



Research Paper

## Building Failures: A Philosophical and Ethical Tragedy

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### Abstract

Like engineering, Moral Philosophy (Ethic) is a science because it comes from philosophy and moral, as expressed by Perez (p.13). So understood, ethic should play a principal role in all human activities, between then, the civil and structural engineering, even more, because, as Master of Engineering, Cross point out, the objective of the engineering is to serve to the humanity, building your homes, the real only place where people feel good and safe and where they have all their belongings and memories. To preserve all this treasure, the homes, like other construction developed by engineers such as bridges, ports, airports, roads, they should be constructed with ethic to guaranteed that they will be safe to serve the purpose that they were built. But appear that today, this noble objective is blurring in a materialistic world that has completely forgotten ethics. The objective of this paper is to make some appreciations about this regrettable situation, that, sometimes, has transformed the beautiful engineering profession in one merely mercantilist with a total absence of ethics, considering the complex ethical behavior of engineers. About the abolition of transcendence in modern society, Leisenberg, in *Pluralismus und Ethos der Wissenschaft* (p.177 - 178) quote German Philosopher Hans Jonas, who said, that this fact, is "den wohl kolossalsten Irrtum der Weltgeschichte"<sup>1</sup>. The objective sought, will require us to return about 14000 years, to inquire about the human behavior and to clarify the importance of philosophy and engineering sit at the same table to look for solutions to the real problems that arise in a realworld.

**Keywords:** Philosophy, Moral philosophy, Ethic, Engineering, Catastrophes.

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### I. Considerations related with the complex ethical behavior of engineers

First of all, we must look back to understand what has happened with humanity and asking ourselves what relationship exists between philosophy and engineering.

Usually, to achieve the objective sought, looking back, the Heideggerian Historical-Heuristic methodology is used, because this method studies "human action", understanding that, as mentioned by Turtulici et al. (2015):

"Every understanding is different; its meaning is determined by the historical situation of the interpreter and by the interests of each age in its purpose of understanding itself in the light of tradition".

It is therefore necessary to look back, because, as stated by Heidegger (1967, p. 5):

All asking is a search. All search is pre-guided by what is sought. To ask is to seek to know the being as to the fact that it is and its being-so. Cognitive search can become "research, that is, a discovering determination of what is being asked. Every question implies, as far as asking for..., something called into question *Sein Gefrachtes*<sup>2</sup>...

And continues (p.7):

<sup>1</sup> The most colossal error in the history of the world. TA

<sup>2</sup> In German: „Jedes Fragen ist ein Suchen. Jedes Suchen hat seine vorgängige Direktion aus dem Gesuchten her. Fragen ist erkennendes Suchen des seienden in seinem Daß-und Sosein. Das erkennende Suchen kann zum "Untersuchen" warden als dem freilegenden Bestimmen dessen, wonach die Frage steht. In my opinion, Heidegger, who always treat to create new words and to play with words, have used the word Daß- (sein) instead Dasein (thinking being) with the same meaning and Sosein instead So Sein (so being.)

To look to, to understand and conceptualize, to choose, to access..., are behaviors constituting the question and, therefore, also them, ways of being of a particular entity, of the other that we are in each case ourselves, those that we ask.

It will be investigated, which path has chosen, in this modern world, the "human action" mentioned above, in its concrete actions, asking why engineers, between others, abandons ethics, regardless of the damage it does, when is designing or constructing, for example, a building. Heidegger states (1976, p.33):

That Descartes "depends" on the medieval scholastic and uses its terminology; it is seen by any connoisseur of the Middle Ages... In other words, destruction is confronted with the task of interpreting the bases<sup>3</sup> of ancient ontology in light of the problem of temporality.

But what is the relationship between philosophy and engineering? They are many probable answers, but I find very simple the following explanation given by the Spanish philosopher F. Savater, who points out:

Let us say there are three different levels of understanding:

- a) The information, which presents us with the facts and primary mechanisms of what happens.
- b) Knowledge, which reflects on the information received, hierarchies its significant importance and seeks general principles for ordering it;
- c) Wisdom, who links knowledge with the vital choices or values we can choose, trying to establish how to live better according to what we know.

I believe – says Savater- that science moves between level a) and (b) of knowledge, while philosophy operates between b) and c). So there is no proper philosophical information, but yes there can be philosophical knowledge and we would like to come to the philosophical wisdom as well (Savater 2003, p. 18).

From this point of view, science and philosophy have in common knowledge and can dialogue and walk

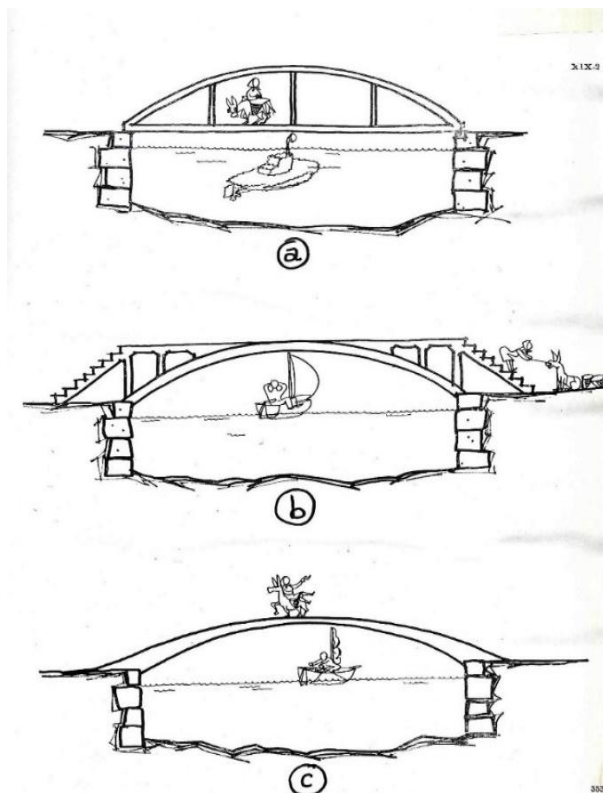


Figure 1. The ethical work of the civil engineer.

together, each with its own identity. Because engineering is a science can dialogue and learn from philosophy and, respectfully, vice versa, but, related with all ethical considerations in field of engineering, it is very important to understand, that engineers handle with “design problems”, not with “scientific problems”.

But let's start by defining what it is the engineering civil: it is the art of applying science to the solution of the different situations that are presented to the humanity in its permanent walk through its world. When these situations have to do with the modification or adaptation of the environment in which man moves and is required to create civilization, that engineering is given the name of "civil", which comes from Civitas, city and civilization.

