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"Back to the Basics: Return to the Origin, Gaudí and Nature"

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Abstract
This chapter is a contribution to a collective work around *Green Energy and Infrastructure: Securing a Sustainable Future*. This book is about one of the world's most pressing global issues of our time. We could write about sports, haute cuisine, art, fashion, or any other interesting trending topic. But no, we write about the most imperative and urgent issues that we all need to be aware of in order to know which actions we can take to help our planet survive. We are all responsible for the wellbeing of our planet, and even the smallest steps we take in our daily lives can contribute to securing a sustainable future. And concretely, this text is written by two experts in Antoni Gaudí, discovering this architect as a pioneer in sustainability, through learning from Nature as "return to the origin": he was the first to transcend the immediate inspiration Nature offers beyond the purely formal application to architecture and design.

Keywords
Sustainable Future; Return to the Origin; Nature; Architecture; Design

1. Introduction: Background and Driving Forces

The Amazon rainforest is in flames, an entire continent like Australia is burning, the ice of another continent, Antarctica, is melting, numerous islands are evacuated due to rising sea levels, etc. Whether people deny climate change or not, there is no doubt the Earth is undergoing apocalyptic deforestation and extinctions of entire species, not to mention water and food crises, wars, and social riots that are uprising everywhere, even in developed countries. Sustainability does affect not only ecology, but also sociology, in an inseparable manner. However, immense fortunes are spent looking the other way: the colonization of Mars, holidays in a space station, a cottage on the Moon, etc. The idea of a millionaire businessman who wants to colonize Mars with a million people by 2050 is a lucrative business. This outrageous budget could be used to create a million self-sufficient oases in a million deserts on our planet, which is what we need right now. The world's most powerful people have it easy to make history today, not only for one million people but for billions.

Although this may seem obvious, for a sustainable future, we humans need to be sustainable in our actions, processes, and infrastructures, and in the energy required to

support those actions, processes, and infrastructures. Therefore, at last, especially in recent times, sustainability has become a pressing priority for the entire planet. It has become urgent, a real emergency, especially now that we are facing the threat of nearing a point of no return. Luckily, although slowly, all these issues are increasingly seeping into public consciousness. This includes those people who run large multinationals. By taking small steps to reduce the harm brought on by their companies, they have the unique opportunity to generate an enormous effect and make change happen.

For example, in a relatively short period of time, the media have echoed the studies on the disastrous effect of plastic bags, or something as specific as plastic drinking straws, on the environment. After raising public awareness, clamors and complaints, there has been a wave of plastic straw bans by companies worldwide, and those problematic items are gradually being withdrawn from the market. All this was generated by a simple decision of corporate leaders, and not a single client was lost in the process. It is clear that the surprising speed at which this has happened has to do with social network empowerment, enabling citizens to get involved in corporate issues and take a stance, triggering an immediate cascade.

However, much remains to be done to overcome the complexity and contradiction observed in human behavior, as can be seen in Figure 1. On one side, some big companies offer plastic artificial grass to cover landscapes, and, on the other side, other large companies are replacing plastic cutlery for metal cutlery, which is a very commendable decision taking into account what it represents in terms of costs. Our planet, however, can no longer bear those economic profits, because the need for a sustainable planet today is priceless. On one side, some shops care about selling in-season fruits and vegetables, and, on the other side, the shop next door to our home sells spring fruits, which come from the antipodes by polluting airplanes, in winter. We are all responsible, and we must refuse to maintain unsustainable behavior. For example, something as simple as avoiding to buy fruits and vegetables out of the natural season they are harvested in helps, because those foodstuffs come from very far away and this generates contamination. Consuming those products is a whim, not a vital necessity. Maybe we can afford this expense, but the damage that we do to our planet today cannot be undone tomorrow.

Figure 1. Complexity and contradiction observed in human behavior. Some big companies offer plastic artificial grass to cover landscapes (left), while other large companies are changing plastic cutlery for metal cutlery (center). Some shops care about selling seasonable fruits and vegetables (right), and, the shop next door to our home sells spring fruits, which come from the antipodes transported by polluting airplanes, in winter. (Photos: Alberto T. Estévez).

