Architecture inspired by Nature. Human body in Santiago Calatrava’s works. Sophisticated approach to architectural design

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Abstract. In architecture, Nature has always been a perennial source of inspiration – both in architectural writing and in architectural design. This paper explores the architecture of the 20th century, especially the Santiago Calatrava’s works that were inspired by the human body. Calatrava (born 1951) inheriting the achievements of the art of engineering, following his significant predecessors, goes far beyond their approach. His displaying the beauty that often comes with metaphorical captures of floral and faunal structures, as well as the statics and dynamics of the human body. These references to the forms of Nature, are easily recognizable in Calatrava’s works. The first part of the paper presents concepts imitation and mimesis within Western traditions of aesthetic. Selected research work and methods in design developed in 20th century, as well as current digital techniques of imitation processes form-finding in Nature also will be presented. The second part deals with the human body as a source of inspiration in architecture and engineering. This part is focused on Calatrava’s works such as: Telecommunications Tower in Barcelona (1989-1992), TGV railway station in Lyon (1989-1994), L’ Hemisferic in Arts and Sciences Center in Valencia (1997-2001), TGV railway station in Liège (1996-2009), Turning Torso in Malmö, (1999-2004). Through semantic and syntactic aspect analyses, this study will reveal the effects of the inspiration on the formation of architectural and structural forms. In conclusion, the paper emphasizes the use of Nature as a model, measure and mentor to solve problems in architecture which creates new pathways for building design in urban space. The transfer between natural forms and synthetic constructs is desirable. Calatrava understands that when engineering is treated as an art of possibilities and creates a new vocabulary of forms, which syntactic and semantic aspects, although based on technical knowledge, is not a praise of the engineering alone.

1. Introduction

From centuries architects and structure engineers have been looking at Nature as a huge source of inspiration. They have been searching for answers to their complex questions about different kinds of shapes, structures or processes, and they have mimicked a lot of natural forms from to create better and more efficient structures suitable for different architectural purposes. Designers quite often transferred the variety of natural shape and form directly into their work often alternated with those of strict geometrical order. This research constitutes a part of a broader area that determines how to draw inspirations from Nature and how to apply the visual and conceptual designs in architectural project.
The research shows that human body-like forms can become sources of inspiration for understanding and stimulating urban space.

2. Imitation and mimesis within Western aesthetics traditions

Within Western traditions of aesthetic thought, the concepts of imitation and mimesis have been central to attempts to theorize the essence of artistic expression [1]. Imitating something is the basic unconscious instinct of human nature. Imitation requires the creative ability of selecting and reproducing the constitutive traits of the chosen object. The term mimesis, in most cases, is defined as having two primary meanings - that of imitation (more specifically, the imitation of nature as object, phenomena, or process) and that of artistic representation. The Nature inspired artistic representation can be classified into three categories of inspiration: visual, conceptual and computational [2]. A visual inspiration is well understood the shape of various living form of Nature or their systems, and to imitate similarly looking functions and spatial systems. A conceptual inspiration occurs when designer or engineer applies principles found in Nature. A computational level is inspired by mechanisms or form-finding processes occurring in Nature. Hence, the mimesis is an elusive term that encompasses a range of possibilities for how the self-sufficient and symbolically generated world created by people can relate to any given "real", fundamental, exemplary, or significant world [1].

2.1. From Nature to Architecture

"Nature's design is fluid, ephemeral, beautifully patterned. Nature's technology is dynamic, lightweight, and driven by a functional imperative - optimum efficiency" [3]. Nature uses life-friendly manufacturing processes. Nature uses an ordered hierarchy of structures. Nature fits form to function. Nature relies on self-assembly. The models provided by Nature have been an inspiration for building forms since time immemorial.

The philosophers of ancient Greece looked at living forms which offered them perfect models having a mesmerizing harmony and proportion between their parts, which the classical ideal of beauty at that time. Plato and Aristotle spoke of mimesis as the representation of Nature. For Aristotle, the Nature was the creative principle of the Universe. During history, designers have looked to Nature as an inspiration source for different kinds of forms, techniques and function. Design methods were based on direct perception, observation and study of Nature.

