

ARCHITECTURA SINE LUCE NULLA ARCHITECTURA EST

On the material nature of light. On light as matter and material.

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“And God said, Let there be light: and there was light. And God saw the light, that it was good: And God divided the light from the darkness. And God called the light Day, and the darkness he called Night. And the evening and the morning were the first day.”

Genesis.

When an architect finally discovers that light is the central theme of architecture it is then that he or she begins to understand and starts to become a real architect.

Light is not some vague or diffuse thing to be taken for granted just because it is always there. The sun does not rise for everyone, every single day, for nothing.

Yes, although we may no longer subscribe to corpuscular theory, light is nonetheless something specific, precise, continuous, material. It is the most measurable and quantifiable matter, something physicists are well aware of, but the fact seems to pass many architects by.

Light, like gravity, is unavoidable. And it is fortunate that that this is so, since the history of architecture is defined by these two primeval realities: light and gravity. Architects should always carry with them a compass to measure the direction and angle of light and a photometer to measure the quantity of light, just as they carry a tape measure, a spirit-level and plumb line.

If the struggle to master gravity continues to be a dialogue, from which the material construction of architecture is born, it is with the addition of the search for light, and the corresponding discourse, that this dialogue reaches the most sublime levels. It is then that one discovers the essential truth that only light and light alone can truly overcome and conquer gravity. So, when the architect manages to trap sunlight, thus penetrating the space formed by structures of greater or lesser mass which need to be rooted to the ground to transmit the primitive strength of gravity it is that very light that breaks the spell, making the space float, levitate and soar. The Hagia Sophia, the Pantheon and Ronchamp are tangible proofs of this wondrous reality – of the triumph of light over gravity.

Light has as much material substance in architecture as stone. We tend to think and write that builders in the Gothic period accomplished veritable marvels with stone, making architecture work to its utmost to attain more light. Properly speaking, we should be saying that what Gothic architects did was to work with light as matter, as another material. Since they knew that the sun shines diagonally, they stretched their windows, raising them up to trap those diagonal, nearly vertical rays. They foresaw the possibilities available to us today. Rather than organizing stone to trap light, Gothic architecture can be seen as a desire to organize light, material light, in order to create spatial tension.

We know that matter cannot be created or destroyed, it can only be transformed. That is why, instead of the term modern materials, it would be more accurate to say materials used in a modern sense. In this way we can include centuries of thought which we can then enjoy sifting through. As always, when all is said and done, it's just a simple question of reasoning and thought. Thus was stone, plain old stone, transformed into the most modern of materials in the hands of Mies van der Rohe. Steel and sheet glass were not born out of nothing. These two materials, which have revolutionized architecture, have always been there, latent. Today, the conception of new ideas enables them to produce spatial miracles.

Might we not then think that the secret lies in a profound understanding of light as matter, as a material, as a modern material? Could it be that the moment in the history of architecture has arrived, that tremendously exciting moment when we finally confront light? Let there be light! And there was light. The first material created, the most eternal and universal of materials is thus identified as the central material with which we can build and create space. Space in its most modern sense. So the architect once again recognizes himself as a creator, as a master of the world of light.

“The luster and gleam of the stone, though itself apparently glowing only by the grace of the sun, yet first brings to light the light of the day, the breadth of the sky, the darkness of the night. The temple’s firm towering makes visible the invisible space of air.”

Martin Heidegger. “The Origin of the Work of Art”.

SINE LUCE NULLA!

On light as the central theme of Architecture

When I propose the axiom “*Architectura sine luce nulla architectura est*” I mean that no architecture is possible without light. For without light, an indispensable material would be missing.

If I were asked to give three prescriptions for the destruction of architecture, I would suggest: 1/ covering over the central opening in the Pantheon dome, 2/ walling up the glass block façade of the Maison de Verre and 3/ closing the openings which illuminate the priory of La Tourette.

If, so as to protect the Pantheon from the elements, the new mayor of Rome decided to cover over its crowning oculus of nearly nine meters in diameter, a lot of things might or might not happen. Its skillful construction would not change, nor would its perfect composition; its universal function would not cease to exist; nor would its context, ancient Rome, notice (at least not on the first night). All that would happen is that the most wonderful snare that man has ever laid for the sun, to which that heavenly king joyously returned day after day, would be eliminated. The sun would burst into tears and so would architecture, (because, after all, they are rather more than just friends).