We have reached this point precisely because of the technological advances achieved. Those breakthroughs, especially the ones related to artificial intelligence, have increasingly significant implications in all areas of human activity. Therefore, open and specific debates on these issues should be considered more necessary than ever. It is clear that humanity can obtain an unquestionable benefit from technological progress, although it depends on the ethical use we make of these new possibilities available. In parallel to the immense technological progress, an appropriate development of responsibility and values is required. From north to south, from children to adults, extensive training in those values is essential. It is much more urgent for children to know all the principles of sustainability that should govern our daily lives than other useless information that fills their brains and that will be forgotten after they have used it in an exam.

Each one of us has to do more than strictly our part. For this reason, since the 1980s, the architect who signs this chapter wanted to learn and he started putting into practice the principles of passive solar architecture (Estévez, 2019). In 1996, he founded the first architecture school in the world (ESARQ - UIC Barcelona) that included compulsory undergraduate subjects on sustainability (with contents on combining ecology and architecture) and international cooperation (with contents on merging sociology and architecture). He also promoted two pioneer master's degrees in sustainability and international cooperation, the latter successfully founded in 2004 thanks to Amanda Schachter and Alex Levi's valuable help.

This is the **background** we have, the present landscape, the challenge! And each and every one of us, without exception, is the **driving force** to take on that challenge.

2. Nature, What Else?

And now, let us look around. We do not need to go far. It is right there, before our very eyes, in our own cells, bones, and physiological systems. It is present in all plants and animals, large and small, that surround us, even if we do not see it. This is where to find the model, the top model for sustainability: **Nature, what else?** (Allow us to talk about "Nature" as the human convention provided by its definition, as an abstract entity, as a human figuration of the set of elements that form our environment).

Nature's "laboratory" has been improving living beings for millions of years, with the main objective of just "living". It has developed from the simplest to the most complex. It would therefore be folly not to go to the source of that enormous experience and wisdom in order to adjust our main objective today, which is also "living", and the survival of our planet. Our goals, those of Nature and those of humanity, converge. Nature, however, has a huge advantage over us as far as its "science" and applications are concerned. Therefore, we have to focus on learning from it, through biolearning (Estévez, 2014).

Each field of human knowledge must find its own biolearning path. In our case, we will try to undertake biolearning to apply it in the fields of engineering, architecture, and design. This is where a great champion, a great pioneer, Antoni Gaudí enters the scene. He was the first to transcend the immediate inspiration Nature offers beyond the purely formal application to architecture and design, which is what architects and designers sometimes do.

Most people know his unique works which attract millions of tourists to Barcelona every year. Thanks to the Internet, it is easy to find out about some aspects of his biography, so we are not going to cover this in the present chapter (or check Estévez, 2002a, 2010). However, only a few know what is behind the forms of his architecture: real and deep biolearning of Nature. When someone asked Gaudí where he had learned his architecture, he pointed to a tree near his workshop saying: This is my teacher! (Bergós, 1974). Indeed, when he was a child, because of his delicate health, he spent long periods of time in the countryside, surrounded by mountains and stones, trees and flowers, birds and insects, transforming his weakness into his strength. “Little Gaudí collected the purest and most pleasing images of Nature, that Nature he always called ‘my teacher’, and he remembered them with pleasure even in his old age” (Bergós, 1974). At the same time of being “blessed with a remarkable gift of observation, he developed a personal architecture based on applying what he learnt from Nature to his work” (Bonet, 2000). That is also the lesson of Gaudí for each one of us: to learn from Nature from the point of view (“with glasses on”) of our work, which, in the case of Gaudí, was architecture and design.