Figure 1, by the Master of Engineering Eduardo Torroja (p.353) clarifies in a simple and wise way what has been mentioned: in this case, there is a problem to be solved, which is to cross a river. Alternatives (a), (b) and (c) are feasible, but, when *all* the requirements expressed by the concepts of safety, serviceability, economy and aesthetics are considered (see section 3.2), there is only one that meets these requirements and that is (c). This doing that considers all the needs, all the norms, is, par excellence, an ethical work. For this reason, the

<sup>3</sup>In the translator's notes of “Sein und Zeit”, Chilean professor Jorge Eduardo Rivera clarifies that in the original text "des Bodens" which literally means the soil, from the ground on which something grows, it was translated as "of the bases". I consider more accurate to translate the word "des Bodens" as "from its origins".

work of the civil engineer, in addition to being a design work, is an art, in which different alternatives, different needs, must be studied to differentiate it from a scientific work, which usually works with unique solutions. The consideration of this point is fundamental because it is there, in this study of alternatives, where you can "sneak in", without making fuss the fuzzy ethics, by presenting alternatives, for example with safety factors lower than those required, as happened in 2013 with the Space residential complex in Medellín, which had to be demolished in its entirety, after the collapse of its tower #6.

In contrast to scientific problems, design problems have no unique answers; it is absurd, for example, to request the "correct answer" to a design problem, because there are none. In fact, a "good" answer today may well turn out to be a "poor" answer tomorrow, if there is a growth of knowledge during the period. [And continues] A design problem is *not* a hypothetical problem at all. Design has an authentic purpose-the creation of an end result by taking definitive action or the creation of something having physical reality.

This fact, is a first very important finding, related with the ethical behavior of engineers, because there is not only one truth, but there are also multiple truths, and they all can be correct – it should be highlighted, that sometimes, for different circumstances, some answers to a design problem are not correct and these answers conduce to catastrophically failures-. Finally, Shigley reminds us, that: "In the meantime, however, the engineer has a job to do, a design to produce; he requires answers today, not next week or next year" (1983, p. 12). In this way- always working under pressure- usually, there is no time to think twice about the chosen solution, there is no time to build a model, which can conduce that the adopted "valid solution" it's finally wrong. This situation represents a second very important finding about the complexity of ethical behavior of engineers.

Coupled to the situations described due to the work of engineering is the abandonment of ethics, hard to understand, because the inherent relationship between moral philosophy and engineering. But trying to understand this "Abschaffung der Transzendenz (abolition of transcendence)" quoted by Leisenberg, mentioned above, we must look for ways out of the crossroads. Ortner (1988, p. 71) raises this situation with a fundamental question of Alexander Solschenitzyn: "Ist unsere Gesellschaft noch ethisch gesund?"<sup>4</sup>, and based in an analysis of current life in year 1988 in Germany, points out that the suppression of ethics has led to the emergence of painful crises with serious psychic-spiritual problems, including:

- Kontrasozialer Egoismus
- Angst von der Leben ( dem fremdem und dem eigenen)
- Konsum und Verschwendungsmentalität
- Abtauchen in die Illusion von Scheinwelten
- Flucht in Pseudoreligiosität
- Anwachsen von Verhaltensnöten bei Kindern una Erwachsene
- Deutlich steigende kriminalität vor allem bei Kindern<sup>5</sup>

These very important conclusions are today more valid than ever and give a fundamental answer about the ethical crisis in science and engineering, in our pandemic and transhumanist world, and represent our third finding, related with the ethical behavior of engineers.

To understand the human behavior in its abandonment of ethics, we must look back to understand whether this evil of modern man has always existed or if it is something current, that accompanies today is cyber being. We set out on the path already with the certainty that ethics (moral philosophy) and engineering - and science- must or should walk together, giving a quick look at the beginnings, the pre-philosophical and pre-engineering times and then their becoming past the Middle Ages until we reach the present day. To understand the magnitude of time in each of the stages of that walk, emulating Carl Sagan, in a later chapter, we will compress, in an imaginary year, the last 14000 years of human history, approximately since the end of the Paleolithic and the beginning of the Neolithic in a table, finding that the last 20 years, correspond to the last afternoon of that imaginary year, its last sunset.

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<sup>4</sup>Is our society still ethically healthy?

<sup>5</sup> -Selfishness against society  
-Angst of life (of others and of oneself)  
-Consumption and waste mentality  
-Diving into the Illusion of sham worlds  
-Escape in pseudo-religiosity  
-Growing behavioral needs in children and adults  
-Significantly increased crime, especially among children

A last finding, the fourth, related with the very special being of engineers and his ethical behavior, perhaps is related with the abrupt process of change of the actual society, that violent the being who finds no response in science. As Kick (1988, p. 35) stablished:

*Weithin besteht Einigkeit darüber, dass unsere Gesellschaft – und mit ihr alle hochentwickelten Gesellschaften- tiefgreifenden Wandlungsprozessen unterworfen ist. Die Bindung an religiöse und moralische Überlieferung ist schwächer geworden, ohne dass die objektivierenden Wissenschaften einen Ersatz bieten könnten*<sup>6</sup>

Let us begin by trying to read that past, to understand the being of these cultures, through his engineering legacy, because in this engineering construction is written the history of each culture, as Rodin (2014, p. 44) quoting Victor Hugo rightly says: “*Durante la Edad media, el género humano no pensó nada importante que no esté escrito en la piedra*”<sup>7</sup>.

## **II. Is it worth to looking back?**

After this introduction, we will return to the question if It is worth to looking back. One might wonder whether research on the current state of engineering that includes a historical review of the construction and development of structural theories has a place in this virtual and impersonal world today. Perhaps it was the German statesman Otto von Bismarck, who more than 150 years ago, answered this concern when he expressed, “We must study and understand the past, so that this may be a teaching for the future”. Those, who preceded us, that chain of men who with character devoted their lives to developing the sciences of material resistance and structural theory, bases of civil engineering, taught us that theory and practice must go together and that we must have enough humility to accept, that what we have received, and it seems clear to us, represents the knowledge of many, who with their work have allowed us today to carry out the increasingly complex tasks of engineering and especially structural engineering, despite being a very old art, is a relatively new science.