In ancient centuries temples and houses were built in a way to symbolise the Universe and their living forms do not follow function [4]. In ancient Egyptian civilization, for instance, the columns of the temples which were inspired by the lotus plant, the sacred plant of the Egyptians. Trees and plants generally have been used as a source of inspiration for the ornamented structural columns of the classical order at the Greek and Roman ages respectively. Ornaments were known as indirect imitations of Nature (floral and plant-inspired motives) and were mostly used in such styles as: The European Baroque and Art Nouveau. Antonio Gaudi (1852-1926) used the Nature as structural, functional, spiritual and decorative inspiration. His structural forms mimicked those found in Nature thereby providing him with both aesthetic and functional benefits. Examining the law of gravity, Gaudi used scale models made of chains or weighted strings to study naturally distributed static load. It has been a well know truth that an optimal arch follows an inverted catenary curve. Through these experiments, Gaudi came up with a kind of “parametric” design process long before the invention of the computer. The beginning of the 20th century, was quite a peculiar period in the architectural history, mainly because the invention of a reinforced concrete - the most significant aspect at the century. Felix Candela (1910-1997), used the reinforced concrete to realise his design ideas which were inspired by Nature. He was fascinated by the effect of the geometrical approach to architectural forms. He studied the shell structures and he applied his studies and thoughts to buildings through a new material - reinforced concrete. Candela used the geometric hyperbolic paraboloid as a source of inspiration.

During the period of modern architecture, natural growth and evolutionary processes were described by Frank Lloyd Wright (1867-1959) who introduced the term "organic" architecture in which form and function were just one aspects [5]. This philosophy of architectural design, emerging in the early 20th
century, asserting that in structure and appearance a building should be based on organic forms and should harmonize with its natural environment. Today, this term equals to produce by derivation from living organisms, structures and it is borrowed from biology in architecture enabling designers to compare inorganic forms, structures and function found in living organisms [6]. The root of this concept can be traced back to the aesthetics of classicism [7]. At the same time, through sufficient observation of both naturally occurring and experimentally derived phenomena Buckminster Fuller (1895-1983) discovered that a tetrahedron is the smallest and basic geometric element used by Nature to build its forms [8]. He believed, humans to be a part of Nature, and consequently, all human creations were treated as natural as well. Through sufficient observation of both naturally occurring and experimentally derived phenomena he developed topologies for spherical shell structures with use of as many identical beam and node elements as possible. His geodesic structures reflect aspects of virial structures, quasicrystals and fullerenes [9]. Less well-known is scientific research of Frei Otto (1925-2015) on shapes and structures in Nature. In his pioneering works he described the growth and form of natural structures in living and nonliving Nature. His soap film models used for form-finding, just as an experimental approach in the field of hanging (cable-net) structures, are famous. As a pioneer of lightweight construction, Frei used the nature’s minimal surface principle to design cable-net structures. He also has developed an investigation how optimizing processes in biological structures. He believed that natural formations should be essential in any planning and the basics of self-organization processes should be used in urban development [10]. Today, the experimental methods for basic research or form finding developed by Frei Otto may be replaced by modern computer-based methods.

At the end 1960s, a new concept imitation of Nature emerged. The study of how humans and animals perform certain tasks and solve certain problems, as well as studies, of the findings application to the design of electronic devices and mechanical parts has been popularized. This research field is called "Bionics" and it is concerned with a transfer of technology between life-forms and artificial objects. This study often emphasizes implementation of function found in Nature rather than imitating biological structures per se [2]. However, the main challenge in architecture is to do a parallel in Nature for the protection and survival of living beings. Bionic building, based on knowledge of different concepts such as combining the Natural Sciences and Engineering in the study of complex biological systems in living organisms, is the result of the analysis of natural form.

At the end of the 20th century, another path is coming to the forefront, a path that involves studies of Nature’s models and imitating natural designs to solve human problems. Nature is treated as a "Model, Measure, and Mentor" on a path toward sustainability. This approach to design is called "Biomimicry". There is no difference between "Biomimicry" and "Biomimetics", where "Biomimicry" is used at developing sustainable design solutions and "Biomimetics" has been applied to technologies honed from bio-inspired engineering at the micro and macro scale levels [2]. In order to create designs, as Nature does in its environment, it is important to understand what the emergence, of natural form-shaping processes, are, and to gain knowledge how to apply mathematics to describe these processes in the ways which are useful to designers. analysis of natural form.