In fact, it is easy to marvel at the forms of Nature seen from the outside, but it is not enough. As soon as we pay closer attention, its processes and functionalities become fascinating. Sunflowers, for instance, rotate their heads during the day to track the sun’s movement across the sky. Gaudí paid tribute to sunflowers at the beginning of his professional career, as can be seen in the central photo of Figure 12.2. He integrates them into his first two works in ceramics, especially in *El Capricho* (1883-1885), but also in a small part of *Casa Vicens* (1878-1888). It is as if he felt from the very beginning not only that he was going to stick to a formal inspiration of Nature, but that he would be the first architect in history to transcend to a deeper level of learning from Nature, of biolearning. Undoubtedly, his special sensitivity for Nature provided him with it. When Gaudí was working on his first house, *Casa Vicens*, he felt sorry for the little yellow flowers on the construction site that were doomed to disappear, so he decided to preserve them forever in the decorative ceramic tiles, which covered the whole building, as can be seen in Figure 2 (right). The palmetto leaves in the iron fence were included for the same reason. Antoni Gaudí was a magnificent example of someone who respected the environment, long before anybody talked of ecology (Estévez, 2002a).

Figure 2. Left: sunflower field. Center: sunflower façade decoration (Gaudí, *El Capricho*, Comillas, 1883-1885). Right: little yellow flower façade decoration and palmetto leaves in the iron fence (Gaudí, *Casa Vicens*, Barcelona, 1878-1888). (Photos: Alberto T. Estévez).

In that sense, the fact of going beyond the mere exterior form of Nature, until —as he said— discovering the secret laws of the universe, "Gaudí's work is an advance from traditional architecture to new architectural structures based on the mechanics and experiments such as those of the catenaries, but, at the same time (...) it truly penetrates in the world of natural morphology, which does not copy but transfigures and integrates into an architectural or structural-ornamental factor" (Cirlot, 2001). Gaudí did not adopt the different arches defining each architectural style (Roman, Visigoth, Romanesque, Gothic, Renaissance, Mannerist, Baroque, Mudejar-Mozarabic, Hindu, etc.), as his contemporaries used to do in the architecture of the late 19th and early 20th centuries. He would have his own, the catenary arch. That is, his own constructive system, which cannot be identified with any historicist style. This functioning of the catenary arch can be understood, by looking at Figure 3, where a free hanging chain (catenary) is transferred to parabolic-catenary arches at the *Teresian College* designed by Gaudí (Barcelona, 1887-1888). On the right of Figure 3, Gaudí's peculiar architectural design methodology is shown. He created string models, hanging from the ceiling tying bags of sand to them to calculate the weight proportional to that of the real construction. When turning the photo of the model upside down, the structure of the designed building emerged in the most structural and efficient way.

