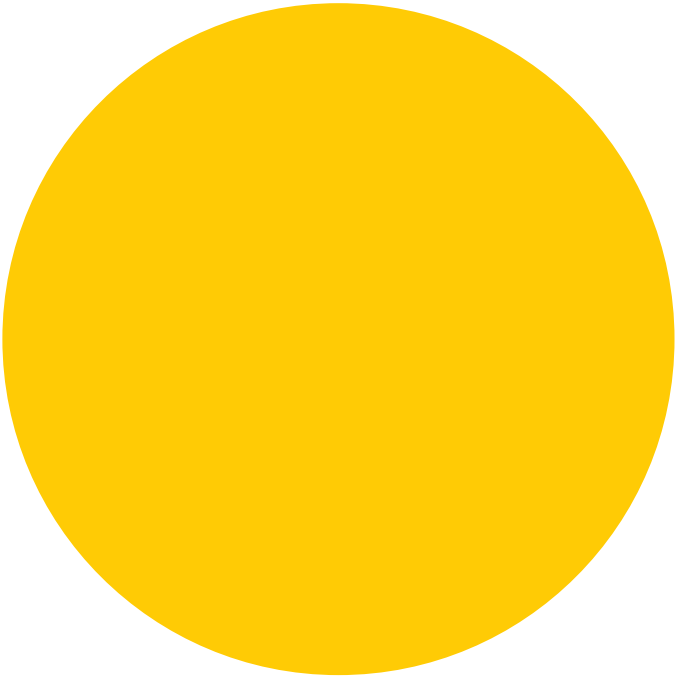
Sensing Solar Cells

Nina Edwards Anker



"Des choses aux yeux et des yeux à la vision il ne c'est passé rien de plus que des choses aux mains de l'aveugle et de ses mains à sa pensée. La vision n'est pas la metamorphose des choses mêmes en leur vision, la double appartenance des choses au grand monde et à un petit monde privé. C'est une pensée qui dechiffre strictement les signes donnés dans le corps."

Maurice Merleau-Ponty, *L'oeil et l'esprit*, 1964

In current 'green' architectural design, solar energy tends to be discussed in technical terms. This paper holds that in order for photovoltaic panels to become fully accepted as a building material, they must be designed according to parameters that look beyond cost and energy efficiencies. Through the lens of phenomenological theory, we investigate solar cells as perceptual devices for mediating light into designed spaces.

By investigating the use of solar cells beyond their limited technical role, I will set out to show that the enhancement of a building's performance by techno-pragmatic criteria does not come at the expense of phenomenologically informed design. By implementing novel design methodologies, solar cells can add meaning to architectural spaces. James Carpenter Design's Austin Convention Center from 2000 and Martinez Lapeña-Torres' photovoltaic canopy in Barcelona from 2004 are two of the few built examples of solar installations which influence visitors' perceptions; both works are also integrated into their design concepts from inception. Torres' concrete sculptural solar collector at the end of the Barcelona Forum esplanade provides shading from the heat and sea views, serving as a destination point at the edge of the city. The canopy, tilted at 35 degrees for optimal solar collection, connects through its geometry to the networks of the esplanade paths. Seemingly co-extensive with the linear stepped urban passages, the tilted collector expands from urban scale to global scale by linking the paths with the sun.

The Sculptural Light Screen on the west front of the atrium for the Austin Convention Center, made up of both photovoltaic and colored glass louvers, screens the western sun from the atrium. The light screen modulates the incoming sunlight that projects onto the translucent curtain wall behind it. From the shaded escalator inside, visitors view a mosaic like pattern on this projection screen/wall.

Solar cells can filter sunlight in ways that reinforce sensual impact. The continually expanding technology of commercially available solar cells is making the task of designing new devices for thermal and visual delight easier for the architect. Although specialized solar panels are still expensive, their prices have been coming down. Soon the availability of transparent, translucent, opaque, multi-colored, flexible, light-weight solar panels in all shapes and sizes will make them comparable to regular glass panels.

In her critique of ocular centrism, Lisa Heschong claims that engaging all of the senses for holistic experiences enhances the way we live in the world: "One of the magical things about our senses is that they do not function in isolation. Each sense contributes to the fuller comprehension of other sensory information. Indeed, one may not even be able to understand the information from one sense properly until it can be related to information from other senses."[1] For example, hanging a photo of a waterfall or similar view in a hot and humid room can help to relieve the heat.[2] In a similar manner, the thermal and visual sensations created by the dark cool shadow of a solar panel in a glass facade can be reinforced by the auditory sensation of wind blowing through a nearby tree.

While it is relatively simple to comprehend the sensual ramifications of sunlight filtered through

solar panels in architecture, as in, for example, relief from heat and glare simultaneously, it is more complicated to conceptualize how we perceive sunlight mediated by pv-treated glass. How does the notion of sustainability enter into our perceptual apprehension of sunlight filtered through solar cells? In other words, what is the difference between our perceptions of sunlight passing through dark glass containing photovoltaic cells as opposed to regular dark glass?