If Doctor Dalsace's grandson had walled up the façade of La Maison de Verre for security reasons a lot of things might happen. Or they might not. Its construction would remain untouched. Its composition would remain intact. With good electric lighting, it would continue to function without a problem. The immediate environment, the city of Paris, wouldn't know anything about it, even after the first night, given La Maison de Verre's private, not easily accessible location. All that would happen is that a most wonderful container of clear, diffuse light would be destroyed, a container that achieved its splendor thanks to the subtle and wonderful mechanism of the glass block, which surreptitiously allows light to pass through, transforming it into pure glory. Darkness would fall on the house, and architecture would be plunged into utter despondency.

If a new Dominican monk at La Tourette, zealously seeking a way to improve concentration levels, were to cover up the cracks and holes in the monastery chapel, many things would happen, or stop happening. Its robust construction would not change. Its composition would remain untouched. Its sublime functions would continue, although they might become more "concentrated" in the candlelight. No one in the surrounding area would know, or it would at least take a long time for word to get out. Only the alarming stillness of the roosting pigeons would eventually alert the local country folk to the sacrilege that had been perpetrated there. The overly concentrated space would have darkened and the monks would find to their amazement that the luminous Gregorian chant was sticking in their throats. The monastery, and the architecture along with it, would have entered into a long, dark night.

Covering over the central opening in the Pantheon dome, walling up the Maison de Verre glass block façade and filling the openings in La Tourette Chapel would signify an end to architecture, and history too. And the sun would refuse to come out again. Whatever for? The fact is that architecture without light is nothing; it is less than nothing.

"Spring is coming. I want to see the light!" And he sent his daughter-in-law Otilia to open the windows before closing his eyes forever." Goethe's last words before his death.

LIGHT TABLES

On how light is quantifiable and qualifiable

Lorenzo Bernini, a magician of light if ever there was one, drew up his own tables to measure light accurately, which were very similar to those now used to calculate structures, Meticulous and precise. The master knew that, like all matter, light can be measured and classified; it can be scientifically controlled.

What a pity that on Bernini's return from a tiring and fruitless trip to Paris in an attempt to build the Louvre, his young, absent-minded son Paolo lost his tables. On the 20th October 1665, Bernini was quite relieved to be leaving the city of light, which had treated him so badly, but discovered to his horror that he did not have his tables, which were more valuable to him than the Law itself. He searched for them in vain. Chantelou, the

punctilious, reliable chronicler of the trip to France made no mention of the unfortunate incident in his felicitous narrative.

It is reported that many years later Le Corbusier managed to acquire some of the key pages of that valuable manuscript in a secondhand bookshop in Paris, and knew how to use them cleverly. And he too was able to control light with great precision.

However, while capable of stirring our emotions and making us tremble in our innermost being, light is more than a feeling.

Light is quantifiable and qualifiable, whether with Bernini's tables or those of Le Corbusier. Or with a compass, solar cards and photometer, Or with scale models or the most perfect computer programs now available. It is possible to control, tame and dominate light.

The mechanisms, the snares with which architecture traps light, with their well-defined dimensions and proportions, are the cause of that spatial tension, the inimitable beauty of works that constitute the best history of architecture.

To change the small diameter of the skylights in the baths of the Alhambra, either reducing or enlarging them, or to change the height of the horizontal upper plane of the "continuum" that is Farnsworth House, by enlarging it or decreasing it, would be sure recipes for destroying two brilliant pieces of our culture.

That is because continuous space, with Farnsworth House as its archetype, is also a question of light. The break in tension produced by doubling its interior height would not be so much an error of compositional dimension as a break with the clear and exact amount of light, of transparency, which permits space to accurately speak of continuity, achieved with such great effort by the Modern Movement. It took Mies van der Rohe many long years to build such an esteemed piece. To achieve the difficult continuity of continuous space, it must be controlled, its dimensions and proportions mastered so that light can efficiently sweep through them.

Thus one can affirm that light is quantifiable and qualifiable, controllable. With man as a yardstick; for in the end, it is for him, for mankind, that we create architecture.

"This open and secret temple (the Pantheon), conceived as a sundial. The hours were to circle the center of its carefully polished pavement where the disk of the day was supposed to rest like a golden buckler; there the rain would make a limpid pool from which prayer could spiral like smoke toward the void where we place the gods."