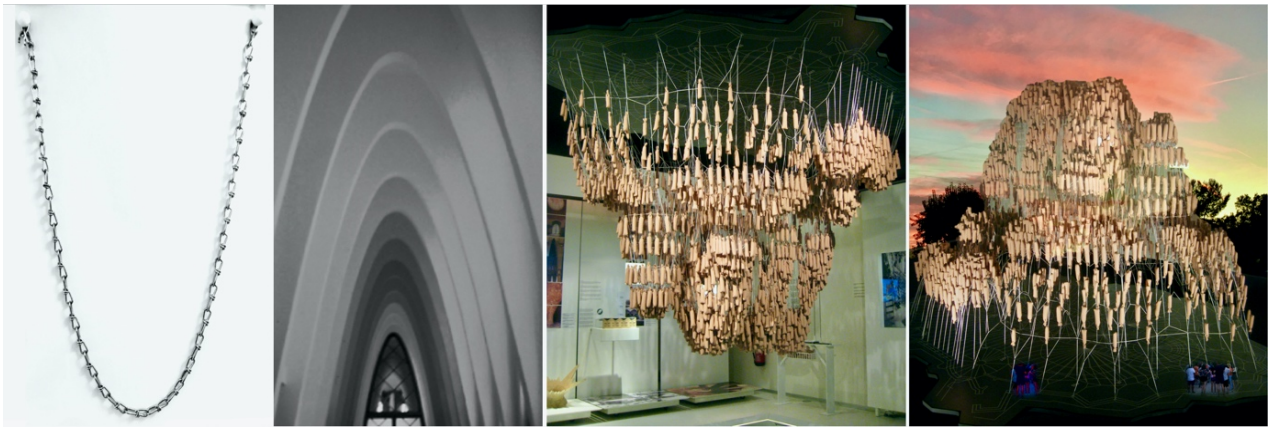

Figure 3. Left: catenary (free hanging chain) and parabolic-catenary arches (Gaudí, *Teresian College*, Barcelona, 1887-1888). Right: image of the string model, hanging from the ceiling with bags of sand to calculate the weight proportional to that of the real construction, following Gaudí's peculiar architectural design methodology. When turning the photo of the model upside down, the structure of the designed building emerged in the most structural efficient way. (Photos: Alberto T. Estévez).

Only engineers using mathematics and physical science in the construction of bridges, railway stations and iron markets, and Catalan masons applying centuries-old tradition and popular experience have approached the catenary arch, as it is the most consistent with the natural function of structures. Gaudí went further than those engineering infrastructures and anonymous popular constructions and, by using his artistic rationality, he was the first to take architecture to a whole new level. He was scientifically aware of its structural effectiveness. This fact confirms Nature was his definitive source of inspiration and learning. He did find inspiration not only in its “flesh”, formal and external, but also in its “bones”, in its structures and functions.

Gaudi’s works are never dressed in arbitrary ways, but they respond to the same criteria of tectonic functionality as those of Nature. He managed to provide maximum structural efficiency to the traditional compression architecture by following those criteria, closing that chapter to start modern traction architecture. Thus, Gaudí offered the alternative of the unbeatable catenary arch in architecture when compared to the poor static performance of arches of historical styles (semi-circular, pointed, horseshoe, etc.), which presented structural deficiencies in roofs, vaults, walls and vertical pillars as well. The catenary arch solves everything better, converted into a surface via successive repetition (which forms the characteristic diaphragm arches in Gaudinian spaces), repeated through space along a curve that is perpendicular to its own and of similar geometry. These catenary arches, and their similarity to the parabola, and their corresponding vaults of ruled geometry and resulting inclined pillars follow the natural line of thrust of the loading: they achieve the ideal structural work in the buildings with the minimum necessary material and with the minimum energy cost, as Nature does.

Gaudí innovated the history of architecture taking compression construction to its highest point. Furthermore, we should recognize that these resulting sinuous curves are those of Nature, in whose natural evolution the most appropriate structural geometries have been selected, so that plants and bones are —apart from cost-effective— maximally strong. Trunks, branches, stems and all the apparatus of living beings are made up of this geometry, of conoids, ellipsoids, hyperboloids, paraboloids, and helical growth patterns (Estévez, 2002b).

As we can see in Figure 4, paraboloids, hyperboloids and helical growth patterns govern the shaping of trees. And Gaudí, learning from Nature, designed with paraboloids, hyperboloids, ellipsoids and helicoids the whole interior of the *Sagrada Familia Church*, where the pillars of the Basilica spread out like tree branches (see Figure 5), following the natural lines of thrust from the structure above.