In 21st century, inspired by the biological evolution and morphogenesis of organisms, recent advances in the discipline of evolutionary computation propose a radically different approach. Currently, there is, at last to a degree, an exchange of ideas and techniques between architecture and other disciplines such as biology, physics, chemistry and mathematics to mimic the identified biological processes. The focus is mainly on natural processes of formation and adaptation which occur in Nature, on the instrumentalization of these processes through mathematical models and computational techniques, as well as on their simulations and digital visualizations. This approach named "morpho-ecological design" diametrically changes an ancient concept of imitation and mimesis within western tradition design" changes diametrically the ancient concept of imitations and mimesis within the western tradition of aesthetics [11].
2.2. Human body and the building

Both a human body and buildings were pettily often defined and metaphorically transcribed with the help of measurements, numbers, proportions and geometric figures. The anthropomorphic metaphor consists of two different forms of expression: first, the form or the image of the body itself; and, second, its numeric or abstract translation into numbers and geometric figures. A structure of the human body with its dynamics and statics also can be seen as a model for the design of a building. The human body is thus being rediscovered as the primary referent for architecture, and an understanding of the body is being transformed.

Well-known ancient examples of using the human body in architecture are the colossus of the Odeon in the Agora and the Erechtheum on the Acropolis in Athens. The Erechtheum is a classic example of the use of clad female body in column construction and refers to Aristotle's understanding of imitation. He applies to the body a concept of unity, where the whole is an assembly of parts such that no part can be added to nor taken from it without detracting from the whole. In order to understand the soul, Aristotle anatomised the bodies of human beings or animals, enabling him to discover the purpose of each part [12]. Since Greek antiquity, the human body has been regarded as a microcosm of universal harmony. However, the metaphor of the human was also considered as an immediate symbolic model and copy of architecture or its parts. Both the body and the building were defined and metaphorically transcribed with help of measurements, numbers, proportions and geometric figures. For Vitruvius, a human body was the primary source for architectural composition, since it provided a demonstration of ‘good proportion’ in relation of part to whole and a manifestation of cosmic or Natural order [12]. Since the writings of Vitruvius in the first century AD, the use of the human body as a metaphorical and symbolic referent has provided what is perhaps the most prolific trope for architectural theory.

During the Renaissance period, great artists and master builders returned to the early concepts of the ancient Greeks. Much attention was paid to the geometry of man as well, and the subject of human proportions was related to geometric figures. Inspired by remarks of the Roman architect, Vitruvius, a number of artists, including Durer and Leonardo da Vinci sought to illustrate a geometry of human proportions. This study of motion of human beings led to an analysis of curves that are formally identical to the curves used in classical astronomy to describe the planetary orbits, or epicycles [13].

In the late 15th century, Francesco di Giorgio Martini frequently drew bodies over plans, facades entablatures, and even entire cities. At the same time, he argued that the principles derived from the body must be complemented by talent and experience, applied in accordance with the discretion and guidance of the artist [12]. A radical questioning of the anthropomorphic conception of architecture took place in the French architectural theory of the 17th century. Claude Perrault rejects theory of proportion that could be applied to architecture like the law of Nature. In his writings proportions of a building are based on an agreement determined by tradition and custom,[14]. An influence of his thought can still be detected in architectural theories from the 18th to the 20th century [15]. Neufert’s ideas on the theory of proportion, first stated in 1936, remained unchanged in all 39 editions of his Bauentwurfslehre that have been released up to the present day. Neufert’s model refers to both industrial standardization and the assembly of architectural components as well as the political motives of the time. In the 1950s Le Corbusier (1887-1965), developed the "Modulor", an anthropometric scale of proportions based on mathematics and a human scale. Le Corbusier’s use of the golden section was not his only recourse to an earlier tradition. Like Vitruvius before him, Le Corbusier derives the size of the body from the height of a grown man. As an anthropomorphic measure, this was also common in ancient and Byzantine metrology, as well as in modernistic building practice. Thus, with his propagation of the golden section as well as his Modulor (proportional figure), Le Corbusier stood in a long-outlived tradition. Le Corbusier believed that „the architect is only able to establish harmony between the person and its urban environment”[16].
In beginning of the 21st century, the theory of architecture postulates that the evolved body is a primary medium for an experience of the built environment [17]. Although, there are analogies between the form of human body and certain architectural elements, the mind uses that physical experience, past and present, as the most reliable basis and, in a sense, an organizing metaphor. This is a kind of instinctive psychophysical frame of reference - for understanding, judging, and designing the built environment.

