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Modern Sculpture: Work of Engineering or Art?

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Introduction

In a first approach to the problem, it should be noted that the division proposed between engineering and art is understood in this study as a language game or rather, the consequence of a distinction due to historical development. Engineering moved away from aesthetic categories and therefore does not participate in what is currently understood as an artistic manifestation, as if Architecture is considered one of the Fine Arts. If engineering is limited exclusively to its scientific, knowledge and technical field and is not understood as art, it seems that modern sculpture, located within the field of art, has to face an important dichotomy, since a first approach has much of the first. The size is closely related to the historical development and culture of each era. While `classical' sculpture adapted its dimensions to be ideal concerning its contemporaries, today there is a tendency toward large-scale works that put scale against space and our way of perceiving it. There is an attraction of the gaze due to size, artists tend to make huge works, elements such as human faces out of scale that significantly modify our perception. And it is from this perspective, that it is necessary to analyze the position of engineering about what is properly understood today as art and that represents, for example, sculpture. Sculpture tries to become bigger and bigger because it is associated with creativity and this brings it closer to engineering as the resistance problems begin. The foregoing can be analyzed from two points of view: sculpture needs engineering to be able to "appear" since it needs its structural design component and in this sense, it could seem that engineering is reduced to a mere enabling tool due to the technique. However, it should be noted that the vision of engineering as a uniter of science and art, since its method is not limited to the methodological application of the scientific field and part of the intuition of the engineer, responds to the symbiosis that is established in the case of modern sculpture, which tends to copy what itself is understood as engineering. Based on the above, it could be answered that modern sculpture is engineering.

It seems that today the small is associated with objects, with the functional, with use and such an appreciation would distance sculpture from art that itself flees from such categories. So, it has tended to emulate what a great bridge is, for example, which is undoubtedly something else even though it intrinsically carries a functionality. It can be said that a large work, when put into action, harbors other factors than the smaller work [1]. The objective of works such as this one is to show the common territory that exists between sculpture and engineering since both themselves respond to how to bring the concept to the physical world from the space of ideas.

What is the meaning of bringing something from the world of ideas to the tangible? How is the action of making possible the realization of an idea understood as giving reality to something that until then was only conceptual? The answer is found in engineering, for which it is necessary to define what is meant by engineering.

In a large part of the current works, the collaboration between the artist and the engineer is essential, which has also occurred throughout the history of art [2]. The foregoing gives rise to feedback between the disciplines, for example in the case of engineering with the need for innovation from new materials, new regulations, tests... required in sculptural works that cannot be conceived strictly with the rules that govern engineering works. The raison to be of sculpture is to follow free forms, which move away from structural typologies, from conventional materials, from regulations adapted to solve the problems of engineering work, which in many cases do not coincide with those of sculpture. The foregoing requires decision-making by the engineer without the support of what is known, but in itself, it nurtures the specialty for its possible application in strictly engineering works.

The work process of these collaborations must be shown in their different phases, which will make it possible to show how fragile the dividing line between disciplines is since both are needed in the project. The final element does not arise from watertight drawers in which the artist in the first phase delivers an idea that becomes a reality in a second engineering phase, but it is necessary to go through a joint decision-making path. There are antecedents around the study of the relationship between sculpture and engineering, from the need to vindicate aesthetics [3] and the engineering space as a formal expression as well as a functional tool.

This study answers the first question, which is why in art organic forms have been mainly exploited and in engineering, pure geometric forms have been chosen for the most part. Although in art there have historically been examples of movements such as De Still that revolved around geometry and that coincide in this case with their approach to architecture and the demand for transversality between disciplines, in many cases it has been abstract and its purpose The latter tries to represent a concept through something physical (a painting, a sculpture). On the other hand, in engineering, the geometric domain is undoubted with few examples of an approach to freer forms. This is mainly because engineering has tended to avoid packaging and oversizing, which would come into tangency with the ethical part due to extra cost, which is associated in many cases with free forms. The engineering form has historically been linked to the tyranny of structural typologies, which has undoubtedly led to the oversimplification of the field of engineering expression. However, some examples have attempted to overcome the above with concepts such as significantly [4] or structural truth [5], which advocated escaping from packaging, but with a mastery of technique and search for the essence, which allows transcending the tyranny of these typologies. A previous example and reference in the calculation was Torroja, who greatly liberated forms even without technology thanks to his intuition [6].

