or the closest similar. These analogies are conceptual, relationships are more abstract than exact (İnceoğlu, 2004). Conceptual analogy is the "semantic loaded" state of the analogical analogy (Table 2).

Table 2. Examples of conceptual indirect analogy

	
Royal Ontario Museum (The Crystal), Canada	Harbin Opera House, China
	
Sydney Opera House, Australia	Changsha Meixihu International Center for Culture and Arts, China
	
London Aquatics Centre, United Kingdom	Milwaukee Art Museum, America

In conceptual analogy, architects interpret the analogy they chose as a starting point for the design process. The project develops and results on this interpretation. It transfers an image to the structure by analogy. The final product reflects this analogy. Analogy gives symbolism to the structure.

3. RE-CLASSIFICATION OF ANALOGICAL DESIGN AND EXAMPLES

From past to present, all architectural products have served as a model in which the designer put forward similar beliefs and thoughts as expressions of the thought and belief they represent. At this point, analogies emerge. Analogies in architecture have been researched and divided into various classifications by people who have specialized in this field. These classifications and their characteristics are as follows (Aydınlı, 1993), (Uraz, 1993), (Collins, 1965), (Ayyıldız, 2001) (Table 3).

Table 3. Classification of analogy according to Abel, Collins and Gordon.

Analogy models according to Abel (Uraz, 1993)	Analogy classification according to Peter Collins (Collins, 1965)	Analogy classification according to William Gordon (Aydinli, 1993)
<ul style="list-style-type: none"> ○ Spiritual Models ○ Classic Models ○ Military Models ○ Utopian Models ○ Commercial Models ○ Organic Models ○ Mechanical Models ○ Artistic Models ○ Semantic Models ○ Models Expressing Identity ○ Non-Architect Architectural Models 	<ul style="list-style-type: none"> ○ Biological Analogies ○ Mechanical Analogies ○ Gastronomic Analogies ○ Linguistic Analogies 	<ul style="list-style-type: none"> ○ Symbolic Analogies ○ Direct Formal Analogies ○ Individual Analogy ○ Cultural Analogy

Within the scope of the study, as a result of the literature review, a new analogy classification was created under 3 main titles. In architectural structures that use analogies formally in their designs, analogies such as Venturi's Duck Structure in Vegas; In addition to its formal, concrete and literal use, examples where it is used conceptually by loading abstract meanings are frequently seen. This has led to the necessity of dividing the new classification into two groups as "**conceptual analogy**" and "**formal analogy**". In another classification, based on the idea of imitating nature in the analogies used while constructing the structures, an evaluation was made as living and non-living nature. This can be designing in harmony without harming the nature, as well as dominating the nature, standing against the laws of nature, or using some objects that exist in nature and being inspired by them. It can be made by inspiring from the structural structures of living things (human, animal, plant) or their skeletal system, cell structures, DNAs, which are used when designing structures. This has led to the necessity to examine the analogies according to the reference object of the newly made analogy classification under two headings as "**living nature**" and "**non-living nature**". In addition, it has been determined that architects are inspired in two titles as "**as shell**" in form design or "**as structure**" in carrier system while using analogies in their designs. Within the scope of the study, a new analogy classification was created under 3 main titles (Table 4).

Table 4. Reclassification of analogies

1. Classification according to the perception of analogy	<i>Formal Analogy</i>	<i>Conceptual Analogy</i>
2. Classification by reference object of analogy	<i>Inspired by the Living Nature</i>	<i>Inspired by the Lifeless Nature</i>
3. Classification according to the way analogy is used in architectural practice	<i>Inspired by Structure</i>	<i>Inspired as a Shell</i>

Within the scope of the study, with this new analogical classification, the structures that have analogical features in recent modern architecture are classified.

The Herzog de Meuron design was inspired by the high strength of the Beijing National Stadium birdhouse, provided by fine branches, and constructed with thin steel bearing elements. The thinness and tightness of the steel elements has increased both the transmission of the roof load to the ground from many points and the potential of the transparent surface that can be formed (Table 5).