Professor Lorenz (1913, p. 644 - 645) masterfully describes this situation:

*Trotz der regen Bautätigkeit alle Kulturvölker im Altertum und Mittelalter finden sich in den Literaturen dieser Zeiten keine Spuren wissenschaftlicher Überlegungen über die Ihr zugrunde liegenden Materialeigenschaften. Man begnügte sich offenbar in den Kreisen der ausführenden Handwerker mit einfache Faustregeln, die, von einer Generation der anderen überliefert, nach aussen hin als Geheimnis ängstlich gehütet wurden un nur selten auf Grund neuer Erfahrungen eine Erweiterung erfahren. Die Bauleitenden Architekten dagegen fühlten sich. Wie auch heute, vorwiegend als bildende Künstler und kamen jedenfalls über die Anwendung des seit Archimedes bekannten Hebelgesetzes nicht hinaus, wobei stillschweigend die Baustoffe selbst als starre Körper betrachtet wurden.*<sup>8</sup>

This situation described was not changed until the beginning of the seventeenth century and only from the middle of the nineteenth century, structural theory began to develop, systematically and with it, the constructions of civil engineering, as we will see later. Understanding engineering thinking requires going backwards, to try to understand how buildings were born and evolved as Aristotle pointed out in his book Politics, as Quoted by H. Straub (1975, p. 7): “Man wird am besten zu einer Erkenntnis gelangen, wenn man die Dinge vom Ursprung her in Ihren Werden und Wachsen betrachtet”<sup>9</sup>.

## **III. But really, can engineering talk with philosophy?**

At this point, we must solve following fundamental questions: Should philosophy be complex? Should philosophy handle only complex reasoning? Normally not, especially when it comes to problems that concern us all, the everyday situations. That is why, it will be explained in a simple language, the relationship between

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<sup>6</sup> “There is a widespread agreement that our society –and with it all highly developed societies- ist subject to profound processes of change. Wherever we may look, ties of religious and moral traditions have been weakened, without the objective sciences providing any substitute.” [Translated by Kick]

<sup>7</sup> During the Middle Ages, mankind did not think anything important that was not written on the stone.

<sup>8</sup> “Although all civilized peoples in antiquity and the Middle Ages had great constructive activity, no rational reflection on the resistance of structural elements or the fundamental properties of structural materials is found in the literature of those times. Some simple empirical rules were carefully managed and kept in the circle of construction craftsmen and passed from generation to generation without appreciable changes. Architects were considered construction artists and rarely went beyond the application of the lever law, known since the time of Archimedes, which implicitly regards building materials as rigid bodies” [German translation by the author]

<sup>9</sup> “Knowledge is acquired, when things are looked at from their origin and evolution”.

engineering and philosophy with the short history “Sofía and Genie are in the field”, where philosophy, under the name of Sofia and engineering, under the name of Genie [Pronunciation: Dyeeni], engage in a conversation that help to give an answer to the above-mentioned fundamental questions: This day was different, it felt different, and everyone felt a fresh gentle wind that encouraged them to go out. In the mountains that lined the city, you could see a faint haze that, feeling the heat of the sun, fluttered with joy, and began to rise to reach that blue sky, which bathed the city that day, which was ideal for going for a walk. At the top of the mountains were footpaths with forests and streams that invited contemplation, reflection, and learning, of which pristine nature, there in its simplicity, taught us. Already in the early hours of the morning, people were seen in groups or alone enjoying that special day, that clean air, peeking into the dew-covered leaves and the small streams with their slow walk, beginning their journey to reach the sea.

In this beautiful environment, by chance, by one of those chances that arise when special events occur, two lonely walkers, lovers of wisdom and knowledge, were found and decided to continue together the way, without any haste, for they were only moved and motivated by the desire to understand all that this forest, silently, offered them. The eldest, who already showed some white threads in her head and a shuddering peace, said her name was Philosophy, but that those who knew her, called her Sofia. The other, the youngest, had a longer name: Civil Engineering and explained to Sofia, who called her Génie, because in French, her name was called Génie Civil, a name she liked because she was a complete lover of the sweetness of that language. Thus, made these presentations, Sofia and Génie continued their journey, talking, as old friends, as if they had known each other forever and, for some reason they did not know, they had walked away. As Sofia looked up at the sky and the distance and ecstatic with the beauty of the shapes of the mountains and with the streambed, Génie did not look away from what surrounded her: the shape of logs and tree leaves, the ingenious tricks that plants used to grow together, the fort supporting the weak and how animals made their nests.

SOFÍA- You know, Genie, when I come to this place I am amazed at the beauty of the creation and reflection on his permanence, threatened at every moment by man, by his works.

GÉNIE- I agree, but these works are required because the population grows. Remember that about 14000 years ago, our ancestors lived in caves to protect themselves from the inclement weather and animals, but that was an insane, dark and in the midst of an ever-humid environment. Something had to be done.

SOFIA- I agree with you and, in fact, little by little, those cavemen, came out of those caves and started building shelters in the countryside, next to the rivers, but the important thing is not the act, what is done, which in this case is necessary by the way, but as it is done.

GÉNIE- That is or should be the guiding principle of every work, of every project, no matter where, or for whom it is done. And, let me tell you a little of those beginnings, when men started to come out of their caves, because I know this knowledge will make you very happy. They, like us, were very observant and look, they saw that in the banks of the rivers grew very long reeds that bent and intertwined each other forming a kind of vaults, which allowed them to stay there and protect themselves from the rain and the winds. Thus, they began to apply this knowledge, which lovingly gave them nature and began the construction of houses and then villages, with total respect for nature.

SOFIA- Look at Genie! See how those little ants that work frantically to build their nest, do it in an orderly fashion, taking pieces of sand from the same earth and forming a small mound so that the water does not flood the nest. Animals, like the primitive men, respected the nature, solved their problems without harming it, but that is no longer the case. You do not know what I reflect on and try to understand, which is what led humanity to break these natural principles, to confuse good with evil, to choose paths that serve only one, harming others. From these villages, where one lived in harmony with nature, using only what was required, towns and cities emerged and, from the increase in the population, a bad so-called greed appear, which confronts individual values within the communities, enriching some and impoverishing others.

GÉNIE- You don't know Sofia, what haunts me that situation, because my work is related to construction- that under that principle of greed, which is the one that moves today the work of humanity, perhaps it should be said better, destruction- I am aware of it, but those who hold power, do not understand this that you and I are talking about and how important it would be, that you could speak to all of them, and from your wisdom, you made them see, that their clumsy gaze will lead to this world becoming a real hell. You Sofia, who has come to look beyond what sees the short-sighted gaze of this modern humanity, should always be present, with your teachings, in city decision-making, to prevent that unwanted world, which we already live, from continuing its unstoppable and destructive march.