3. Research for the human body inspired architecture within Santiago Calatrava's artworks

The main aim the research is to demonstrate possibilities of application of the human body metaphors in modern built environment and to find an answer to the question of whether the human body inspired architecture is predisposed to contribute to what in architecture and urbanism is defined as place. The term place is understood as a space which is covered with meanings and values significant to its users. This three-dimensional space, as David Canter indicates, is a result of a relation between human activities, concepts relating to the management of the space and its physical attributes [18]. One should therefore aim at transforming the surroundings in such a way that its newly created features would meet the requirements of the other place-creating components. That would mean a creation of such features that would facilitate or simplify the identification of a given place. Place plays an essential, vital role in human life.

In the first part of the research, the main anthropomorphic, metaphoric and symbolic features relating to the human body are defined. A brief history of using the human body as design inspiration is given, which includes a discussion on our tendencies as humans to use the Nature inspired artistic representation. Different approaches to the topic are considered, with a focus on the physical-spatial system of imitation rooted within Western tradition of aesthetics. The second part of the research goes on to attempt to solve these research problems through architectural case study. This study covers Santiago Calatrava's works designed between 1979-2007. It is going to find out opportunities to create the human body inspired architecture and define Calatrava's approach. It goes on to attempt to explain basic issues such as: the way place looks (form), what it is made of (material), how it is made (construction), how it works (process), what its capability (function) and how Calatrava's mimicked architecture can create place.

4. Results and discussions

Santiago Calatrava (born 1951) is one of the most controversial architects working today. Trained as both an architect and a structural engineer, Calatrava has been lauded throughout his career for his work that seems to defy physical laws and imbues a sense of motion into still objects. In his work Calatrava incorporates the achievements of the art of engineering reached by his significant predecessors: Robert Maillart, Pier Luigi Nervi, Eduardo Torroja and Felix Candela, but goes far beyond their approach. His predecessors understood design as the result of efforts to strike a balance between the scientific criteria of efficiency and the innovation of created forms often inspired by Nature. Engineering is the art of these possibilities, Calatrava believes, and is looking for new vocabulary of forms, which approach is based on expertise, not only on a praise of technical solutions [19]. Almost every designing task Calatrava begins almost every design task with the analysis of the complexity of the problem and its synthetic expression, often developed in the form of sketches for the client during a "creative session" with the consultants. During the sessions quick sketches in pencil or watercolour are created, which appeals to the imagination. Then, already complete concepts are prepared and solution options are presented, that makes it easier to achieve compliance of attitudes and opinions in terms of approach and solution of presented problems. Nota bene Calatrava grew up wanting to be an artist, taking art classes at 8 years old. He was influenced by Cezanne and Rodin and had admiration for Brancusi arts.

The concept design of the Kuwait Pavilion (1989-1992) in Sevilla shows how an architect-engineer exchanged metaphors, methods, and images, and a new understanding of the human body parts (human fingers) came to affect architecture. The dissection of the body in anatomy transformed ideas about the
constitution of knowledge, and about how that knowledge was to be obtained. During the Renaissance period, these methods of anatomical study were fundamental to the emergent discipline of science, with the practice of partitioning rendering models of cosmic unity untenable.

![Figure 1. Santiago Calatrava, Kuwait Pavilion, Sevilla, Expo'92, 1989-1992](image1)

The two-story structure is raised, covered piazza, it is defined by two curvilinear end walls. Hydraulic claws move individually to create over thousands of configurations with the overhead condition of the pavilion. Structural columns hold the hydraulic system used to rotate the claws and the support structure of the lower exhibition space under the pavilion. Lower structure of the pavilion made of translucent marble which serves both as the floor for the pavilion and the roof of the lower exhibition hall. The meaning of the movement is the primary source of human aesthetics and pleasurable feelings. A movement must exhibit an inner order, a structure in which the different segments obtain their unity and cohesion. The beauty of this work of arts can be considered as the primary characteristic of the movement endowed with an aesthetic value. This structure mimics movements of human fingers (figure1). Such movement is beautiful when an idea, an intention, a meaning, an excellence, an inner unity and wholeness becomes manifested in a sensuous and dynamic form. Our aesthetic experience consists of the perception of an irreducible excess, a superabundance, and a plenitude in a technically flawless driver performance.

Telecommunications Tower on the hills of Montjuic (1989-1992) in Barcelona, shows how the work and the distribution of forces in the human body can become an inspiration for a design and architectural solutions (figure 2). Human body is both tensile and compressive which forces strength. A unique strong point of this structure is that the compressive and tensile elements happen simultaneously. The structure of the tower consists of Torre de Montjuïc is not based on a vertical trunk.

