THE LIBRARY IN THE FACULTY OF ENGINEERING. A CASE OF HOLISTIC SIMULATION

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ABSTRACT. The Plaza de America building of Expo'92 has been retrofitted by the authors into a new Faculty of Engineering of 40.000 m2 plus an annexed building of laboratories of 30.000 m2. Everything has been developed under strict environmental and echological criteria. Following this idea, the central space of the existing building has been converted into a library, transforming a great glazed vault that received undesired solar gains from all parts of the sky dome into two south-facing, conoidal monitors. At the same time the monitors are provided with large diffusing elements or baffles to regularize light distribution without impeding its entry and the dynamic qualities produced by daylighting. Within this procedure also thermal and acoustic issues have been adressed, but the cultural overtones of the design could not be ignored as they result in a compelling dialogue between architecture and the diversity of environmental strategies.

1.- INTRODUCTION.

Detailed simulations of daylighting have been also performed before the construction and they are being actually checked with monitoring. The new systems create lighting levels that reach the range of 700 lux in July, while with the old vault the lighting values were over 20.000 lux, unacceptable levels for visual comfort besides creating a thermal load of 160 W/m2. On the other hand, in January, the illumination and solar gain levels derived from the old system are lower than those gained by the new one ---1.200 lux in the existing and up to 3.000 in the proposed.
It is also necessary to note that the aesthetics and perception of the spaces has been improved with the introduction of new illumination rythms, patterns that have been elaborated in architecture in the same way that music is composed with a phrase or scale, controlling the tone and duration of sensations and reproducing from the outside world cadences, cycles and seasons in eternal succesion.

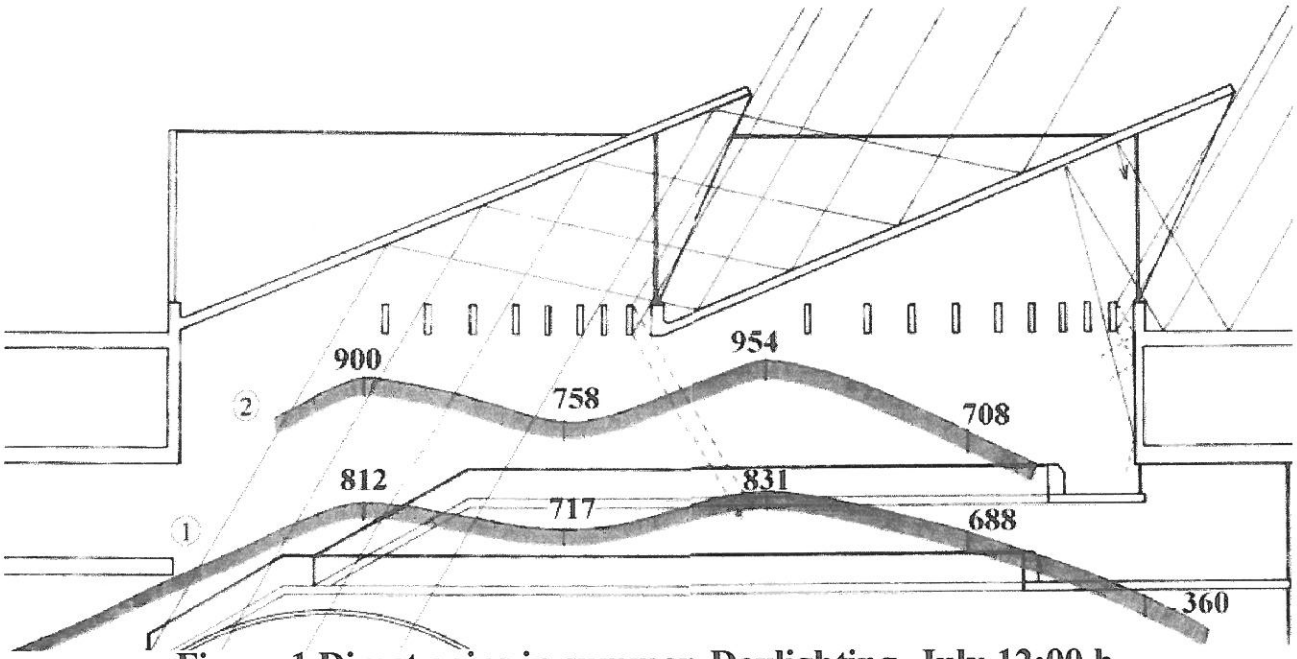

Figure 1.Direct gains in summer. Daylighting. July 12:00 h.
1.- Level 8,30 m.
2.- Level 13,80 m.