So both friends, who now understood that they should always march together, reached the highest part of the mountain, from where you could see the city. There, tired of the long walk, they decided to sit under a leafy tree, a red ceiba, to enjoy the wonderful concert, which with its many leaves offers, when the wind, makes them vibrate in full harmony, looking like to multiple dancing wings. After a while of silence, the conversation continued:

SOFIA- Génie, our city, being a friendly and quiet, has become an aggressive and uneducated. Greed has killed Ethics and, in these conditions, people, in crowds, lose respect for others. I cannot understand the reasons why,

the city, which used to be green, has now filled it with tall buildings, where people live in a jam, which is the germ of all violence. It is built to the sidewalk and no room is left for enjoyment, forgetting everything that nature has taught us, as we could see today in this delicious walk. Remember the little ants and how they did their nests, completely tidy, just as bees, wasps and birds do? This so-called progress is of no use, if humanity does not reflect and look at the distance and settles, with the clumsy gain that gives it its short-sighted gaze.

GENIE- It pains me to see what has been done with the city, look at the river, turned into a straight channel, for those who planned the city, without compassion, took away from the river its sinuousness its meanders, places where it vibrates and lives life, to turn it into something like to a sewer. But that is not all Sofia, look, that instead of leaving aside and side of that canal a bank planted with trees, they built was huge concrete highways, just killing what was left of the river. It is an attacked city. There is a lot to say, but let us stop here, so we do not get sad anymore. For me, it is clear what I have learned with you Sofia, that civil engineering, needs the advice of philosophy, to achieve constructions that are in accordance with moral and ethical principles, which are the only ones that lead, to justice, to have safe constructions for all.

Thus, as the afternoon began to fall, both friends began the return, to that chaotic and aggressive city, arising from greed, which looks forward to the day when it is banished, by the full conviction of those planning the buildings and the city, that these will be feasible in the long term, if knowledge of engineering works, hand in hand, with the wisdom of philosophy.

#### IV. The imaginary year

Emulating Professor Carl Sagan, by clarity, these 14000 years will be compressed into one year, as seen in the following table, corresponding, the last 20 years of this history, a time that I gave him the name of "Last Age", dominated exclusively by dizzying developments in the world of computer science, globalization, and obsolescent consumerism. These 20 years correspond to the last half-day of the imaginary year, in which the knowledge of humanity is being violently reevaluated, jumping upon being and seeking for a new eternal being: a complete tragedy.

**Fig. 1: The imaginary year**

Historical era	From	Until	Years	Days of imaginary year
Prehistory and Antiquity	-11980	500	12480	325.0
Middle Ages	500	1450	950	25.0
Modern Age	1450	1790	340	9.0
Contemporary Age	1790	2000	210	5.5
Last Age (Last afternoon)	2000	2020	20	0.5

During the Neolithic revolution, 12000 years ago the small groups of nomadic hunters transformed into sedentary societies beginning a real agricultural revolution, that made necessary to build small constructions such as houses, small bridges, defensive walls, canals, barns between others, that should be weather resistant. To solve this situation, was necessary to observe with care the behavior of the nature, in other words, to understand how, for example, the trees was able to resist the wind, the rain, the flood and which were the behavior of the different soils and rocks. So, with all this knowledge, with small steps, begin the humanity to build his first constructions and to develop the first ordered rules, that should be considerachieving resistant and durables construction.

Depending on the location of the village, different materials and types of constructions were used. Overtime, the people of different community's interchange among them, the gained skills, expanding, with this procedure, the engineering knowledge, that, as was said, was purely empirical.

In the beginning all the knowledge was transmitted by words of mouth and with the use of complex symbols, but perhaps, 3000 years ago, appear in Sumerian and Egyptian cultures, the first types of writing that allow to represent ideas related to objects and to begin to make compendia of the gained knowledge, to record commercial transactions, write the first engineering codes, between others. The small villages become into towns, such as Terra Amata in France circa 400000 years old and Catalhöyük, in the actual Turkey, built about 9000 years ago. As the civilizations grew more complex, was necessary to build, new and big buildings, between them temples, where gods were worshipped, such as the ziggurats with tall, stepped towers, representing perhaps mountains to reach gods. The ziggurat of Ur from around 2200 a.C. represent one of the most notable engineering works of antiquity. In this context, it is important to mention the lighthouse of Alexandria (350 A.C.), with a height of 100m and one of the seven wonders of the ancient world.

Thousands of centuries passed as humanity added its experiences, to build better and better, seeking its constructions to be, in addition to functional, safe. Thus, constructive practices were developed that were transmitted, from generation to generation, by these first builders and put into codes, the most memorable

example being the Hammurabi Code (-1792 a.C.-1750 a.C.), of which it is worth transcribing two very important laws related to construction:

Law 229: If one builder made one house for another and did not make it solid and if the house, he made collapsed and has caused the owner of the house to die, the builder will be killed and the

Law 230: If this caused the son of the homeowner to die, the builder's son will be killed.

Later, the roman architect Vitruvius (81 a.C.-15 a.C.) publish the ten books of architecture (Valencia 2010), a kind of regulation of how buildings should be built, so that they are safe and aesthetically pleasurable.

In wanting to go backwards, we find a first great obstacle, because, as Professor Lorentz mentioned (1913, p. 644 - 645), in ancient times there is no written vestige about that "birth and evolution" of the buildings, because of the lack of writing, because it was perhaps, about 30000 years ago, when the first words used by man were heard, seeking to convey his needs and desires. Perhaps the words were only growls, but they represented a breakthrough in the way they communicated up to that point, through gestures, in wordless language. That desire to express what they saw and what they felt led them to experiment with the painting, with which they depicted animals, hunting scenes and, in a later advance, expressed movement, in scenes of animals running or fighting. About 5000 years ago, in the Neolithic period, pictographic and ideographic writings appeared, with signs depicting animals, people rivers and objects, allowing stories to be told, and it was that, the first time of written narration, motivated by the need to communicate the meaning and the lived: it was a time of freedom in the search for expression, that allowed them to move from grumble to the verb, which already expressed an action. It is beautiful, to see, for example, as those early writers expressed, gathering drawings, a verb, a state and, thus, for example, drinking was represented as closed red lips, by whose commissure ran a thread of blue water. The whole universe of word and writing was ready to be discovered and used.