Currently, with computer models, the possibilities of playing with geometry without perverting structural rigor have been opened up enormously, and sculpture is an example of this. It is worth mentioning the new materials such as steel, which if in engineering represented a qualitative leap in its development of 2000 years of construction with primary materials such as stone and wood, in sculpture it deserves a special mention. Being an example of what the industrial revolution was, it is also perhaps the material that allowed engineering and art disciplines to approximate, although Eiffel does not consider himself an artist, is not the Eiffel Tower the first example of what modern sculpture is?

An approximation to the problem is found in the concepts of space and place, as evidenced by the works of the artist Chillida with the engineer Fernandez-Ordóñez as well as Heidegger [7], being from philosophy where the answer is found. This crossed artist-engineer-philosopher relationship is not anecdotal. The union of these people and not others (Heidegger could have chosen the work of Brancusi or Rodin) sought to respond to what is also intended in this work: to identify if there are limits where the physical-technical space becomes artistic space [8].

Because of the foregoing and in terms of what sculpture currently represents, there is no difference between the former and engineering than the functionality of the latter and its exempt nature, either of particular elements such as a battery (Figure 1 & 2) in front of the entire bridge or of the bridge integrated into the territory (Figure 3 & 4) in front of the isolated disposition of the sculptural element in the space. The exempt adjective that distinguishes between the sculptural and the engineering becomes latent in the pier of a bridge, which could be defined as a sculpted structure [7] and in which to guess the sculpture only requires its observation without integrating it into the whole of the bridge.

Figure 1: "Devil's Bridge" over the Llobregat River in Martorell, Spain. Source: courtesy Julio Martínez Calzón.

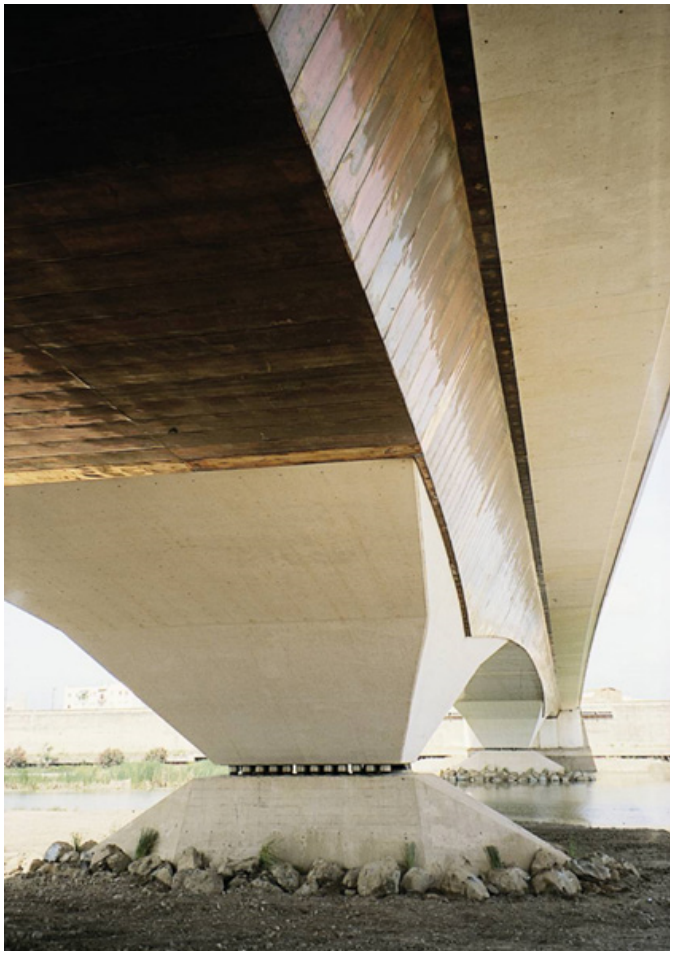

Figure 2: Puente Del Arenal Bridge over the Guadalquivir River, Spain. Source: courtesy Julio Martínez Calzón.

