Active Participation in Passive Solar Design
The poetics of sustainability

SUSAN MELSOP

Department of Industrial, Interior, Visual Communications Design, College of the Arts and Humanities, The Ohio State University, Columbus, Ohio, USA

ABSTRACT: *This study explores the relationships between sustainability and the poetic dimension of human experience in interior space. Drawing inspiration from artists, philosophers and practicing architects, the investigation examines themes common across multiple disciplines, and addresses the psychological and spiritual imperative of connecting the phenomenology of the natural world to the occupant's experience. The inquiry proposes a holistic approach to thinking about and creating interior spaces that integrates the technical principles of passive thermal design with the poetic dimensions of spatial experience. A primary pedagogical objective is to understand the interrelationships and connectedness between our environment and ourselves; to understand the psychological, emotional, and spiritual impact of passive solar design and the effect it may have on user experience. A university interior design course is developed to implement these concepts. The community-based pilot project engages students in a service-learning course that teaches the integration of sustainability, passive thermal strategies, and the poetics of human experience.*
Keywords: sustainability, passive low energy strategies, poetics of human experience, natural light, community engagement, service-learning

INTRODUCTION

Light is not so much something that reveals, as it is itself the revelation. [1]

Figure 1: James Turrell

The sculptural qualities of light in James Turrell's masterful work provide profound and transcendent user experiences. Turrell's work involves explorations in light and space that speak to viewers without words, impacting the eye, body, and mind with the force of a spiritual awakening. [2]

This inquiry explores the psychological and sensory impact of natural light and the poetic potential of passive solar design. Architectural poetic dimensions go beyond rational description: they affect the imagination of those who are receptive. [3] For renowned architecture critic and theorist Jeff Kipnis, the poetic is potentially an affective force. Though architecture's greatest achievements have occurred as artistic effects, as pleasures of eye and mind, its deepest desire is to ply its techniques as a life-shaping force. [4] The question asked here is: do spatial experiences have an effect—and subsequently an affective quality—on the participant? Are there ways to design that can create new possibilities for inhabitation? Are there design criteria that can reinvigorate our capacity to dwell?

Of primary consideration is engagement with specific environmental conditions; for example; how can natural light and other environmental features invite participant engagement and heighten sensory awareness? Sustainable design proposals require an understanding of and appropriate response to the interconnectedness of the environment, ethics, and economic conditions of the site and its inhabitants. By developing relational design qualities, we cultivate connectivity to our environment, each other, and ourselves.

PASSIVE ENVIRONMENTAL DESIGN / ACTIVE USER ENGAGEMENT

While passive solar design is the central theme, *sustainability* is considered as that which encompasses ecology, equity, economy, and in this context, aesthetics. As the adage goes: the built environment is a reflection of who we are; we care and maintain the structures that ignite our collective imagination and sense of wonder, and they, in turn sustain us. Unless healthy environments are also beautiful and compelling they will not be sustained by the societies they claim to serve. [5]

Advanced technologies and specialized instruments typically inform physical strategies for sustainable environmental design. In an effort to optimize human comfort, practical adherence to psychrometric charts is often calculated; complex combinations of conduction, convection, radiation and evaporation indicate comfortable thermal environments. However, as noted in *Environmental Imagination*, the most memorable and remarkable architectural environments often break the bonds of convention. They discover combinations of environmental elements that by some particular emphasis or relationship enrich the experience of inhabitation. [6] It is these spatial experiences—experiences that may influence behavior, affect individual and collective social change—that are worthy of scholarly discussion and dialog.

The following are inquiries into the complexities of sustainable design that may elicit further discovery:

- What kind of environmental design encourages 'active' participation?
- How might passive solar architecture fulfill basic requirements of thermal comfort while cultivating our own ability to be fully present, cognizant of the collective whole and aware of something larger than ourselves?
- How might all the senses be engaged to cultivate an existential experience temporally and spatially?

PRECEDENT STUDIES

Two well-known buildings serve as examples of the poetic use of natural light and the experience of inhabitation: the Helsinki Museum of Contemporary Art, and The McCormick Student Center in Chicago, Illinois. These structures investigate the interdependencies of natural light and human well-being; they were chosen to illustrate that passive solar design has the potential to influence participant behaviour and shift occupant perspective. The first building articulates a sensibility to its geographic location; the other responds directly to programmatic requirements and in the meantime, pays homage to the institutes' founder. While both buildings embrace natural light as a fundamental necessity, they do so for distinctly different reasons. The experiences within these buildings manifest visceral awareness spatially and temporally, yet neither building comprehensively integrates strategies of passive solar design and thermal material properties.