Along the way, other peoples with advanced knowledge, such as the Sumerians and the Egyptians, turned pictograms and ideograms into symbols and hieroglyphics and, finally the Phoenicians, those navigators, and exceptional merchants, developed the first alphabet with 22 characters, which was known to the Greeks during their intense trade with the Phoenicians and from there came to Rome.

The Greek philosophers began to elaborate this first scripture and to precisely define the meaning of the words. Socrates is reminded to say to Fedro (Platon 2017, p. 203 - 213)<sup>10</sup>:

Do we have to praise, both you and I, the speech for having expressed its author the right thing, and not just because we have been able to give the words the proper clarity, roundness, and accuracy? (Fedro 235(a), but in his intimate being, Socrates doubted the word because it served to "trick persons without substance, to assert each other" so he told Fedro referring to Lysias (243 a): "..., but even more, his simplicity was truly exquisite, for, without having said anything reasonable or true, it seemed as if he had said it; (...).

These words of Plato in El Fedro are prophetic for the break-up that is lived today in the world of writing and writers. From Charlemagne's hand the writing followed his progress and appeared the handwritten books, true masterpieces of scribes and illuminators. It is very important to mention, that was in that middle age- considered by the humanists of the fourteenth century, erroneously as a time of darkness- that the historical problem of developing the simple was solved to allow the development of the most complicated, necessary step, for the arrival of the Renaissance and the Modern Age, Goetz et al. (1933, p. 6).

However, without this written record, we will go back about 14000 years, because it is necessary to go backwards to the moment when humanity left its transhumance and its life in the caves and settled next to the rivers, where it had the need to build different types of works. It is therefore necessary to investigate constructive customs, to read the messages that these primitive constructions convey. This is wordless language, but it is necessary to reach out to it and understand it.

The developments of the construction systems continued with the discovery of the arch, the vault, and the dome, which with its wonderful structural work, due to its shape, allowed us to make constructions of which today we marvel, representing, the Gothic cathedrals their maximum expression. The master builders of antiquity and the Middle Ages had developed empirical rules, for their constructions, but even understanding the flow of forces through structures, they had no theory that would allow them to express with a mathematical language their knowledge, so that they could use them in similar or more monumental situations.

It followed the Middle Ages in the modern era in which there was a triumph of science over dogma and began an accelerated development of the understanding of the functioning of structures and, of the wonderful union of experimentation, physics and mathematics, structural theories and the first building codes emerged, which allowed to build safely, structures of all kinds, such as buildings and bridges. These advances continued to this day, especially with the advent of electronic computing, which has allowed engineering, to safely raise projects never before imagined. But, after this epic that had the efforts of thousands of wonderful

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<sup>10</sup> Probably, this translation, made by the author and verified with the help of the Google translator, is closer to text of Plato, than other English translations, for example, the one made by Jowett (2009, p. 6 -11).

mathematicians, physicists and researchers, each putting their best into rudimentary engineering research, something unthinking is happening, because, as knowledge grows, the number of structures that fail, grows equally.

## V. Some thoughts about structure failures

„Man mag immerhin Fehler Begehen-bauen darf man keine“ Goethe<sup>11</sup>  
“Con la ignorancia armonizan bien los errores” Concepción Arenal<sup>12</sup>

The two sentences with which this introduction begins, contain the essence of the catastrophes caused by poor design and construction practices. Let us begin by defining what is meant by engineering: it is the art of applying science to the solution of the different situations that are presented to man in the permanent walk through his world. When these situations have to do with the modification or adaptation of the environment in which man moves and is required to create civilization, that engineering is given the name "civil", which comes from Civitas, city and civilization. For this reason, it was civil engineering, which enabled during the last 14000 years, from the end of the upper Paleolithic and the beginning of the Neolithic, the development of humanity, allowing man to leave the caves and change his transhuman life for a sedentary life. Seated next to the rivers, the first men, those first engineers, saw as on the banks of these rivers grew long reeds that curved by their weight, but that intertwined each other, to form minimum spaces, where they could protect themselves from wind and rain. So, with his knowledge completely limited, but with the need to build his safest and toughest homes, these early engineers began the long journey of knowledge, which allowed them to build houses and villages, roads and bridges, dams and irrigation systems, structures for the winery and ports, great strengths for defense and all that countless works that have made possible, not only the city as we know it today, but the communication between cities and countries, a fundamental basis of the exchange of goods and services, of the modern world. This long path of research and knowledge has been guided by civil engineering, hand in hand with ethics, for that, always sought to make its constructions not only serve people safely, but often, remain as a testimony to that engineering made with understanding, which was based on the fundamental principle that the work that came out of their hands, should be good and durable in time, which in many cases has allowed us to be amazed by these wonderful constructions to this day. As said, nearly 14000 years have passed since man left the caves and the degree of knowledge in civil engineering has grown more and more, accompanied by the emergence of powerful computer tools that allow successful and safe, increasingly demanding civil engineering works. But contrary to what might be expected, there are growing catastrophic failures in many of the works projected by modern civil engineering, which cause serious harm to people and society. In the search for an answer to this situation, a brief description of some relevant historical facts should be made, unfortunately, for space reasons, this description should be left for another paper.

As mentioned, the Heideggerian Historical-Heuristic methodology was used, in the research that has allowed the writing of this paper, for this reason, at this point, can be conducive remember the Heidegger's thinking, as interpreted by those who knew him, narrated soberly in the documentary "Im Denken unterwegs".<sup>13</sup>

## VI. The Inherence of Evil

The sedentary way of life of neolithic bring new tasks and a new activity, which these first men, warriors and hunters did not know: the construction, because, above all, they needed a refuge, a home that protected them from animals and the inclement weather. Thus, each group, depending on the materials it found in the place where it had settled, whether wood, stone, or clay, began timidly, observing and learning from nature, to build the first houses, the first abodes, which were built with caution and wisdom, appearing everywhere villages that traded between them. This was a golden age of humanity's development because greed and evil were still far away. The villages were growing and required silos to store food, bridges, irrigation systems, among other construction works, such as defense walls. The population increase required the emergence of people specialized in monumental constructions, such as palaces and churches, realizations of true "master builders". But, next to these early men and those early builders, came a pleiad of "tricksters", who, filled with greed, forgot the common good, the necessary security that should have the constructions because were

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<sup>11</sup>“Mistakes can be made, but never in construction” (Cited by Albrecht1977).

<sup>12</sup>“With ignorance mistakes harmonize very well”.