We can begin to answer this question by looking at what Lisa Heschong calls the 'associated modes of perception'. In her book *Thermal Delight in Architecture*, Heschong looks at the mind-body connection in the human act of perception. She illustrates her point with Gaston Bachelard's description of sitting by a fire. Bachelard observes how the primal and mesmerizing experience of sitting around a fire stimulates the imagination: "Reverie before a burning fire is…the first and most truly human use of fire."[3] By stimulating all the senses at once, all of their associated modes of perception, such as memory and an awareness of time, are also brought into play.

Kent Bloomer and Charles Moore, in their study *Body, Memory and Architecture* from 1977, also referenced by Heschong earlier in her book, point to the lack of presence of the senses and their associated modes of perception in architecture as an ongoing problem. They explain: "What is missing in our dwellings today are the potential transactions between body, imagination and environment;…to at least some extent every place can be remembered, partly because it is unique, but partly because it has affected our bodies and generated enough associations to hold it in our personal worlds."[4] Bloomer and Moore are among the first to write about how mind-body connections are reinforced by multi-sensory experiences in architecture.

In his book *L'oeuil et l'esprit*, Maurice Merleau-Ponty describes perception as an intermingling of things, eyes, hands and mind, where vision is a thought which decodes bodily signals:

> A plus forte raison l'image mentale, la voyance qui nous rend present ce qui est absent, n'est-elle rien comme une percée vers le Coeur de l'Etre: c'est encore une pensée appuyée sur des indices corporels, cette fois insuffisants, auxquels elle fait dire plus qu'ils ne signifient. Il ne reste rien du monde onirique de l'analogie.

According to Merleau-Ponty, the mental image is a thought based on corporal indices which it 'makes speak more than they signify.'

If we take Merleau-Ponty's statement to be true, our bodily experience of sunlight triggers a 'mental image' which makes its abstract aspects 'speak.' As a way of seeing, 'voyance,' by linking the cerebral and the corporal, makes present that which is absent. Standing in the cool dark shadow of an opaque solar panel, we are aware of the absence of sunlight and thus also of its absorption into the energy-rich solar glass. The added functionality of the glass provides the perceptual process with an extra layer of consciousness.

Merleau-Ponty explains how this added layer of awareness is created in the process of perception:

> Cet equivalent interne, cette formule charnelle de leur presence que les choses suscitent en moi, pourquoi a leur tour ne susciteraient-ils pas un trace, visible encore, ou tout autre regard retrouvera les motifs qui soutiennent son inspection du monde? Alors parait un visible a la deuxieme puissance, essence charnelle ou icone du premier. Ce n'est pas un double affaibli, un trompe l'oeil, une autre chose. [6]

Merleau-Ponty asks why this internalized visceral presence of things can not in turn provide a visceral essence or icon of the first. 'Visceral essence' can be defined as a combined and simultaneous bodily and conceptual understanding of the outside world.

In Merleau-Ponty's opinion, the perspective of an entire geographical and cultural heritage is instantly and inevitably brought to bear on to any moment of perception. Michael Benedikt explains

in his book *An Architecture for Reality*: "The aluminium poles are cold, the cat warm, the plate clean. Really? Yes. These human facts reverberate with meanings that run deep into our personal yet common histories."7 Benedikt supports Merleau-Ponty's view that the act of perception through the senses is accompanied by 'meanings' embedded in personal history and the history of the surrounding context.

Mediation of sunlight through solar cells in a manner which underlines multi-sensory perception thus can potentially heighten our experience of architectural space in a physiological way and in a cerebral way simultaneously. This mind-body connection entails a shift in our perception of sunlight. When feeling and seeing the rhythms of light and shadow through the filter of solar cells, we are also conscious of sunlight and its wider implications as a powerful process of nature. Its manifestation as a source of electric power affects not only our perception of sunlight but also our perception of energy.

If solar panels can stimulate the senses through the modulation of thermal and light conditions, associated modes of perception such as memory and an awareness of time are also involved. They can mediate the processes and relationships of nature and technology in a way that both transcends and reveals the physiological realm. In doing so, solar cells have the potential to function as perceptual devices which allow us to both feel the presence and understand the concept of sunlight in the context of 'green' architecture in new ways.

Notes

01 Lisa Heschong, *Thermal Delight in Architecture* (Cambridge, MA: MIT Press, 1979), 24.
02 Bernard Berenson as referenced in Juhani Pallasmaa, *The Eyes of the Skin* (London: Academy Editions, 1996), 44.
03 Heschong, *Thermal Delight*, 29.
04 As referenced in Pallasmaa, *The Eyes of the Skin*, 41.
05 Maurice Merleau-Ponty, *L'oeil et l'esprit* (Paris: Gallimard, 1985), 41.
06 Merleau-Ponty, *L'oeil et l'esprit*, 22.
07 Michael Benedikt, *For an Architecture of Reality* (Sante Fe, NM: Lumen Books, 1992), 10.