The same concept is followed for the retrofitting of parabolic vaults of the side patios, with the difference being that the previously noted geometric conditions give rise to parabolic conoids, also aesthetically suggestive and of great structural resistence.

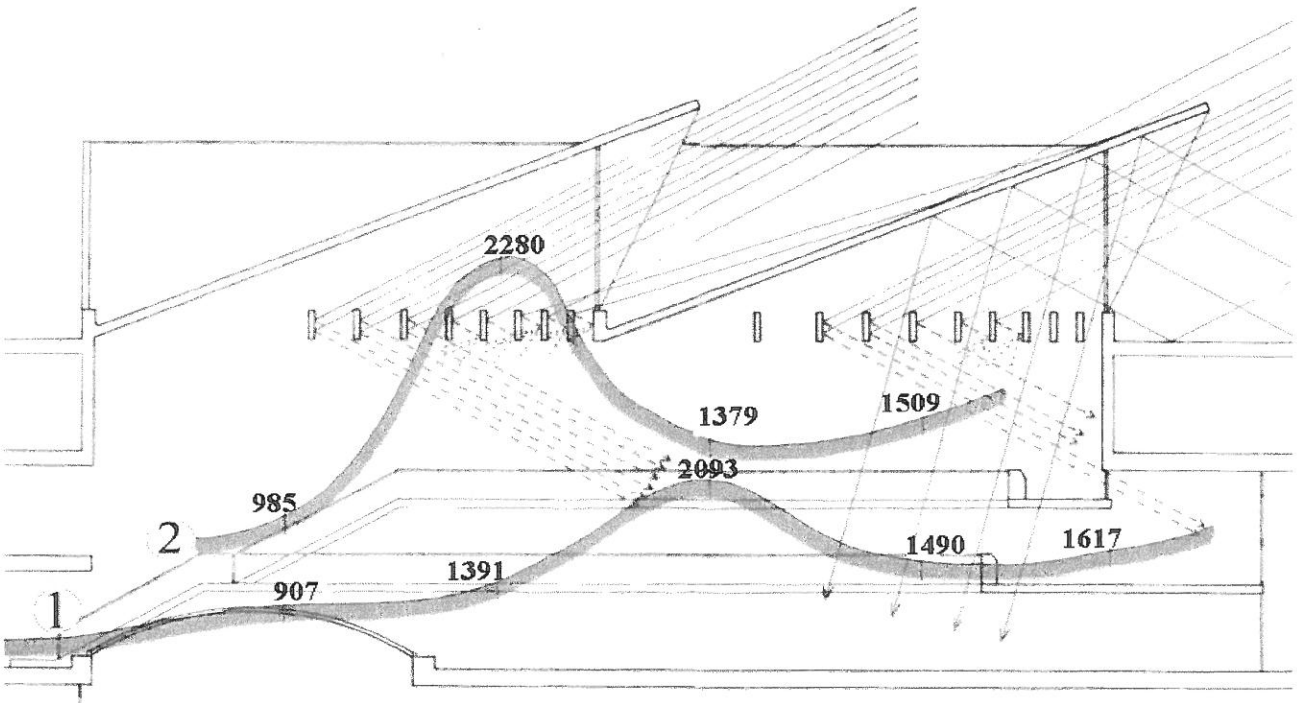

Figure 2.Direct gains in winter. Daylighting. January 12:00 h.
1.- Level 8,30 m.
2.- Level 13,80 m.

2.- THE DESIGN INTENTIONS

...The reduction of the light

There are several metaphors underlying the concepts of the design, ranging from the literal to the dormant or hidden meaning; we would try to describe some of these. In the first place there is the construction system of the conoidal monitors made of steel tubes which, due to this particular geometry, seem to open in the place of the aperture where a more significant amount of daylighting is found, while in the rear of the monitor, with less radiation available, the spacing between the tubes would diminish as to pretend the closing of a flower or vegetal structure under a dim light. The analogy is that a reduction of excessive light has been intendeded with this design, as a way to react against the abuse of glazed surfaces in modern architecture.