Table 5. Beijing National Stadium and sources of inspiration

BEIJING NATIONAL STADIUM Jacques Herzog and Pierre de Meuron // China // 2008	
	
<p>1. According to the perception of analogy: Formal Analogy 2. According to the reference object of analogy: Inspired by Living Nature 3. According to how analogy is used in architectural practice: Inspiration as a Structure</p>	

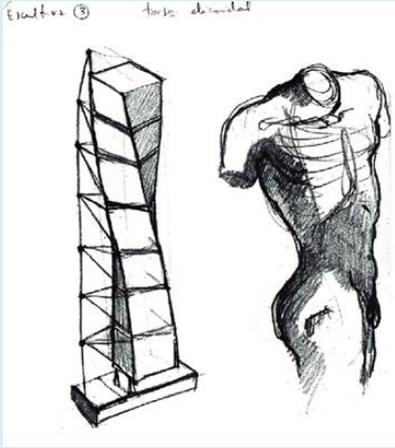
Text description provided by the architects. *“Known as the ‘region of eternal fires’, Baku’s long history of fire worshipping provided the inspiration for the development’s iconic design, consisting of three flame shaped towers, each with a different function, set in a triangular shape. Standing at 140 metres high, Baku Flame Towers will be seen from most vantage points within the surrounding area and is already a prominent feature of the Baku skyline”* (Table 6).

Table 6. Baku Flame Towers and sources of inspiration

BAKU FLAME TOWERS HOK // Azerbaijan // 2013	
	
<p>1. According to the perception of analogy: Conceptual Analogy 2. According to the reference object of analogy: Inspired by the Inanimate Nature 3. According to how analogy is used in architectural practice: Inspiration as a Shell</p>	

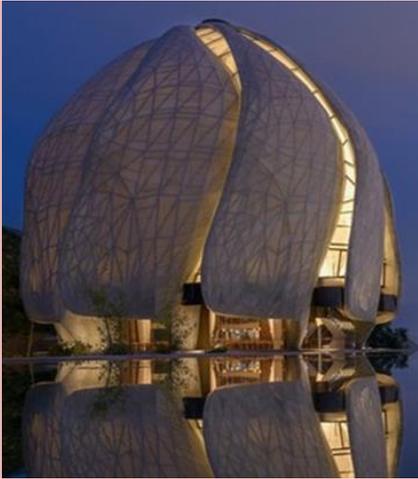
In 1999, Calatrava was invited to design a mixed-use residential tower for a prominent site in Malmö's Western Harbor area and was planned to be exhibited during the European Housing Expo 2001. The form of the tower is based on one of his sculpture, the Turning Torso, where he abstract the form of human movement into a stack of cubes positioned elegantly around a core. In the original sculpture, seven cubes are set around a steel support to produce a spiraling structural effect. In the HSB Turning Torso, the building's form is composed of nine box units, shaped like cubes with triangular tips (Table 7).

Table 7.Turning Torso and sources of inspiration

TURNING TORSO Santiago Calatrava // İsveç // 2005	
	
<ol style="list-style-type: none"> 1. According to the perception of analogy: Conceptual Analogy 2. According to the reference object of the analogy: Inspired by the Living Nature 3. According to how analogy is used in architectural practice: Inspiration as a Structure 	

Sufi whirling dancers and Japanese bamboo baskets were among the references for this sculptural temple in Chile by Hariri Pontarini Architects. The Bahá'í Temple of South America is located just outside of Santiago, in the foothills of the Andes Mountains. *"Nestled in the rolling topography of the mountains and surrounded by reflecting pools and a landscape of native grasses, this complex-curved temple of light acts as an invitation for spiritual contemplation and architectural pilgrimage"* said Hariri Pontarini Architects, a studio based in Toronto (Table 8).

