EPPUR SI MOUVE

On the movement of light, because light is never still

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Galileo claimed that the earth moves around the sun, and history summarizes this in eppur si muove. And, with or without Galileo, we all see the movement of light in our lives.

Guided by Galileo, I have decided to entitle this reflection on the movement of light, eppur si muove. For our topic here is the movement of light and when we architects work with light, we are dealing with a material in constant and predictable movement, like the sun from which it emanates, crossing the spaces that we create, if we provide the appropriate devices.

Time and again I have drawn the comparison between light in its relationship with architecture and air in its relationship with music. But I have never written that, while the air passing through a musical instrument is docile and music is air tempered by the performer of that music via the musical instrument, the light that crosses the architectural space is not so docile; it is in continuous, constant and unstoppable but foreseeable movement. As a result, the fixed images that we have of that architecture are false, or better still, incomplete. Only a film or a video, now within the reach of all, has the ability to adequately translate that movement. In a sense this is what I am trying to explain here.

Light is material, as material as stone, whether we opt for Newton and his corpuscular theory or Huygens and his wave theory. I have said many times that light is the most luxurious, the most wonderful material with which we architects work and as it is given to us for free we do not value it sufficiently. Here, however, I would like to reflect on that other special quality of light and its inescapable movement in and about architecture.

An architect from Granada, Elisa Valero, wrote a book about light that she aptly entitled The Intangible Material. And in my unpublished prologue, I wrote that even the title of this book was a stroke of genius. Writing about light, the most luxurious material that we architects work with, is not easy but necessary. Writing about light and declaring from the outset that it is matter, that it is material, is more than thought-provoking. And to qualify it as intangible is most appropriate because we are not the ones who touch light: it is light that touches us and our architecture, allowing the miracle to happen.

A SIMPLE EXPERIMENT

In some of my projects I have tried to make this movement of light visible. When I designed and built the Pavilion for Pibamarmi at the Verona fair in 2009, I called it: “Catching light in motion”.

The exterior was a black 6x6x6m cube on which were placed reproductions of classic sculptures, in the manner of a Roman Antiquarium. The inside of the cube, all in white, was done in Pibamarmi Carrara marble. And on one of the inner corners, a trihedron, we made equidistant circular perforations to allow the light pass through. To simulate the

natural light of the moving sun, we invented a contraption, like a little choo-choo train carrying the source of artificial light. Obviously, its speed was slow, but greater than that of natural light. In this way, as can be seen in a video, the movement of the splashes of light on the Carrara marble walls was visible, they moved. The effect was amazing; the movement of the light became visible and credible.

A MAGICAL SPACE

And also in 2009, in a joint project with Paulo Durao for Milan Airport, which we called Porta Milano, we proposed an exercise of light in motion. The large box that would lodge the lobby of the Malpensa Airport had a double skin of translucent glass, with many equidistant circular holes, the geometry of which was identical in both skins. Thus, when the rays of sunlight passed through and coincided, the sun would enter as if through a sieve, and immediately stop, and after the briefest pause pass through again and so on, making visible this natural movement of light emanating from the sun.

The central focus, once again, was to catch, to make visible, the movement of sunlight. The projected space was wonderful, as some would say: a magical space.

LIGHT IN AN ISOTROPE SPACE

In geometry, isotropy is the property of invariance in a differentiable variety. It occurs when certain measurable vector magnitudes give identical results, regardless of the chosen direction of measurement.

I applied this isotropic quality with conviction to a cubic space project, constituting one of the many solutions for the MIA, a project for a museum in New York. And on my desk is yet another project, already under construction, for a small mausoleum in Venice, which we have named “Heaven on earth”.

In this small piece of Venice, measuring 3x3x3m, at each corner of each of the six faces of the concrete cube, in a simple isotropic operation, I opened a small square gap of 0.60m, without touching any of those small squares, including the floor. In this way sunlight will successively penetrate into the interior. With this tomb project I made slight variations to control the quantity and quality of the incoming light with greater precision. I will include a mirror on the square floor.

Making the movement of light visible is the central focus in both of these projects, museum and tomb. In both, the intended isotropic space is nuanced by gravity. I’d like to imagine myself – vain whim! – as a bird flying within those isotropic spaces, or better still, as an astronaut who, having overcome the law of gravity, moves with equal ability in all three directions.