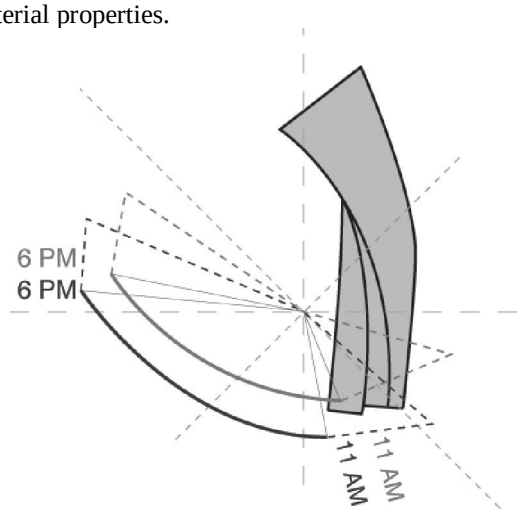

Figure 2: Plan diagram in relation to solar orientation, Museum of Contemporary Art, Helsinki, Finland

Museum of Contemporary Art The form of the Helsinki Museum of Contemporary Art, (Fig.2) by Steven Holl draws its inspiration culturally, historically and contextually from the specificity of its site. The mass of the building is essentially a curved bar, implicitly linking the Finlandia Hall by Alvar Aalto to the waters of Toolo Bay beyond.

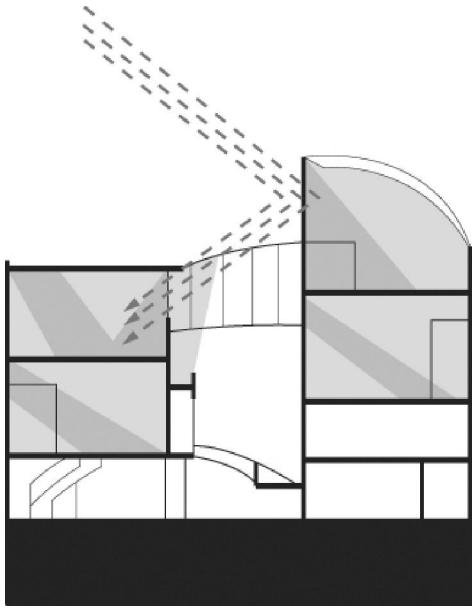

Figure 3: Section diagram indicating use of natural light, Museum of Contemporary Art, Helsinki, Finland

At sixty degrees latitude, Helsinki averages thirteen days of sunlight between the months of October and March and the angle of the sun during winter months is dramatically shallow on the horizon. Holl embraces this phenomenal condition by illuminating the interior (Fig.3) with skylights that trace the path of the low Helsinki sun.

Figure 4: Interior entry sequence,
Museum of Contemporary Art, Helsinki, Finland

Enveloped between the radiating warmth of the concrete below and the illuminating glass above, the entry sequence (Fig.4) provides an opportunity for active user participation, raising the occupant's sensory awareness to the specificity of site and geography. The act of inhabitation is mostly performed in cahoots with the sun, our staunchest ally, bathing our world or flickering through it, helping give it light. [7] Although the interior gallery spaces are intended to be *silent* rooms (Fig.5), there is a dynamic shift of natural light.

Figure 5: Interior galleries,
Museum of Contemporary Art, Helsinki, Finland

Anticipating user response Holl states: the casual circulation provokes moments of pause, reflection, and discovery. Direct sensuous reality…remains the sole solid touchstone for an experiential world now inundated with electronically-generated vistas and engineered pleasures; only in regular contact with the tangible ground and sky can we learn how to orient and to navigate in the multiple dimensions that now claim us. [8]

McCormick Student Center In contrast to the silent and contemplative atmosphere in the Helsinki Museum, is the media-saturated experience found at the McCormick Student Center at the Illinois Institute of Technology, in Chicago. Sensory overload is a typical experience in urban settings, however, at the Student Center designed by Rem Koolhaas and OMA, this experience is cleverly orchestrated with the quietude of small interior courtyards.