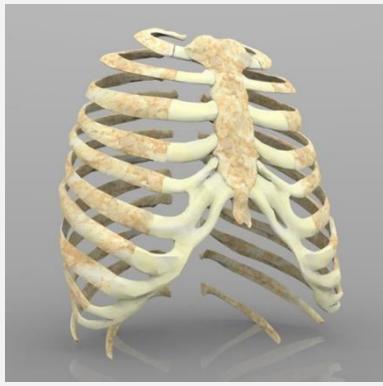
Table 8. Bahai Temple and sources of inspiration

BAHAI TEMPLE Hariri Pontarini Architects // South America // 2016	
	
<ol style="list-style-type: none"> 1. According to the perception of analogy: Conceptual Analogy 2. According to the reference object of the analogy: Inspired by the Living Nature 3. According to how analogy is used in architectural practice: Inspiration as a Shell 	

From the outside, its image appears to be the skeleton of a prehistoric animal or perhaps a huge whale. Unlike any other conventional museum, the late signs of ‘prohibited touching’ of each sample invite them to come and participate, learning in each of the interventions. Its appearance is descontracturado playful and striking as the huge ‘bones’ which was coined. Its design is based on the repetition of the asymmetric structure in the shape of ribs. These ribs are connected by metal white horizontal

longitudinal elements that surround the front glass. As is often repeated in Calatrava’s designs, the structure is a protagonist and always in sight (Table 9).

Table 9. City of Arts and Sciences and sources of inspiration

CITY OF ARTS AND SCIENCES Santiago Calatrava // Spain // 2005	
	
<ol style="list-style-type: none"> 1. According to the perception of analogy: Formal Analogy 2. According to the reference object of the analogy: Inspired by the Living Nature 3. According to how analogy is used in architectural practice: Inspiration as a Structure 	

Zaha Hadid Architects was appointed as design architects of the Heydar Aliyev Center following a competition in 2007. The design of the Heydar Aliyev Center establishes a continuous, fluid relationship between its surrounding plaza and the building’s interior. The plaza, as the ground surface; accessible to all as part of Baku’s urban fabric, rises to envelop an equally public interior space and define a sequence of event spaces dedicated to the collective celebration of contemporary and traditional Azeri culture. Elaborate formations such as undulations, bifurcations, folds, and inflections modify this plaza surface into an architectural landscape that performs a multitude of functions: welcoming, embracing, and directing visitors through different levels of the interior (Table 10).

Table 10. Heydar Aliyev Center and sources of inspiration

HEYDAR ALIYEV CENTER Zaha Hadid Architects // Azerbaijan // 2013	
	
<ol style="list-style-type: none"> 1. According to the perception of analogy: Conceptual Analogy 2. According to the reference object of the analogy: Inspired by the Inanimate Nature 3. According to how analogy is used in architectural practice: Inspiration as a Shell 	

Text description provided by the architects. *“The building design is inspired by a mineral formation commonly found in the deserts of the Gulf region. The ‘desert rose’ is a rock formed when minerals*

crystallize in the crumbly soil just below the surface of a shallow salt basin.” The system of interlocking disks surrounding the historic palace like necklace looks as if it’s been propagated organically. It incorporates exhibition spaces that fan out in an elliptical circuit around a central court, the Howsh, where outdoor cultural events will be staged. The desert-rose form evokes the culture and climate of Qatar. It emerges from the ground and merges with it. The shadows created by overhanging elements allow visitors to stroll around outside at the same time as protecting the interior from light and heat. The sand-colored concrete cladding is in harmony with the local environment (Table 11).