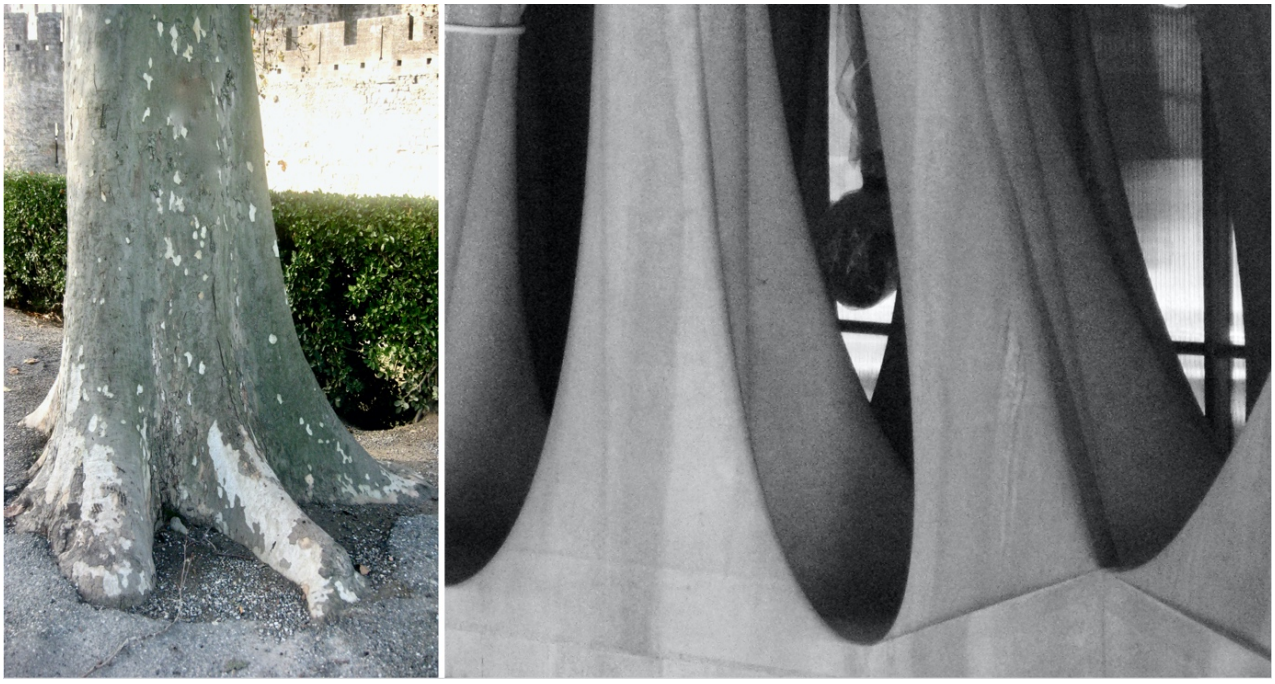

Figure 4. (Above): Paraboloids and hyperboloids of a tree (left). Paraboloids, hyperboloids, ellipsoids, and helicoids inside the *Sagrada Familia Church* (right, above and below). (Photos: Alberto T. Estévez).

Figure 5. (Below): The pillars spread out like tree branches, following the natural lines of thrust from the structure above. (Photos: Alberto T. Estévez).

Nature never stops teaching us, patient, from the origin of life on this planet, as if it were waiting for us to be sufficiently prepared and mature. We only need open and curious minds, and sensitive and attentive spirits in order to learn its lessons. For example, as seen in Figure 6, plant leaves achieve the most efficient balance when using the minimum material (less energy needed in the internal processes of growth), the minimum thickness, and covering the largest possible area, to absorb the most light and to allow water to flow, thus avoiding overloads in case of rain. To do this, their surface curls, giving greater rigidity to the whole, more than if the surface is flat, which is the case of

conventional human buildings, furniture, and numerous objects. Gaudí knew this and designed the roof of the *Sagrada Familia Schools* (1908-1909), following the same concept of efficiency using twisted ruled surfaces: conoids in this case.

Figure 6. Left: plant leaves achieve the most efficient balance when using the minimum material, the minimum thickness, and covering the largest possible area, to absorb the most light and to allow water to flow, thus avoiding overloads in cases of rain. To do this, their surface curls, giving greater rigidity to the whole. Right: Gaudí, *Sagrada Familia Schools*, 1908-1909, design of the roof, following the same concept of efficiency using twisted ruled surfaces (conoids). (Photos: Alberto T. Estévez).

Similarly, as shown in Figure 7, bones in Nature achieve the most efficient balance when using the minimum material (less energy needed in the internal processes of growth) and their resistance, following hyperbolic forms. They are more resistant than the shape of a cylinder with the same amount of material, as those found in conventional architectural columns. Again, Gaudí knew this, and in *Casa Batlló* or in the *Sagrada Familia Church*, he designed the vertical elements with hyperboloids, following the same efficiency principle.