Marguerite Yourcenar. "Memoirs of Hadrian"

TRIAL BY FIRE

On different types of light

We have already discussed the seductive quality of the Maison de Verre thanks to light and how dark it would be without it. With everything else intact (construction, composition, function, and context), it would nevertheless be nothing without light, less than nothing. But, can you imagine if Doctor Dalsace's grandson, tired of so many visits and finding the light we have described as divine to be a trifle dim, decided to replace the great glass block wall with a technological and transparent curtain wall made of the biggest and flattest sheet glass he could find on the market? Many things would happen then, perhaps too many. Among other things, all the ugliness of the Parisian courtyard where it is located would be invited inside the defused space.

To avoid this, anticipating the disastrous results, it might occur to him to use the Gothic windows taken from the demolition of the nearby St. Denis church. Things would take on another hue, or rather, other colors. The invasion of angels with trumpets and biblical figures would block out the view of the bare courtyard and would transform the well-known space into a pure celestial glory of a thousand colors.

So this very same space, with identical dimensions, construction, use and context, has appeared in our imagination in various forms: dark at first, then very light and finally gloriously colored; three different spaces and one true one, the original: merely by changing one material, light. Merely by changing its quantity and quality.

The architect of the Maison de Verre, Pierre Chareau, used light as a material, knowing that it had to be given a physical definition. To say the word light in the same way as one might say the word stone is to say almost nothing; it is only the beginning. Of course, most architects never move beyond this first stage of definition, which accounts for the results they achieve.

There are many kinds of light and we shall discuss some of them now; whatever its direction, horizontal light, vertical light, or diagonal light. Whatever its quality, solid light or diffuse light.

In the old days, when people needed to take light from above, what I call vertical light, they could not, because if they made openings in the roof, water, wind, cold and snow could enter. It was not a question of risking death just to obtain light. Only the immortal gods in the Pantheon dared to harness it. And in their honor, Hadrian commissioned that lofty architecture to anticipate the achievement of vertical light.

Thus, throughout the history of architecture, light has always been horizontal, taken horizontally, piercing the vertical plane – the wall – as was logical. Since the sun's rays fall diagonally upon us, a great part of the history of architecture can be read as an attempt to transform horizontal, or diagonal, light into light that might appear to be vertical.

This is what was achieved in Gothic architecture, which should not be understood simply as the desire to obtain a greater quantity of light, but fundamentally to achieve light that was qualitatively more vertical, in this case diagonal.

Similarly during the Baroque period, architects tried to twist light with ingenious mechanisms in order to convert horizontal light into a light that would appear as vertical light, and sometimes was by reflection. By taking one more step and achieving greater verticality than in Gothic structures. The magnificent transparent Baroque light achieved by Narciso Tomé in the beautiful Toledo cathedral is a masterful lesson in this very achievement.

The type of light – horizontal, vertical or diagonal – depends on the position of the sun in relation to the planes that make up the spaces tensed by that light. Horizontal light is produced by the sun's rays as they penetrate through holes in the walls. Vertical light is produced when the sun enters through holes in the upper horizontal plane. Diagonal light is produced when the sun passes through both the vertical and horizontal planes.

This means that the possibility of vertical light entering climate-controlled spaces was not achievable until the advent of large-scale flat glazing. Thanks to the option of constructing the upper horizontal plane, which is drilled and glazed, it has become possible to introduce this vertical light. This is one of the keys to the Modern Movement, to contemporary architecture, in its understanding of light. These are the skylights in the upper horizontal plane, now a regular feature of contemporary architecture.

I don't know if the architects of the Alhambra Baths were aware of the wonder they had produced when they made those star-shaped openings in their domes. These were used not only to illuminate an area that demanded a certain degree of discretion, but also basically served as a natural outlet for the steam from the baths. However, above all, they were, perhaps without knowing it, allowing the entry of solid light that would slice through the air and steam like a knife. It is fascinating to spend some time in those rooms and watch the sunlight move and change as it streams in. It would be even more exciting to bathe there. Even now, it is still possible to see spaces of this kind in certain Turkish baths dating from Constantinople, where the intersection of solid light and steam makes the material nature of this white light all the more palpable.

I don't know either whether or not Le Corbusier, who was to later use solid light with such effect, was aware when he constructed the unequalled Ozenfant studio that what he was really constructing was a treatise on diffuse light. The ingenious construction of the small, glazed saw-tooth roof produced a material plane of diffuse light across a continuous translucent roof. Then, in alignment with the angle of large panes of glass, and with the necessary arrangement of lines, he created that amazing trihedron of diffuse light which has not yet received due consideration from contemporary Architecture. That diffuse light which reaches its maximum state in the previously-mentioned Maison de Verre.