<sup>13</sup> Ballesteros translated "Im Denken unterwegs" in Spanish as "De camino al pensamiento", translation that we find wrong. For this reason, we propose following translation: "Pensando en el camino" that reflects the intention of the filmmaker of the documentary, professor Wisser. In English could be translated as "Thinking on the road"



only interested in large profits: the "human evil" was always there and this was why, it was necessary to try to control this "inherent evil" through codes like Hammurabi's already mentioned.

To describe this situation of the rise of evil, Mejía (2011), cites the next thought referred by Jaspers (1955, p. 21), in his book the *Spiritual Environment of Our Time* found in a papyrus with more than 4000 years old:

Everywhere there are marauders... don't plows and everyone says: we don't know what's wrong with the country... There is filth everywhere, no one has whited their dresses... the earth turns like the potter's lathe... There are no more men... gold and lapis lazuli stick the neck of the slaves... laughter has been extinguished... Big and small they say: they would not have given me their lives... Citizens are joined to the mill stone... Ladies are like sawn goods... Waste is snatched from the snout of pigs, so hungry there is...

The quartermasters open and the lists are stolen... the scribes, whose records are destroyed... It should be added that the country has been deprived of the monarchy by a few meaningless people... The secret of kings is revealed... officials are scattered across the country... there is no charge that is in its real place... they are like a frightened herd without shepherds. no artist works anymore... the most are the ones who kill the least... who had nothing today possesses treasures; the great flatters him.... who of his God knew nothing, offers him today the sacrifice with the incense of another. Insolence has taken hold of all the people...oh, let men be over and that there would be no more fertilization, no more childbirth. May there be silence in the land of all tumult and that there should be no more struggles.

Later, Jaspers (1955, p. 72) continues, referring to the "Language of lie and Sedition" characteristic of fuzzy language- of fuzzy ethics- which governs many of the paths of science and engineering today, the job of the tricksters:

Where an expert does not know what to do, nor can he know, he must resort to formulas that have the appearance of knowledge, justifying, for example, political acts with legal interpretations, justifying criminal coding (abortion caused, death penalty), etc. Extreme things, it could be said that it seems indifferent what is said of any essential point, that the rule of value of the formula in its ability to defend order and cover up what is called into question.

And, in case this is not enough, to see how the confusing language, the tricking language, the language spoken by the trickers, has had refuge in humanity for centuries, let us remember Plato (2017), in *The Fedro* (p. 254):

No one cares in court about the truth of all this at all, but only whether it seems convincing. And this is precisely the plausible and towards it is what it is appropriate for the one who intends to speak with art to be oriented. Sometimes, there is not even to mention the same things as they have happened, if that happened has no glimpse of plausibility; it is better to speak of simple plausibility, both in indictment and in apology. Whenever someone exposes something, he must therefore pursue the plausible, saying goodbye to the truth with many cordials fuss. And by keeping this throughout the discourse, art is achieved in its fullness.

The word Ethics, as a study of human behavior, appears in Aristotelian studies some 350 years before Christ and, from that moment, ethics, as a branch of philosophy, was a main theme in every philosophical discussion, understood until not long ago, that science and philosophy were the same, for this was nothing but love for knowledge. In the first century BC, the Roman trader, Marcus Vitruvius wrote "The Ten Books of Architecture" from which a paragraph is transcribed, in which, referring to the art of architecture, he clearly shows that relationship with philosophy and shows, that the problem of evil has always existed (Valencia 2010, p. 5):

As for philosophy, she makes the architect have high sights and prevents him from being arrogant, on the contrary makes him courteous, loyal and fair and without greed. This is very important, because no work can be done properly without honesty and incorruptibility. Philosophy teaches him that he should not be greedy, nor should he always be thinking about receiving gifts, but in seriously seeking to maintain his own dignity and good reputation, which are among the precepts of philosophy.

But, in the second decade of the 1920s of the last centuries, the so-called Vienna group, led by Moritz Schlick, definitively separated the science from philosophy, before which, and in the hypothesis, I raise, philosophy muted or only mumbled, allowing "flying" with absolute freedom to a science that already moved, with the original sin of evil. The two world wars and their crimes, never before seen, made people grow that feeling of futility of ethics, if finally, everything was the same. Thus a spawn was created, a bizarre world, which gave rise to the advent of new technological revolutions, of liquid people, who settle, to the new vague and empty sciences, with which people are judged, a time when philosophy was silenced and followed in their usual discussions, by a different path, opposite, that of these new sciences, those bizarre sciences, where

everything is worthwhile and, when more, it is known, without any clarity and total certainty, as to whether there is something called fuzzy ethics, which seeks in a low, too low voice, to stop the monster created by the new technological Babel.

In the midst of this confusion in today's world, it presents itself to all, expectant and non-expectant, an absurd situation, because the more knowledge and tools are available to build in a safe way, the more failures are presenting the most. Finding and interpreting the causes of this situation, which puts the lives of thousands of people and their heritage at risk, is the general objective of the research work I do, but not the causes related to the technical aspects of engineering failures, but as already mentioned, with the ethical or behavioral aspects that have led to the calamitous situation described.

In philosophy, the concept of truth is understood as the conformity of the idea with the object, concept otherwise simple and clear, apparently clear. This simplicity might make us think that there should be unity in all men about the understanding of what is true and what is not, for such a pristine concept should in principle not lead to misunderstandings. This pure image of the truth appears in a painting by the French painter Jean León Goréme, where the truth is represented by a naked young woman, free of garments, unadorned and free of interpretations, as it should be. This truth, without garments and additions, should have been perpetuated in time and in all cultures, but unfortunately, it was not.

As aforementioned, during the Neolithic revolution about 14,000 years ago, small communities were formed, changing their nomadic lives to another, completely new, sedentary, forming communities that required the construction of homes, rooms to store food, stables for animals, walls to protect themselves and utensils and weapons to defend themselves. According to the conditions of the environment where they had settled, the different peoples developed their own way of seeing the world, they were discussing their problems. Busing to try to interpret what they saw and lived, they needed to master the fears of what surrounded them and so, little by little, they were finding their truths, which were theirs and were born of their own experience.

Every town in every place where you set your home, he had his own truths and, in this way, the concept of unique truth was diluted, even more so with the appearance of the different religious beliefs, many diverse and dogmatic, which turned truth, truths, because of discords and wars and it was as well as the truth, he began to dress in different dresses, colors and beautiful surely, but different and only of the taste of the tailor who weaved them. Here and so the first Babel was born, where the terms and truths were confused depended on the circumstances and fears that overwhelmed them and made them understand reality according to their convenience, because they needed to agar the fear, which has always accompanied humanity and has been their merciless executioner.