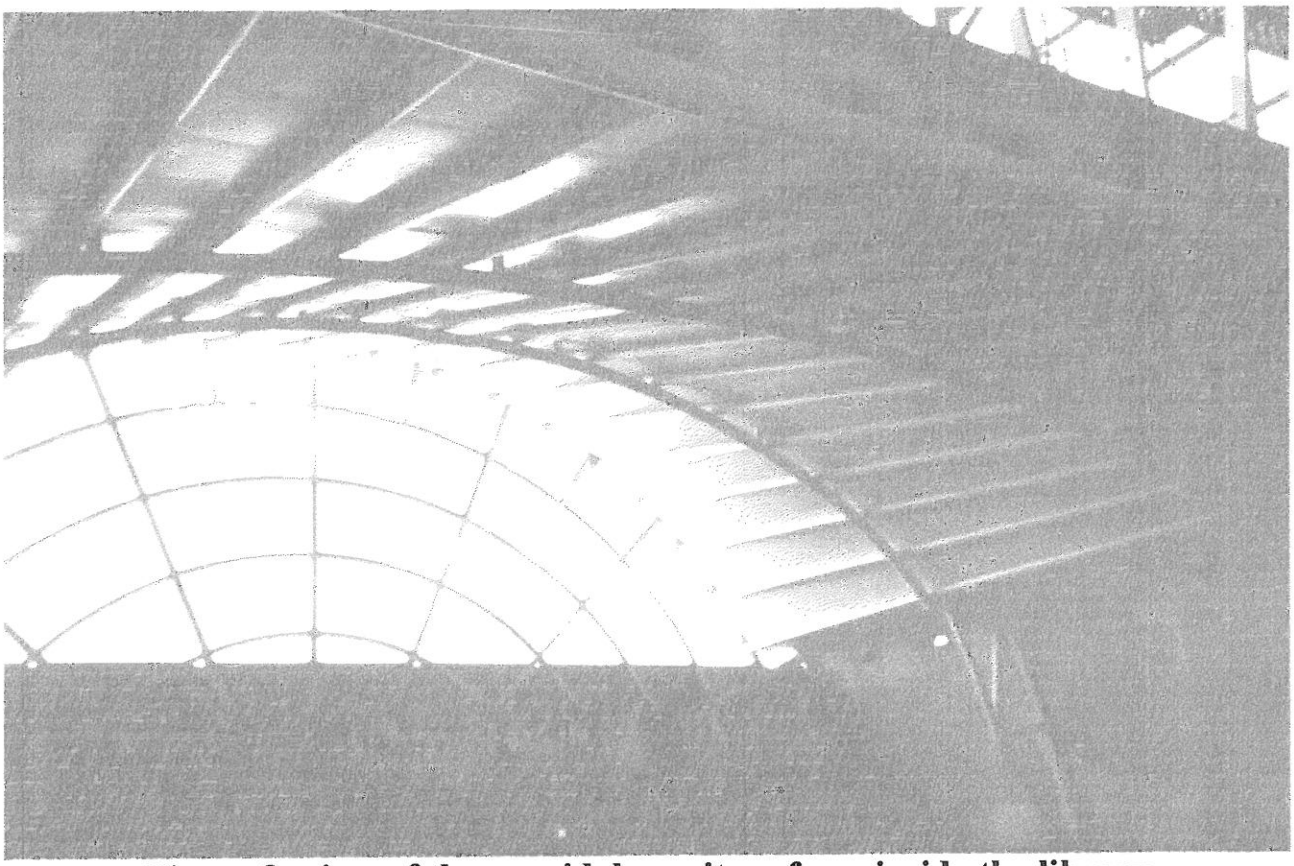

Figure 3: view of the conoidal monitors from inside the library

...The loss of the center

Then there are also assumptions related with the geometry of the roof. These assumptions appear when we try to compare the proposed vaults with traditional domes from historical libraries or other historical buildings. In the buildings of the past, the vault was more or less centered to symbolize the dominion of human beings over this center or, in other words, an anthropocentric conception of space. In statements of theoretician Sigfried Giedion this would imply the second category of space conception, the building turned to its inner space avoiding the contact with the unpredictable and unruled outdoors.

On the contrary and, though a central conception is still recognizable in the frames of existing arches,at the traverses of the former barrel vault, this no longer happens with the design of these conoidal monitors. In fact, we know that the conoidal shape evolves from a circumference basis to a linear vortex, whose center is located at the infinite.*

The aforementioned statements intend to outline that no geometrical center is detectable in this architecture, and we consider it natural as the perceptional center produced every instant by daylighting, temperature or acoustics, has taken the place of a no longer reliable morphological axis. To the depictional space or rather "cosmic void" we have overimposed an environmental Space. From now on, Man alone is not the center of architecture and instead the environment surrounding Man is the new axis, but this axis is in perpetual change.

The position of the previous metaphorical axis is made evident not through magic or divinity, but by means of a thoroughly simulation procedure; that is why we often refer to the abolition of metaphysics in some of our design concepts, as the object entwines with the subject and, in lieu of building's domination over the enviroment, we have rather the environment's zephyr to reveal the core of our chambers.