Figure 3: "Puente De Tortosa" over the Ebro River, Spain. Source: courtesy Julio Martínez Calzón.

Figure 4: "Puente de Miraflores" over the Guadalquivir River, Spain. Source: courtesy Julio Martínez Calzón.

It is necessary to resort to the significant adjective in terms of the form of engineering, since the signs themselves have a deep intellectual value, as is engineering itself. The sign is an intellectual value, not of nature. The sign is something human that comes from the depths of the human being; a sign can only be understood by humans, animals or nature has no signs. Hence, engineering makes the territory signify, that this value is transcendent since it exceeds what is currently achieved by sculpture, which is limited to the local.

The engineering form came out of a universe that had not participated in the formal fact, it was foreign to the previous creation of man because structures, for example, have not been a sphere of action for the man until relatively recently and what we have extracted from that area is significant from that area and was therefore not in anything that had been talked about until then. Who had talked about a truss or a cable? Nobody did exist and the fact of the cable-stayed bridge, for example, even if something like lianas had existed, is a current concept; it is significant where it has come from, the intensity of those materials. The foregoing marks the distinction between engineering and science since the latter discovers what exists, the meaning itself is the transcendence of engineering [9] above the sculpture. As an example, it is worth mentioning the metaphorical extraction of a mine, of a material that had never been discovered, that material has its forms, as does wood or iron and sculptors know very well that the form of wood cannot be the same as iron or alabaster, since those forms that each material proposes as the truly significant ones are proposed by engineering because the engineering fact had not been discovered. It should also be pointed out that the significant experience of the engineering fact, of the engineering of large works, is also a revealing proposal.

An approximation to art is found in the great works of engineering because they share in a certain way what is exempt from the work of art. There is no reductionism in the limitation of

the art to the great works, which with a functional character have an exempt character in the field of life, serve as an example the great bridges such as the Golden Gate. And even so, engineering is capable of overcoming the exempt, since it is easy to identify the particularity of works such as highways or railways that are beautiful in their extension as a form in itself in the space of the landscape, of light, of chromatism... and they are examples of how engineering proposes an experience that we will call significant.

The concept of exempt is important in terms of large works to limit the study to others such as sanitary, drainage..., which also make up civil engineering. However, this aspect reflects the pyramidal nature of the disciplines in terms of excellence; as are single-family houses in architecture, and certain musical styles, which do not reach aesthetic or artistic categories of value, for the mere fact of being framed in areas of art.

We speak of exempt engineering work as a work that is surrounded by space, which carries the significant exempt form and therefore creates a reference power that eliminates another type of form; it is also an enabler of significant experience. This attempt to concretize in the line of adjectives and the importance of language follows authors such as Torroja who, with precise words such as effort, movement…. was a reference and has come to this day; The foregoing is considered convenient in the present work, compared to other authors such as Ortega, whose meanings differed according to the context.

As shown above, it can be said that sculpture is engineering; however, engineering is more than sculpture.

Engineering, like sculpture, determines its presence through the way it is put into action [10]. However, in the case of engineering, the form does not come from merely historical, organic, "costumbrista" references, but is determined by the technical-natural world that formalizes them, which is why the distance between sculpture and art is found since they are somehow strange to the viewer. This difference in the concept of form, or more precisely the new kind of form that engineering generates, is what authors designate as true form or significant form [1], which imposes or impregnates a specific character, in a certain sense of an abstract character, concerning the world of "human" or realistic forms, with all that this adverb can imply of being imprecise.