And so humanity went its way and portentous civilizations were born, where mythology reigned and was only, with the emergence of the Greek people, people of thinkers, when they began to talk and argue about truth, ethics, morality etc., laying the groundwork for all the events of the next two thousand years, signed by irreconcilable hatreds, caused by religious reasons etc., laying the groundwork for all the events of the next two thousand years, signed by irreconcilable hatreds, caused by religious reasons : the truth, that one truth, became bloody dagger that mourned and antagonize entire civilizations. From those times of ruin and nobility, we remember on 27 November 1095, when the French Pope Urban II, shouting "God wants him" decided to wipe out the infidels who were in Jerusalem, for which he convened a Crusade that effectively slit the throats of Mohammedan men, women and children, creating a gap between cultures, which once coexisted peacefully, a gap that still endures today and sharpens , being his most moving example, the conversion into Mosque of The Basilica of Hagia Sophia in Istanbul.

The garments of truth in the course of history have been stained with blood and, increasingly, the possibility of returning to principles is increasingly far away, the truth becomes diffuse and hides. In the midst of this chaos, philosophy has tried to interpret the reality of that being-there of the state of things and seek paths, as Marxism-Leninism has done, recognizing the fact that the morality and truth that accompanies it- as Pope Benedict XVI put it in his encyclical "Caritas in veritate" in which he highlighted the relationship of truth and good- not part of general and abstract definitions , but of the specific historical conditions, so, with the change of the social regime, morality also changes. The Spanish philosopher Francisco Soler, in a complete article on the "Philosophy of Julián Marías" (2016), coldly analyzes the truth without plugging down and says: "The proper realm of truth is human life". It makes no sense for things themselves to say that they are true or false: "Only when they enter into relationship with me, when they function as elements or ingredients of my circumstance, do they acquire that new dimension which is their truth or falsehood" outside of human life, therefore, one cannot speak of truth or falsehood. Truth, truths, multiple truths are covered with a gray veil, for there really is no one and the color of the dress with which it is dressed will be the truth. Soler continues:

It follows from what is said that no truth exhausts reality, for in order for it to be so it would have to involve all possible perspectives, and the truth is the presence of things themselves, as they are in themselves, but present here and now for a certain person.

A multiplicity of truths, which would make the world vague and hesitant, would then emerge, to which Hegel's most sensible assertion that truth is fully so in a system - not in a person - this has been being realized in a formal logical system. But it is that reality itself is systematic and, therefore, it also has to be truth and knowledge. And because reality is historical, truth has to be too, this is "truth has to function as such within a historical context and only within it does it have true truthful existence".

Truth cannot be individual, for their garments would be torn apart, at least it must be uniformed in every historical context, so that it can accompany good and allow the birth of the rules and norms of coexistence and conduct of men that allow them to live in peace and, with them, morality.

## VII. Conclusions

In ancient times, in the Middle Ages and much of the modern age, there was no difference between what we now know as engineering and architecture and, those works that still amaze us today, were directed by those unique men called "Masters of Construction" or simply "Masters". In the aforementioned times, the works that marvel at us were clearly engineering works, complemented by the aesthetic details of the so-called "engineering architecture". Subsequently, first of all, with the knowledge of resistance of materials acquired from Galileo (1564-1642) and with the use of mathematical methods applied to the solution of structural problems, began the marked division between civil and structural engineering and architecture.

The elegant language of mathematics allowed to express through simple formulas, the results of centuries of knowledge and experiences. In a letter that on 7 January 1815, the German mathematician Karl Friedrich Gauss (1777–1825) sent to the astrophysicist Heinrich Olbers in 1815, in which he makes some reflections on the accuracy of mathematical calculations and formulas developed by him to prove his claims. Considering it of great historical value, at this time of struggle, a separate part of this letter is transcribed:

*Es ist eine Lust zu sehen, wie bequem die Versuche für u danach durchgeführt werden. Jeder Versuch erfordert bloss 8 Aufschlagungen, 3 in den Logarithmen, 4 in den Sinustafeln und einer in meiner Hilstafel für Logarithmen von Summen und Differenzen. Um so wenig wie möglich zu schreiben zu haben, ...*<sup>14</sup>

These analyses, like many others contributed by the brilliant researchers of the modern age, gave engineers the tools to solve the complex work that the development of countries required them, in multiple fields, such as in buildings, bridges, aqueducts, roads, canals, ports and tunnels, among others.

The "Masters of Construction" increased their prosperity and served as an example, Doménico Trezzini (1670-1734), in charge not only of the planning of the city of St. Petersburg in Russia, which filled with canals, gardens and roads, but of the construction of great works, such as the fortress of St. Peter and Paul with its cathedral, the summer palace of Peter I and the monastery of Alexander Nevsky in Kronstadt.

All this development, allowed to define an engineering language, leaving behind that Babel of concepts, created by the different cultures, which came to reach their peak with their expression by means of formulas, which left no room for elucubrations about the end of engineering and, with this, reaching the end, that engineering works were safe. In this context, a question arises immediately: If this is the case, why do the structures fail? As conclusion of my research for this paper, there are at least, five findings, four of which were discussed in the chapter "Considerations related with the complex ethical behavior of engineers" which are transcribed below:

1. Because engineering handle with "Design problems", not with "Scientific problems" there are not only one truth, but there are also multiple truths, and they all can be correct.
2. The engineer should give answers to the "design problems" today, not for the next year and for this reason, he works every day under pressure. There is no time to think twice about a problem.<sup>15</sup>
3. From an ethical point of view, society is sick and that has always been the case.

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<sup>14</sup> "It is a pleasure to see how easy it is to determine u. Each attempt requires only 8queries, in the logarithm tables, 4 in the sinus tables, and one in my helper tables for sum and subtraction of logarithms. To have to write as little as possible, (...)".

<sup>15</sup>The contrast of that world in which there was time to think is notorious, when Gauss reveled their findings to simplify the complex mathematical calculations he performed and, as he himself says, "to try to write as little as possible." This "try to write as little as possible" is today the basis of voice and image transmission processes, through the Fourier transform

4. Today, in the last afternoon of mankind the abrupt change of the society has shifted moral philosophy by greeting the advent of new, more lucrative branches of knowledge.

5. This "Cyber-times" have created a new Babel because people in general do not think, do not understand and blindly rely on the results of technology, in what machines, with their complex algorithms do. Only a few experienced people are able to discover mistakes and thus the failures of every nature become possible.