...The "promenade architectural"

The circulation flux throughout the library has been designed in a dynamic way that enables informational communication; spiral stairs and rounded platforms enhance this objective and afford visual communication with the most unusual angles of perspective, registering every corner of the newlyfound Space which, as mentioned before, is modelled by the environment. Also, thanks to the transparencies produced with the introduction of new patios, we have a completely different sort of "scene per angolo" including the vision of Seville's western soft hills and at the same time of the riverwoods by Northeast. Again, we would identify an attitude which roots back to baroque "veduttism" but inevitably links us with landscape and echology.

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*There is mathematical proof saying, that the sectional cuts in a circular straight conoid yield successive ellipses and, as the same name suggests, the ellipse is a figure without a proper center whose utmost case is the straight line. Here we would occasionally find some of the arguments for the extensive utilization of eliptical plans in post-renasissance architecture, but also we would recognise a hint for the loss of the center, when we compare this with former axis-simmetrical designs. Acoustical implications of the congruent flattening of the vault have shown positive, as well, in the sound pressure determinations.

... The light and crystal fans

In previous works of our group, (see painter's Santiago del Campo house in Triana) elements spreading out to capture light, heat, or wind, had been designed. Popular reverie, connected with visual resemblances, had invented a name for those elements, a name that you would also hear in Seville's modern pop songs. We found the name full of poetic paradoxes, this name is: crystal fans, a paradox in itself as you are supposed to wave in your hands a very fragile and transparent object, every time you feel hot, here in the warm South of Europe. And thus, we have adopted this name for our recent creations, "light and crystal fans"; ...others may design crystal knifes to show violence and damage, but our own audacity is to construct crystal fans to cool the atmosphere...

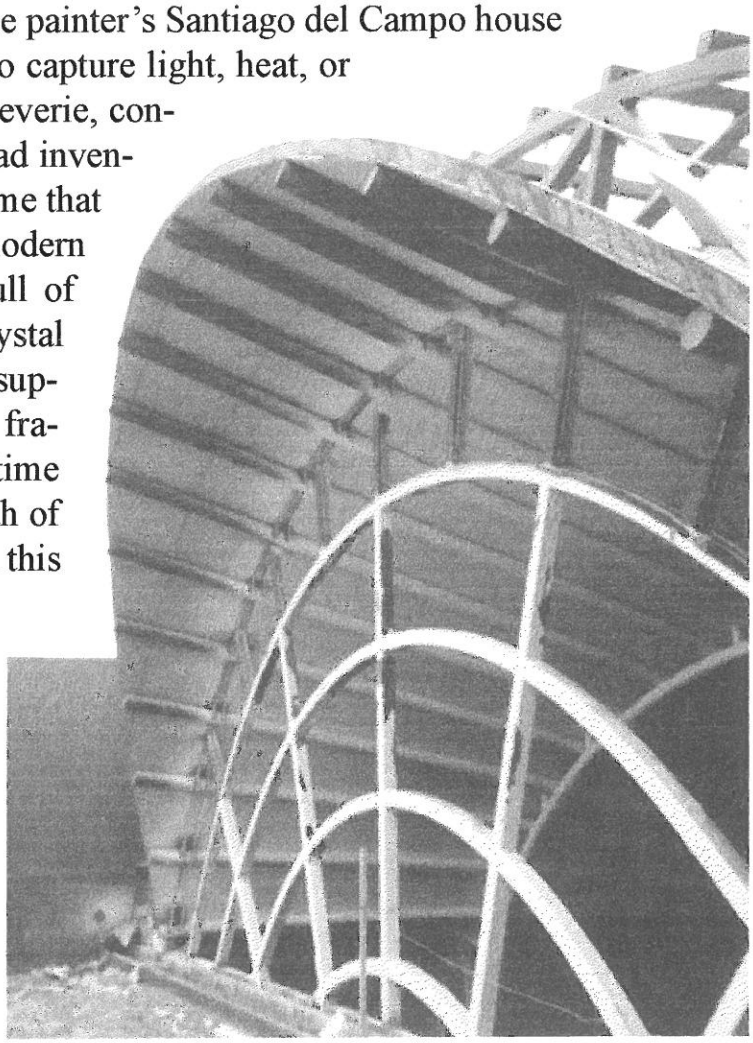

Figure 4. View from the outside of the south-facing monitors

3.- CONCLUSIONS

We have completed this project from the point of view of a scientifical and cultural basis that relies on the potential of sunlight as a form-giver to architecture.

The necessary conclusion is that the diverse environmental strategies (lighting, thermal, acoustics, etc.) do entwine for the sake of architectural opportunity, and so, human and cultural overtones can not be ignored. We address the issue of daylighting to enhance the possibilities of the users to work, to comprehend and to enjoy the space in which they and we live. Through this holistic understanding we expect a development of more compassionate attitudes towards nature and mankind itself.

4.-ACKNOWLEDGEMENTS

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