Table 11.Qatari National Museum and sources of inspiration

QATAR NATIONAL MUSEUM Ateliers Jean Nouvel // Qatar // 2019	
	
<p>1. According to the perception of analogy: Formal Analogy 2. According to the reference object of the analogy: Inspired by the Inanimate Nature 3. According to how analogy is used in architectural practice: Inspiration as a Shell</p>	

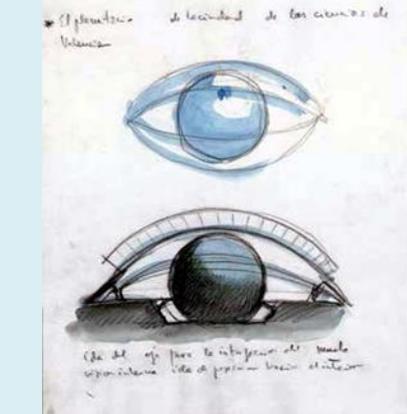
This auditorium was awarded to Studio Nicoletti as the result of an International restricted competition. Astana’s central nucleus occupies a rectangular area whose organizational axis is based upon a system of three piazzas. In the largest of these, dominated by the Presidential Palace, the Central Concert Hall faces the Senate House. Its shape is similar to a "Dombra" the typical Kazak instrument, entirely clad in American cherry hardwood. This music hall is one of the largest in the world with a vineyard conformation, designed for classical music but able to adapt itself to any kind of performance thanks to a special system of false ceiling's mobile panels and acoustic tents (Table 12).

Table 12. Astana Kazakhstan Auditorium and sources of inspiration

ASTANA KAZAKHSTAN AUDITORIUM Manfredi Nicoletti and Luca Nicoletti // Kazakhstan // 2010	
	
<p>1. According to the perception of analogy: Conceptual Analogy 2. According to the reference object of the analogy: Inspired by the Living Nature 3. According to how analogy is used in architectural practice: Inspiration as a Shell</p>	

It is located in Valencia. Composed of a science museum, planetarium, IMAX theater, opera house and a very large pergola surrounding the outer space, the complex is one of the major cultural city candidates in Europe. While designing the planetarium, which is an observatory, Calatrava sketched using the eye shape (Table 13).

Table 13. City Of Arts And Sciences-Planetarium and sources of inspiration

CITY OF ARTS AND SCIENCES-PLANETARIUM Santiago Calatrava // Spain // 2005	
	
<ol style="list-style-type: none"> 1. According to the perception of analogy: Formal Analogy 2. According to the reference object of the analogy: Inspired by the Living Nature 3. According to how analogy is used in architectural practice: Inspiration as a Structure 	

4. DISCUSSION AND CONCLUSION

Architecture is a form of communication. Many different relationships are established in architectural designs, from formal constructions to semantic constructions, from functional requirements to historical and environmental references. Being able to interpret these complex relationships requires deciphering the formal and conceptual essences in a sense. For architects, architectural form; With its social, economic, technical, psychological, aesthetic and ideological qualities, it is the architectural echo of the life, feeling and view of a particular society. For expression in architecture; It has been observed that they are inspired by living things and inanimate objects in nature.

At this point, the analogy is from the visual that the architect is affected by; A representation that extends to the product it reveals is a form of expression. In the study, analogies and classifications were examined and a new classification was proposed. In addition, according to the classification made in the field study, recent modern architecture examples were analyzed.

Architects use the analogical way of expression to ensure cultural continuity, giving messages with references to the past, to reflect the project function and concept to the building appearance, add attention to the structure, adding symbolism to the building and making it an iconic structure of the city, it has been determined that the architect uses it for reasons such as being part of the personal architectural language. Architects make use of analogies in structural design or form design. The flawless formation of nature is a source of inspiration in architecture as in every branch of science and art. Architects see analogy as a form of expression, as a source of inspiration, and use it in different fields in their buildings. Telling something unknown by referring to a known object is also a form of expression in architecture. Architects, who integrate sources of analogy into their structures differently, expose their inner worlds in this way. It has been seen that the analogy used in Architecture is more than just symbolic statements, it is a tool to convey the architect's own imagination. The analogical design used from the past to the present will continue to be a source of inspiration for many more architects.

Author's Note: This study was derived from the master thesis of Şeyma Nur GÜMÜŞ, titled "Analogical Design as a Communication Tool in Architecture", which is ongoing at Konya Technical University, Faculty of Architecture and Design, Department of Architecture, Graduate School of Natural Sciences, with the supervision of Asst. Prof. Dr. Emine Yıldız Kuyrukçu.

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