![Figure 2. Santiago Calatrava, Torre de Montjuïc, Barcelona, 1989-1992](image2)
The tower consists of an inclined, not vertical shaft with about three supporting metal structure. The cross point between the static and the dynamic, ensures balance by matching the center of gravity of the base with the vertical holding its own weight. The shaft is supported by a circular concrete base. This steel structure weighs 1,000 tons. The tower, with a height of 130 meters, was built to celebrate the Summer Olympic Games. Its shape was formed as a result of studies of forces and strains in human body, characteristics for several sport disciplines. As a result, the pose of a runner igniting the Olympic torch was selected. The sketches clearly show the figure in motion - legs bent at the knees and the arms lifting in triumph the Olympic flame. Flexible steel and coloured concrete that is often used in the chimneys of power plants was used in its construction. The tower was covered with smooth white metal plates. The quality of the concrete used was necessary to shorten the construction time and ensure a completion of the structure in time for the Olympics [20]. Similarly to the construction of many of his bridges, Calatrava used the “trancadís” to coat the base of the tower, in this case white. Scraps of characteristic ceramic in the works of Gaudi. The orientation of the tower ensures that the shadow of the central needle on the circular platform acts as a sundial.

Lyon-Satolas Saint Exupéry Airport Railway Station (1989-1994) is one of the three TGV railway stations in France and the only one located outside the city center. It was the result of the competition held in 1989. The victory in this prestigious competition brought Calatrava an international fame and the executed project resulted in a revolution in understanding of architecture and engineering.

Due to a likelihood of potential shock waves, the TGV tracks were isolated by the system of caisson and acoustic shields. Yet again Calatrava was inspired by the human body and its workings at variable loads. Standing side by side with their legs apart, like a parade of athletes, structural elements are able to support the roof. Nature has adapted the human body to withstand various physical loads (figure 3a). The central building is meant to be a symbolic image of flight or a human eye, which comparison facilitates its association with the character of the region, bringing together the idea of alpine landscape. It reminisces “Birds”. Thanks to a strong V-shaped concrete abutment at the front entrance, people usually think about bird’s wing; thanks to dramatic angling at a side view, people think about the bird’s beak or landing birds. Calatrava said “I never thought of a bird, more of the research that I am sometimes pretentious enough to call sculpture”, in which he was more inspired by a human body - human eyes” (figure 3b).

Figure 3 a-b. Saint Exupéry Airport Railway Station, Lyon -Satolas, 1989-1994, a) view of acoustic shields, b) view in dusk

The anthropomorphic form is determined by steel tendons. The hall is huge - 120 meters long and 100 meters wide, with the height of 40 meters. Light steel structure comes out here in its fullness. It is aggressive and seems to float, held back only with the sharp ridge of the side walls. Steel elements mimic the spine and spread wings or an open eyelid with an eyebrow. This resemblance can be seen by night in the illuminated object. Turning to other experiments with the balance and dynamism of curved
roofs, Calatrava has created a new kind of super-structure [20]. TGV tractions appear below, in the cutting covered with openwork reinforced concrete structure. Its delicate and refined shapes resemble the world of plants, animals and people who carry loads. He used the same materials as Eero Saarinen at TWA Terminal (1956-1962), who also reached for the metaphor of a building soaring in the air. However, Calatrava's work is more expressive and dramatic, light and subtle. This frozen motion is another fascinating experiment with the laws of statics.

In 1996, the design of the TGV Train Station (1996-2009) in Liège won the first prize in the international competition held in 1996, and was executed in 2009. Calatrava conceived the station as a link between two distinct areas of the city Liège North is a rundown urban area, laid out in a typical 19th century style. The slopes of the Cointe Hill located on the south host a less dense, landscaped residential area. Calatrava designed a 200-meter-wide passenger terminal, built symmetrically about a northwest-southeast axis that bridges these two distinct areas with an arched roof for the terminal building. In the project of the TGV railway station in Liège, the human body shapes, smooth lines and planes of structural systems with complex vital functions intersecting each other, proved inspirational (figure 4).