Figure 7. Hyperboloids in an image of bones (left), balustrade (Gaudí, *Casa Batlló*, Barcelona, 1904-1906), and pillars of a gallery (Gaudí, *Sagrada Familia Church*, Barcelona, 1882-present). (Photos: Alberto T. Estévez).

Many details can be learned from Nature, as long as we keep our eyes wide open. As Figure 8 shows, the tiles of Gaudi's *Casa Batlló* (1904-1906) follow the principle of fish scales; besides, they are provided with hydro dynamicity, because they need to let the water flow in the best possible way.

Figure 8. Dolphin and roof tiles like fish scales of Gaudí's Casa *Batlló*, Barcelona, 1904-1906. (Photos: Alberto T. Estévez (left) and Judith Urbano (center and right)).

Gaudí only needed Nature and its guiding principles to develop all his work as an architect and designer. He also managed to synthesize a basic point of Nature, which ended up configuring a value, a value of intelligence, an indicator of quality: continuity. And he said: "the continuous forms are the perfect ones. (...) Polyhedral forms and those mistakenly called geometric forms do not abound in Nature. Even those that man makes flat (doors, tables, boards) become warped over time" (Puig-Boada, 2004). In Figure 9, we can see the continuity of forms as an essential characteristic in Nature, where each part and each function is solved with continuity on the whole. This is undoubtedly because continuity provides better structural and growth conditions. Gaudi's architecture offers even greater advantages by designing his works in this same continuity as Nature. This can be seen in the exterior of *Casa Milà* (Barcelona, 1906-1911) or in the interior of *Casa Batlló* (Barcelona, 1904-1906). Exterior continuity helps the flow of air and water. Interior continuity improves thermal and acoustic characteristics. This is form and function in perfect convergence and harmony.

Figure 9. Continuity in the forms of Nature, lily and little snail "surfing" on it (left). Continuity in the forms of Gaudí's works, exterior of *Casa Milà* (Barcelona, 1906-1911), interior of *Casa Batlló* (Barcelona, 1904-1906). (Photos: Alberto T. Estévez (the two images on the left) and Judith Urbano (the two images on the right)).

It is clear that Nature, as an abstract entity, has no awareness of beauty. Nature does not look for it as artists or architects do, promoting or discarding living beings in relation to their beauty, but only in relation to their functional efficiency. Despite this, as if it were subjective, we find Nature beautiful in its continuity and flow. This occurs in a kind of "automatic" human agreement, beyond cultures and traditions. It is thus Gaudí himself

who recognizes that there is an “objective beauty”, which is precisely what Nature shows us through its achievements of functional efficiency. And this is always accompanied by color.

Gaudí tells us: “Nature does not present any object to us in a monochrome way, completely uniform in terms of color, neither in vegetation, nor in geology, nor in topography, nor in the animal kingdom. The contrast of color is always more or less vivid, hence we must use color in a part or in an entire architectural element” (Ràfols, 1999). This is said by an architect who used Nature as a model precisely in order to learn the architecture that must be performed consciously, from it.

Once it is understood that we have to give color to what we do, a second point appears: color in Nature has gradations and blurring, different shades and chromatic nuances. This is something, as can be seen in Figure 10, Gaudí also applied in his works: either by introducing these gradations of colors in the material itself, as in the glazed ceramic tiles at *Casa Batlló*, or by introducing them into the light that tinges the spaces, thanks to installing colored stained glass, as the reflection we can see in the structures of the *Sagrada Familia Church.*

Figure 10. Color gradations of Nature (left), ceramic roof tiles at *Casa Batlló* (center) and the light reflected on the structures of the *Sagrada Familia Church* (right). (Photos: Alberto T. Estévez (left and right) and Judith Urbano (center)).

