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Published in:
Utzon(x) Summer School 2013 Exhibition Catalogue

Publication date:
2013

Document Version
Accepted author manuscript, peer reviewed version

Environment as a Generator for Architectural Design
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Environment is what surrounds us. But it is also what interacts with us and forms us, and our architectural constructs.

We breathe the air around us, we absorb the solar energy through our skin and we hear the sounds in our perceptible proximity. According to biologist Jacob von Uexküll (Uexküll, 2010) every organism has its own environment and this environment is in direct relation to the complexity of the organism. Hence, one-cell organisms has little understand and perception of its environment, whereas multi-celled complex organisms, such as humans, have a radically expanded understanding and interaction with its environment. Uexküll refers to this as the *Umweltstheorie*, in which feedback between the organism and environment constantly creates the perception of the organism in the environment. The interrelation is therefore inseparable and suggest that an organism and an environment is so intimately linked that they cannot be understood apart.

This biological understanding is becoming evident in different scientific fields in which environment must be said to have an important role. In fact, it is difficult to think of a field of study that in some way or another does not have to relate its enquiries to its environment. An example is in the natural sciences related to artificial intelligence and robotics. Current research (Sumioka, Hauser, & Pfeifer, 2011) suggest that control systems, artificial intelligence, is not only located in one processor, the previous image of the equivalent to a human brain, but rather as embodied intelligence and perception. Actions and control are performed outside the 'brain' and from this understanding the development of robots have started to become more focused on material properties and the potential inherent processing capacities in local material organisations. A simple example is to use materials with particular elastic properties in robotic legs. When the robot move, the material will perform actuations (movements) as a direct response to the force applied to it, without getting a signal from the control unit to act in this way. Without having to send information to the central control unit, response is faster and less costly for the entire system.

In a similar way, we can imagine architecture respond to its environment by organising materials in an intelligent manner. We know that various materials respond differently to environmental changes. For decades this has been seen as a problem in architecture, but instead we can turn this around and start to suggest a strategic application of such material processes. Wood, as an example, has been controlled by shifting fiber directions, so that when one layer bends, another layer will bend the opposite direction and counteract its final form changes. In architectural studies performed within the last recent years (Hensel, 2010) we, however, see a growing understanding of how the material properties of wood can be used in correlation with environmental changes. The hygroscopic properties, woods ability to absorb and release moisture, enables a single layer wooden surface to bend and be used as an architectural dynamic responsive element.

Organising the materials in a way in which the building surface becomes open according to humidity constructs not only the potential of a dynamic façade, which potentially can improve the spatial qualities, but also suggest a profound and interdependent relationship between architecture and what we consider external to an architectural construct, the environment. Thus, as moist, a property of the environment, is absorbed by the wood, it becomes the determining material that alter the form of the wood and therefrom the perceived architecture. Moist is temporarily and explicitly part of the materialization of architecture before it is released again when the moisture concentration of its local surroundings decreases.

While the above example with wood is a known material artifact, understood through new optics, more dramatic and unconventional approaches can be applied. If we consider architecture 'as the construct of artificial environment', as prescribed by the german philosopher Peter Sloterdijk (REF), then there should be no reason to think of architecture as only constructed in solid forms. In fact, there is a much more direct way to construct environments, that is, constructing the environment itself. Diller Scofidio+ Renfro does exactly this by their *Blur Pavillon*, in which thousands of nozzles spray moist forming a spatial condition for humans. By controlling the density of the moist, they control the

humidity, visual transparency and temperature. Furthermore, as they argue, humans can drink the building and thus reach another level of interaction with the architecture/environment they inhabit.

From a subtler and less intruding approach to above environment and architectural construct can be articulated to enforce a particular atmosphere and perception of an environment. Such an approach is visible in the Nordic Pavilion in Venice from 1962 by Norwegian architect Sverre Fehn, who by placing a double layer of high perpendicular oriented beams transform the direct and sharp Mediterranean light to the diffuse and soft light of the north. The architectural atmosphere intended becomes thus the driver for the distinctive architectural expression of the pavilion, emphasizing ones again that environment can be the primary objective in articulating architectural constructs.

Since the 1960s great advances have been made in computational science. The above example of robotic science takes great use of this development. To make something in a digital setting but with the intentions of creating for the physical world ask for a technique that links these two, digital/physical, together. Simulation of physical phenomena coupled with digital processing enables this and further more rapid design iterations between making and analysis, enabling synthesis.

The summer school project does exactly this, coupling making and analyzing in rapid succession. By simulating light conditions, the designer understands the spatial spreading of light in even complex geometrical organisations in its context of the Utzon Center courtyard before it is constructed. Even small visual design modifications might have a radical effect on how daylight is reflected through the enclosing surface. Another strategy for an environmental architecture is to let the computer suggest material application based on the local climatic conditions. In this manner, the summer school project analyses the amount of solar energy on each surface of the construct and suggest from this a colour that will enhance the reflectivity or absorbance of the surface, which, again, result in a change of the perceived light environment of the pavilion.

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