Figure 4. Santiago Calatrava, TGV railway station, Liège, 1996-2009

Free form was created, which as a whole was only subject to the laws of its structure. The geometry is only of secondary importance here and does not specify the total conformation. The shape of the building is the result of a free combination of parabolas and sinusoids. However, despite the general concept of complete freedom, it is not arbitrary or accidental, but an unequivocal, orderly design. It is about some subordination of the form to the natural laws of the load-bearing system. We must not forget that even in the most free-forms of nature there is a repeated geometrical order, especially when the whole is not a defined geometrical solid [20]. The project has no facade in the traditional sense, since the interaction between interior and exterior is seamless. The monumental roof becomes, in effect, the project's facade. To an observer on the hill, the roof reveals something of the inner organization of the station. To an observer within the station, the arches frame provides commanding views to the outside. All of these are related to fundamental human feelings, can establish holistic relationships between building, Nature and people.

Built in the shape of the human eye, L’Hemisfèric (1996-1998) is one of the structures within the City of Arts and Sciences. L'Hemisferic is the largest in Spain cinema-planetarium with a screen area of 900 m². It is one of the most striking examples of Calatrava's anthropomorphic architecture in Valencia. Emerging from emerald water, the structure covering the planetarium film theatre and auditorium, completed with its reflection, appears like a huge eye of the Cyclops, whose lid is the openable part of the object. The roof made of glass and steel reaches a length of 45 meters and a maximum width of 27 meters. L’Hemisferic, also known as the Eye of Wisdom”. It is placed in the middle of vast pond and the reflection of the building in the water creates the complete image of an eye. The planetarium globe is placed in middle of the elliptically shaped building, constructed of concrete, glass and steel, and can be seen as the "pupil" of the big "eye". The “pupil” is the hemispherical dome of the IMAX theatre and the “eyelid” can open and close by using hydraulic lifts to operate the steel and glass shutter.
Calatrava wanted to bring water back to the area by creating a reflecting pool which serves also as a stunning artistic display at night when the lighting creates an image of a whole eye. By observing, analysing and studying Nature Santiago Calatrava can extract elements which enable him to make optimal use of materials. He goes further and uses the capacity of organism to change shape, to grow and move such as tensions of muscles reflected in his buildings. Calatrava believes that "architecture and engineering design are organic and related to the form of the human body" [19].

In 1999, Calatrava was invited to design a mixed-use Turning Torso residential tower in Malmö's Western Harbor area which building was planned to be a part an exhibition during the European Housing Expo 2001(Bo01). The project was envisioned as an important part of the transformation program of Malmö's Western Harbor. It was conceived as a free-standing sculptural element posed within the cityscape. The form of the tower is based on one of his sculpture, the Turning Torso, where he abstracts 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 spiralling structural effect. In the residential tower, the building's form is composed of nine box units, shaped like cubes with triangular tips. Each unit houses five floors of about 2,000 square meters and are in fact the 'sub-buildings' of the tower. At 190 meters high, the Turning Torso is the tallest residential building in Sweden and the second tallest residential building in Europe. The entire building is handicapped accessible and features a highly advanced environmental design. Moreover, the engineering technique applied allows for an extraordinarily efficient method of construction. After the sub-basement was erected as a conventional concrete work, the vertical circulation nucleus and slabs were put up using a sliding framework system. The exterior steel structure was then attached, using elements that were in-shop prefabricated. Finally, cranes pulled up the in-shop, prefabricated facade. In this way, despite its highly innovative and complex design, the construction time was reduced substantially [19].

5. Conclusions
Following his significant predecessors' philosophy, Santiago Calatrava relieves it a bit by displaying the beauty that often comes with metaphorical captures of a human body, animal skeletons, structures of
flora and fauna, as well as human movements and gestures. These references to natural forms seen in Nature. Their shape and dynamics, are easily recognizable in Calatrava's works. They are not merely a product of the sculptor's imagination, but they have a foundation in knowledge comprised in bionics, a discipline of science founded in 1960. Bionics is not seen as only a mere application of biological knowledge to solve technical issues. Today, this is a much wider area. It includes examination of the ways Nature uses to solve various problems. And the ultimate goal is to use bionics to build miscellaneous devices and for their functioning, as well apply it in various types of construction. Although anthropomorphism has been an idea afflicted with all sorts of contradictions and controversies, it has repeatedly played a role in relation to architecture - both as a form of thought and as an argumentative support. The transfer between natural forms and synthetic constructs is desirable. According to environmental psychologists, architects should consider both emotional and functional qualities of places [17]. Hence, the purpose of designing places is not only a facilitation of everyday activities should also provide symbolic and affective qualities that may play an important role in attracting people to places. Places are experienced unconsciously and such experience always involves the ‘existential insideness’ of a person. Architecture inspired by Nature is the art that provides such experiences.

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