A third consideration would be to observe how color appears optically “vibrant” in Nature, pixelated as we would say today by analogy with the digital world. In Figure 11, the mentioned optical vibration of every little point can be seen in Nature, from a microscopic size to a larger scale, as for example by looking at flowers and leaves. Gaudí also introduced it in his works, in his typical colorful “trencadís” made with small ceramic tiles. As in Nature, the little pieces of his buildings surfacing are all different in color, even the white tones found in *Park Güell* (Barcelona, 1900-1914), for example. Although each element in Nature is similar to another, the small differences in size, shape, position, color, and light together produce a special and mysterious attraction to the human eye, more so than artificial elements, which are always absolutely identical in their manufacture and homogeneous color: this gives connotations of coldness, artificiality, less humanity, less attraction and less visual comfort to the whole. Gaudí also followed Nature with respect to color application.

Figure 11. From left to right, the optical vibration of every little point that can be seen in these microscopic images of a butterfly wing (4x), a butterfly eye (8x), and in a tree with its little flowers and leaves. Next, the ceiling of *Park Güell* in Barcelona (1900-1914), built with small ceramic tiles, all different, and of different white tones. Although each element is similar to another, the small differences in size, shape, position, color and light together produce a special and mysterious attraction to the human eye, more so than artificial elements, which are all always absolutely identical in their manufacture and homogeneous color: this gives connotations of coldness, artificiality, less humanity, less attraction and less visual comfort to the whole. (Photos: Alberto T. Estévez).

Clearly, for such an effective inspiration, we need sincere fascination, which is only possible by looking at Nature in a loving and sensitive manner, behind which there is respect for the environment, to such an extent that Gaudí can be qualified as the first environmental and ecological architect, at a time the words ecology and sustainability did not even exist (Estévez, 2010).

The emergence of modernity in architecture and design implied a rejection and demolition of quality values that were traditional in history. Thus, in contemporary times, the safest quality value was consolidated around the level of originality that a work could have. Given the empty desire for originality that architects and designers sometimes had, Gaudí said one of his most famous sentences: “Originality means returning to the origin” (Martinell, 1967), and the origin is Nature. This is a sentence that brilliantly channels the superficiality of just looking for name and fame towards the deepest root where the authentic quality of a work lies, the learning that any work could take from Nature. This is because the authentic quality is reflected in the intelligence we use to do something. We know that sensitivity is also intelligence, together with ingenuity. And the intelligence that is seen in the conformation of living beings, in Nature, is still very far from being surpassed by the human being, if he ever succeeds. Therefore, it would be good for scientists to humbly recognize it, instead of appearing in the media exuding self-assurance and complacency, for every tiny achievement they accomplish by joining a few molecules. In contrast, Gaudí's humility, the sublime synthesis of his work and thought, made him exclaim: “My ideas are of an indisputable logic, but I just do not understand how they have not been applied before, and I am to be the first to open fire. This is the only circumstance that sometimes makes me hesitate” (Bassegoda, 1989).

Gaudí had no doubts because even his reading of history was made under the principle of “return to the origin”. For example, he said “we do not have to stick with what our ancestors did. They came to Nature to learn” (Matamala, 1999). Nowadays, in the greatest and most serious challenge that humanity faces, paradoxically, to go forward we must look “backwards”, towards the origin of everything, **“return to the origin, back to**

the basics". We must learn from Nature, and from all its potential to teach us the most perfect understanding of sustainability we can apply. That is the origin, the basics, and the most effective source we can turn to for solving the sustainability of the entire planet. In fact, Nature had already ensured such sustainability for millions of years, before the human being disrupted it in just a few decades. Nature solves the planetary sustainability with life. Human beings must follow the same path. Something shouted out loud for many years: from the origin to today's evolution in architecture and design, taking us to concepts such as Genetic Architectures (Estévez 2003), Biodigital Architecture (Estévez, 2015), and Metabolic Architecture (Dollens, 2017).

Sometimes we are able to introduce solutions from Nature, with living elements, in a very simple and traditional way, as presented in Figure 12: living plant elements, which are sustainable, renewable, recyclable, applied to architecture; façades, which block the direct incidence of the sun with its shadow on the walls, prevent heating in summer, emit oxygen and absorb CO_2 and dust. Today, any gesture in favor of introducing life into architecture and design should not only be well received but is necessary.