THE ROSY-FINGERED DAWN

The window of my little apartment in Madrid is large and illegal. And it has stunning views of all the roofs and rooftops and stainless steel chimneys that reach the tallest buildings in the Plaza de España. As the window faces west, every day it receives the direct rays of the evening sun, providing welcome heat in winter, but rather less welcome in summer! In the mornings, however, all the chimneys adorning this landscape of Madrid rooftops, almost all made of shiny stainless steel, are stained by the pinkish light of the rising sun at dawn. And because of the movement of light, this marvel only lasts a short time. My head and my heart are touched by the rosy-fingered dawn that Homer speaks of in his Odyssey. I can assure you that it is a spectacle of enormous beauty. And that is why I mention it here, because it makes the movement of light visible, it accounts for the passage of time and confirms my reiterated affirmation that light builds time. From dawn to sunset.

REFINING LIGHT IN GRANADA

I had already worked with light in movement in Caja Granada. Can you work with light and at the same time ignore that it is a material in constant movement? One cannot and should not.

The Caja Granada building in Granada is the consequence of giving due consideration to that movement of sunlight. Initially, the project proposed a grid of skylights, the same concrete structure in a 3x3m grid with 3m depth and all the recesses open. Then I discovered that, as the NS cube was oriented according to its diagonal, light would only enter through the southern quadrant and that with its 3x3x3 proportions, light would only enter at noon when the sun was very vertical. Two suitable corrections were then introduced to move the grid to 6x6x3 in the 64 existing boxes, and only open 12, in groups of 3 linked to each of the 4 large columns, and in the right direction.

The day that the skylights were revealed and the sun came streaming in is simply unforgettable.

A ROUND OF APPLAUSE FOR THE SUN IN CADIZ

It is difficult to explain what happens every day in Cádiz, because it scarcely seems credible.

Last summer, at dusk, after a walk through Cádiz with my sisters, I was told in hushed whispers that we were going to see something very special. And they took me to San Sebastian Castle, which is linked to the city by a narrow isthmus where the lighthouse stands.

The landscape before us was just as it used to be when we were children and living in Campo de las Balas. There, in the tower where the old lighthouse was located, it is said that the Oracle announced to Caesar Augustus that he would be emperor. And when he became emperor, he issued a decree whereby all those born in Cádiz became Roman citizens.

One of the most beautiful design projects I have ever made is for the castle of San Sebastian, which I wanted to make the flagship of the City of Cádiz. I still have the secret hope of one day bringing it to fruition.

There, at the castle, we encountered quite a number of people sitting on the wide parapets of the edges, waiting. They were waiting for the sun, the red evening sun, to descend into the sea and disappear over the horizon. When this happened, everyone burst into applause; we all did. Quite amazing! Here was light in motion, disappearing.

DAMNED APOLLODORUS OF DAMASCUS!

And what can we say about the light in the Pantheon? Although I have written extensively about it, here I will limit myself to merely proclaiming my admiration for the wisdom of its architect, Apollodorus of Damascus. Both the 43m diameter of the air sphere contained within and the 9m diameter of the lofty oculus are designed with implacable precision. The amount of light entering through the oculus is perfectly controlled, and the movement, the dance of the golden disc on the curved or flat surfaces inside, is extraordinary. The movement of light here attains untold heights. Mind you, there are those who say that after all, the Pantheon, with its all its precision, is nothing more than a sundial.

FEDERICO'S SPHERE

There is a well-known photograph of Federico García Lorca in New York in 1930, sitting on a marble podium, under a large black onyx sphere in the center of the campus of Columbia University. This was a curious sundial that marked the hour by means of the shadow thrown from the sphere onto the podium on which the hours were marked with bronze numbers. And an inscription also in bronze lettering that read: HORAM EXPECTA VENIET, await the hour, it will come.

With the passage of time the sphere broke and was taken away. The podium is still there today with the inscription that, without the sphere, leaves those reading it somewhat perplexed. And this is where I am in the habit of having my photograph taken with friends when we go to Columbia. And it is that very light in movement, with the precision of sunlight, that gives rise to the building of sundials. No wonder I repeat again and again that in architecture, light builds time.

FINALE

Some time ago, I invented the existence of tables of light, mathematical tables to accurately calculate the quantity and quality of light, like tables for calculating structures. What was an invention then has become reality today. Now there are computer programs designed to quantitatively and qualitatively control light in movement with absolute precision.

Light! The primary material of architecture, always in constant movement.