To finish these thoughts some Goethe's requirements to science, as cited by Szabó (1987):

*(...) so müssen wir uns die Wissenschaft notwendig als Kunst denken, wenn wir von ihr irgendeine Art von Ganzheit erwarten.*

*Um aber einer solchen Forderung sich zu nähern, müsste man keine der menschlichen Kräfte bei wissenschaftlicher Tätigkeit ausschliessen.*

*Die Abgründe der Ahnung  
Ein sicheres Anschauen der Gegenwart,  
mathematische Tiefe,  
physische Genauigkeit,  
höhe Vernunft,  
Schärfe des Verstandes,  
bewegliche sehensuchtsvolle Phantasie,  
liebvolle Freude an Sinnlichen, nicht kann  
entbehrt werden zum lebhaften, fruchtbaren Ergreifen  
des Augenblicks, wodurch ganz allein ein Kunstwerk,  
von welchen Gehalt es auch sei, entstehen kann.<sup>16</sup>*

Because the moral philosophy and engineering have the same purpose, that is none other than to understand and to avoid the five situations (findings) indicated in this paper, which are the ones that lead to the immoral behavior of those who plan and develop the buildings, both, Philosophy and Engineering, can sit down at the same table, to work together, in the search for ways that avoid this situation, to discuss and look for solutions to solve "real problems" for a "real world"

### References

- [1]. Albrecht R (1977) Bauschäden. Bauverlag, Wiesbaden.
- [2]. Beckers E (1998) Pluralismus und Ethos der Wissenschaft 1. Symposium des Professorenforums. Verlag des Professoren forums, Frankfurt:
- [3]. Cross H (1971) Ingenieros y las torres de marfil. McGraw-Hill, México.
- [4]. Goetz W (1933) La Edad Media. Tomo III. Espasa-Calpe, Madrid.
- [5]. Heidegger M (1967) Sein und Zeit, Eizelaugabe. Max Niemeyer Verlag, Tübingen.
- [6]. Heidegger M (1976) Sein und Zeit, Gesamtausgabe. Vittorio Klostermann, Frankfurt.
- [7]. Heidegger M (2018) Ser y tiempo. Editorial Trotta, Madrid.
- [8]. Jaspers K (1955) Ambiente Espiritual de Nuestra Tiempo. Editorial Labor, Barcelona.

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<sup>16</sup> "(...)so we must think of science as art if we expect some kind of wholeness from it.

But in order to approach such a demand, one would not have to exclude any of the human forces in scientific activity.

The depth of the imagination

A safe look at the present,

mathematical depth,

physical accuracy,

high reason,

Sharpness of the mind,

Free visionful imagination,

lovely joy in material things, it can not

deprive us of a lively, fruitful grasping

of the moment, which is why a work of art,

from which a profit is also obtained, may arise

Goethe, *Materials on the History of the Science of Color* (Second Section: Romans, Reflections on Color Theory and Color Considerations of the Ancients).

- [9]. Kirby RS (1990) *Engineering in History*. Dover Publications, New York.
- [10]. Leisenberg W (1998) *Zielverlust oder das Dilemma der philosophischen Ethik*. Symposium des Professorenforums. Verlag des Professoren forums, Frankfurt.
- [11]. Lorenz H (1913) *Technische Elastizitäts-lehere*. R. Oldenburg, München.
- [12]. Marco Aurelio (2019) *Meditaciones*. Editorial Gredos, Barcelona.
- [13]. Mejía LG (2011) *La maldad es inherente al ser humano*. *El Colombiano*, 22 May 2011. Medellín.
- [14]. Perez J (1988) *Introducción a la Ética*. Editorial Edwin´s, Medellín.
- [15]. Plato (2009) *Phaedrus*. Translated by Benjamin Jowett. Good Press. [Classics.mit.edu/Plato/Phaedrus.html](http://Classics.mit.edu/Plato/Phaedrus.html)
- [16]. Platón (2017) *Diálogos*. Editorial Gredos, Madrid.
- [17]. Real Academia Española (2001) *Diccionario de la Lengua Española*. RAE, Madrid.
- [18]. Reinhold O (1998) *Pädagogik: Wo bleibt die Ausrichtung auf Gott?* Symposium des Professorenforums. Verlag des Professoren fórums, Frankfurt.
- [19]. Rodin A (2014) *Las Catedrales de Francia*. Abada Editores, Madrid.
- [20]. Sartre JP (1966) *El ser y la Nada*. Editorial Losada, Buenos Aires.
- [21]. Savater F (2003) *Las preguntas de la vida*. Ariel, Barcelona.
- [22]. Schlick M (1930) *Die Wende der Philosophie*. *Erkenntnis* 1:4-11.
- [23]. Schopenhauer A (2007) *Los dos problemas fundamentales de la ética*. Siglo XXI, Madrid.
- [24]. Shelton Kirby R (1990) *Engineering in History*. Dover Publications, New York.
- [25]. Shigley JE (1983) *Mechanical Engineering Design*. McGraw-Hill, New York.
- [26]. Soler F (2016) *La filosofía de Julián Marías*. Universidad de Chile, Madrid.
- [27]. Straub H (1975) *Die Geschichte der Bauingenieurkunst*. Birkhäuser Verlag, Basel.
- [28]. Szabó I (1987) *Geschichte der mechanischen Prinzipien*. Birkhäuser Verlag, Basel.
- [29]. Topolsky J (1982) *Metodología de la Historia*. Ediciones Cátedra, Madrid.
- [30]. Truesdell C (1975) *Ensayos de Historia de la Mecánica*. Editorial Tecnos, Madrid.
- [31]. Turtullici R, Kenya P (2015) *Investigación Histórico-Hermenéutico*. *Investigación en Ciencias Sociales*. <https://sites.google.com/site/investigacioncsociales/investigacion-empirico-analitica-1>
- [32]. Valencia A (2010) *Marco Lucio Vitruvio. Los diez libros de la arquitectura*. Editorial Universidad de Antioquia, Medellín.
- [33]. Wisser R (2013) *Heidegger, Im Denken unterwegs*. Neske- Produktion, Südwestfunk.Film to YouTube. [https://www.youtube.com/watch?v=7\\_5aR8\\_PK7I&t=42s&ab\\_channel=Pobednik1985](https://www.youtube.com/watch?v=7_5aR8_PK7I&t=42s&ab_channel=Pobednik1985)