Figure 12. Images of (sustainable, renewable, recyclable) living plant elements applied to architecture; façades which block the direct incidence of the sun with its shadow on the walls, prevent heating in summer, emit oxygen and absorb CO_2 and dust. (Photos: Alberto T. Estévez).

However, virtually all academics (with few exceptions) of current architecture consider including life in architectural projects suspicious, as they are still governed by the principles of an obsolete architecture, devised in the 1920s and 1930s of the last century, very far away from the understandings of nowadays avant-garde architecture, of biodigital architecture: which includes key words as biology and digital, concepts as natural intelligence and artificial intelligence, bio-learning and machine-learning, organic forms and digital tools, and bio-manufacturing and digital-manufacturing. If Gaudi currently lived, would he fit into this?

We must pay attention to the signs of the times, to the *Zeitgeist*, or we will look ridiculous when our history is written, as today, in addition to the great development experienced by biological technology, we can count on the immense help of digital technology. To the power of the media that we have in our hands today, we have to add intelligence and willingness to face the challenge of our time. Sensitivity, for adjusting the objectives and research methodologies, and the uses we give to the results, is also required.

3. Conclusion

We can see the true meaning of “back to the basics, and return to the origin”, and let biolearning give us the clues to solve the urgent needs our global society faces. The closer the proposals are to Nature, to life, the better the results we will obtain. Nature means efficiency and sustainability and, therefore, *Green Energy and Infrastructure: Securing a Sustainable Future.*

For this reason, we must help to increase research, which is essential to find better sustainability solutions. Let us involve politicians, who are the ones who must direct their citizens towards the real common good, and this can only be done with a global vision of international solidarity. We must also take advantage of all the digital technology that gives us enormous advantages for such research and we have to implement its solutions. Biological and digital techniques combined with biodigital architecture offer us new and advanced possibilities.

In conclusion, if technological progress causes increasing inequalities, it cannot be considered real progress. If the so-called technological progress of humanity becomes an enemy of the common good, it would lead to an unfortunate regression, to a form of barbarism dictated by the law of the strongest. Therefore, our work must engage in an effort of civilization, which will also be measured by the objective of reducing economic, educational, technological, social, and cultural inequalities. Obviously, we all have to act from our field of expertise, as when there are no more areas or people that are not affected by (or that do not affect) global sustainability in a positive or negative manner. In our case, it is the field of engineering, architecture, and design.

It could be claimed that the responsibility requested is really fulfilled when one begins to live in harmony with oneself. This means to live in harmony with Nature and with human beings at the same time. There is an intercommunication between the entire cosmos, where they are neither exclusive nor excluded. The project for everyone to live a full life can only be created in this way. Such an understanding of life is characterized by the connectivity and harmony of relationships between water, territory and Nature, community life, and culture. Do we want to live well? We can only do so if we do things well, making responsible use of all the goods that are available to us in this world. We need to adopt responsible habits, protect the land, and change our culture of excessive consumption, solid waste production, and stimulate reusing and recycling. We need to reduce our dependence on fossil fuels and the use of plastics. Changing our eating habits (excess of meat, fish and shellfish) for more austere lifestyles is necessary and so is being actively engaged in planting trees, in looking for sustainable alternatives in agriculture, energy and mobility respecting the rights of Nature. We need to promote the education of integral ecology at all levels and look for new economic models and initiatives for a sustainable quality of life, for an integral and self-sustainable development. We urgently need the development of new clean energies and policies that drastically reduce carbon dioxide (CO_2) emissions and other polluting gases. All companies should establish monitoring systems for their supply chains, in order to ensure

that the products they buy, create, or sell are produced in a socially and environmentally sustainable way. The responsibility is personal, collective, corporate, and political.

Luckily, a better world is possible precisely thanks to technological progress. However, it is only possible if it is accompanied by an ethic based on the vision of the common good, an ethic of freedom, responsibility, and fraternity, capable of promoting the full development of people in relation to others and to the environment. We need all of it, in the only world that we have under our feet in the short and medium term.

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