Obviously that particular solid light can only be taken in when the architecture is oriented towards the south so as to receive the perfectly apportioned light that is cast upon it. It is this dramatic southern, solid, cast light, when properly handled, produces the most spectacular effects capable of taking our breath away.

In the same way, diffuse light is normally taken in by orienting the architecture towards the north to obtain a serene and peaceful, reflected, diffuse light, the light that produces restful, calming effects.

Bearing all this in mind, we understand that we can search for and use the various qualities offered by light depending upon its orientation in space and time. We can, therefore, tell the difference between the clear, blue morning light, when we look towards the east, and the warm, golden light of dusk when we look towards the west, knowing that both types of light are basically horizontal.

In this way, we could continue to delve into concepts and nuances relating to light in architecture, such as transparency, backlighting, shadow or darkness, luminosity and color.

And we should also mention that characteristic of light as matter in constant movement, following the solar rhythms marked out periodically by Nature. With man and for man, this light gives its life to the service of true architecture.

“And rising one morning, with the rosy dawn, he went before the sun and spoke to it thus: You great star! What would be your happiness if had not those for whom you shine?”

Friedrich Nietzsche. “Thus Spoke Zarathustra”.

WITH MANY LIGHTS AT THE SAME TIME

On the combination of different types of light within a single space

Just as Edison would later invent electric light, (how difficult it still is to use it wisely!), Gian Lorenzo Bernini, the greatest master of light, invented something equally simple; the work of genius known as *“luce alla bernina”*. Using various sources of visible light he first created an environment with diffuse, homogeneous light, generally from the north, with which he illuminated and gave clarity to a space. Then, after centering it geometrically in relation to the shapes, – bang! – he would step in at a specific point, hiding the source from the spectator’s eyes, producing a funnel of solid light – *“luce gettata”* – making it the protagonist of the space. The contrast or counterpoint between the two types of light, creating a furious tension in the space, produced a first-rate architectural effect: solid light in visible movement dancing over an invisible, diffuse light in calm stillness.

The Greek architects Anthemius of Tralles and Isidorus of Miletus did the same thing without the aid of the Neapolitan’s universal tables. The great miracle of their Hagia Sophia, more in terms of light than size, is its fabulous dome. The sun throws its rays in

diverging directions, and due to their distance from the ground, they arrive as if they were parallel. So what is happening in the interior of Hagia Sophia, which receives light through all its high windows as if lit by many different suns? What is happening when the rays of light converge inside, producing those incredible effects? The simple secret is found in the exact dimensions and thickness of the windows, which infuse reflected light with nearly as much strength as direct solid light, and the effect is there for all to see. The secret formula of the miracle is the canny combination of both sources of light, direct and indirect.

Light, like wine, as well as having many varieties, shades and nuances, does not favor excess. The combination of various types of light to excess, just like wine, reverses the possible quality of the result.

The appropriate combination of different types of light, when one knows them, offers infinite possibilities in architecture. Bernini and Le Corbusier knew that well, as did Anthemius of Tralles, Alvar Aalto, Hadrian and even Tadao Ando.

FINALE

On how light is the theme

Finally, is not light the *raison d'être of architecture*? Is not the history of architecture the search for, comprehension and domination of light?

Is not the Romanesque a dialogue between the shade of the walls and the solid light which penetrates its interior like a knife?

Is not the Gothic an exaltation of light that ignites unbelievable spaces with rising flames?

Is not the Baroque an alchemy of light in which the wise addition of diffuse light breaks through solid light, making it possible to create indescribable vibrations within its spaces?

Finally, is not the Modern Movement after breaking down the walls, a flood of light that we are still trying to control? Is not the contemporary period the time when, finally, we have all available means to dominate light?

Deep reflection about light and its infinite possibilities must be the central focus of the architecture of the future. While Paxton's intuitions and Soane's successes were a prelude to Le Corbusier's discoveries and Tadao Ando's experiments, there is still a long and rich road to follow. With light at the heart of it all.

If I am able through my work to make people feel the rhythms set by nature, harmonizing spaces with light, tempering them with the passage of the sun, then I believe that what we call architecture is all worthwhile.