The observation of a bridge is archetypal of everything previously established. They could be assimilated into sculptures, but they have an intrinsically added step that goes beyond the artistic. Objectively it can be affirmed that there is an important correlation with sculpture through form and space, but in bridges, the space is open, it has to face the specifics of each location and the dialogue is circumscribed to nature itself: deep valleys, immense mountains, etc. It is in the common bridge-nature game where the artistic fact appears, in the domain of the territory, of the immensity of nature. It could be said that beauty arises from the ability to subjugate the natural in another specific form of conceptualization. It is a beauty not delicate, or tactile, but limited to the concepts of force, majesty, and infinity. Engineering synthesizes the beautiful not in the modern sense of the term, which today is polished and smooth like a mobile phone or even modern sculpture, and where the difference with it is, it gives us a genuinely aesthetic experience, it is not complacency, because what you face when approaching a work of engineering is discovering your limitations. Primary limitations such as vertigo, the sensation of suffocation, the wind, anxiety in comparison of sizes... not to point to a second step, to bewilderment in the face of the unknown, to the complexity of the intelligentsia of the engineering element. Calls to the limit, or to the border, which opens beyond what can currently be known [11] and in a certain way, close to the romantic in what this term incorporates of sublime.

Based on the above, engineering approaches what art itself is, not necessarily current art. Another of the variables that engineering dominates, such as distance, is also being used by modern sculpture, in an attempt to return to the origin in certain cases, but this is currently difficult to achieve.

Current art tends to anesthesia and to play with the distance of the spectator in terms of closeness, it proposes that the work be touched. Engineering is identified with the classic work insofar as this concept of distance, it is necessary to move the viewer away for physical contemplation, and metaphorically in its intellectuality in the face of the proximity of the primary or anesthetic experience of what is presented as an artistic manifestation today in day.

The foregoing leads us to detect the complexity that engineering finds in fertilizing the common ground that it should share with current art and therefore with modern sculpture, which goes from being exposed to "putting on" so that it is "handled by the viewer", thus as too much pre-specialty, so evident, that there is nowhere to go through knowledge [12].

Engineering finds identification with art if the concept of concealment is used, in the sense of appearance-disappearance [13]; if the importance of playing between presence and absence for art is identified, the art of engineering will become visible. This has a wide spectrum, of the visible and the hidden; it hides more than what appears on the outside and that is where the accent is placed in this work; in not trying to demystify the artistic manifestation until making it so close that it is consumed, one must avoid secularizing, eliminating meaning for the sake of being able to play: without distance, mysticism is not possible. It's why technology tends to spawn what it likes, including the sense of touch, zooming in and demystifying and exemplifying the polish of touchscreens [12], which is far from rudeness in many cases of engineering work.

Engineering shares with art the territory of the sublime, which beyond romantic considerations, aims to recover the transformative sense and flee from dependence on the material in search of truth, beauty, and that twentieth-century society has reviled.

The great current constructions do not have to move away from the sublimity as some authors point out since they are not reduced

to the material that generates well-being, but their grandeur mystifies and in their domain, man captures the sublime. The fact that uniformity has lateralized in modern cities, for example, the sublime, the beautiful and the intimate that give rise to the poetic [14] do not justify that mastery of technique is only an illusion of being above everything, but that engineering can become sublime since what is also beautiful and sublime is what is big, solid, dark and rough [12].

If the grandeur of constructions is not to be confused with the sublime, neither is it to be eliminated; it simply has to be considered, in the need to project what is useful, primarily beautiful issues in the sense of the Greek term "kalon" the elevated, the dignified, the sublime. It can be concluded that modern sculpture indissolubly needs engineering and its technological support in this trend of great works and free forms, undoubtedly helped by the progress in recent decades in the computational calculation of structures. Likewise, it is necessary to bet on common territories rather than on islands of specialty and knowledge. The foregoing will allow us to answer the question: art or engineering.

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