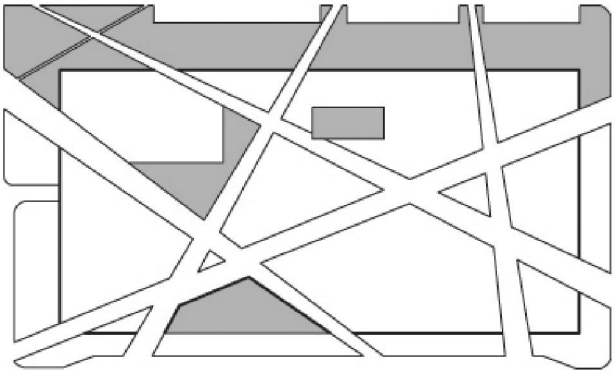

Figure 6: Plan diagram with paths and exterior courtyards, McCormick Student Center, Chicago, Illinois

Situated on a complex site, the plan of the building (Fig.6) is decisively simple, deriving its interior circulation as extension of campus paths. Designed in collaboration with graphic artists, interior walls display signs and symbols in artificial and natural light. Most significantly though to the visceral experience, is the series of pocket courtyards that cultivate an appreciation for the environment and immediate awareness of the natural world. Nestled in the depths of the building and juxtaposed to the dizzying glass-etched walls, each courtyard (Fig.7) provides a welcome relief from retina overload, quieting and reawakening the mind to a natural environment beyond the urban context.

Figure 7: View of exterior courtyard from interior path McCormick Student Center, Chicago, Illinois

What sort of architecture will grow from this attention to our entire human awareness and sensory capacities? [9]
It may be possible that by participating in passive solar design, the occupant actively engages in the immediate natural environment and recognizes how it unites and sustains us all.

DESIGN PEDAGOGY AND APPLIED RESEARCH

In the Design Department at the Ohio State University, we are currently in the process of integrating the principles and practices of sustainability in the curriculum. The design studio is an environment for students to explore the technical issues of sustainable building practices and the poetic relationships of spatial experience. Historical and contemporary examples are analyzed to illustrate the fundamental and profound necessity of the integration of environmental conditions and passive low energy strategies for interior spaces.

The following are questions, which prompt class discussion in the studio environment:

- How can passive thermal design strategies sustain the human spirit and engage the imagination?
- How do interior environments enrich our existential experience and contribute to our psychological and emotional well-being?

The objectives of the course are to:

- Introduce students to tenets of sustainability, including topics of social equity, economic viability, and environmental stewardship
- Research and describe theoretical concepts relating passive solar design with poetic dimensions of human perceptions (e.g. the potential of interior environments to capture the imagination of the occupant and to cultivate a "spirit of place")
- Develop methods for post-occupancy evaluations to measure both quantitative and qualitative project outcomes. Students are responsible for calculating daylight, temperature and humidity levels during various daily and seasonal conditions to determine supplemental quantities required and, evaluating user experience based on behavior mapping, photo documentation, and survey analysis (e.g. Likert scales).

Figure 8: 1251 Bryden Road House, Columbus, Ohio

Project Description Adaptive reuse of a historic building (Fig.8) is a studio project for an interior design course. The site is chosen as a pedagogical instrument to study the social, economic and environmental challenges present in this context. Located in a marginalized and economically distressed neighborhood on the east side of Columbus, Ohio, the building provides students an opportunity to address real issues in a challenging context and apply sustainable design knowledge.

Historical and Current Condition and Context Originally built in 1891 for a wealthy merchant and his family near downtown Columbus, the thirty eight hundred square foot house has had a diverse history. As is typical of many American residential neighbourhoods near city centers, the area was severely affected by the exodus of working professionals moving to the suburbs in the 1950's. As the area became less desirable to reside in, it became home to the underprivileged.

In 1965, Central Community House, one of seven Settlement Houses in central Ohio, purchased the home and for forty years it provided services and programs to the predominately African American population. While Settlement Houses, have historically provided social services to residents of underserved neighbourhoods, Central's capacity to respond to this area's needs soon outgrew the historic home. In 2005, the non-profit moved

out of the neighborhood and into a larger facility. Though, Central still owns the property, the two-story brick structure remains uninhabited and contributes to the despair and plight of the neighborhood.

Program Central Community House is currently eager to reinvest in the historic home, transform it into a Center for Art and Community, and revitalize this downtrodden community. The intent is that the house will serve as a public gathering area and provide space for an urban youth art program, one of many social programs supported by Central Community House. The goal is to create spaces that allow for the production and exhibition of art. Additionally, the house will offer a community kitchen, a coffee bar and rentable office space. The public gathering spaces are intended to foster creativity and cultivate a "spirit of place" that honors the rich African American culture that exists, but has been jeopardized.

Figure 9: 1251 Bryden Road House, interior, Columbus, Ohio

ADAPTIVE REUSE TO STUDY SUSTAINABILITY

Following documentation of the context, environmental site conditions, and user needs, University students studying interior design proposed the following preliminary plans for the historic structure:

- Increase access to natural light; the interior spaces are very dark (Fig.9): increased access to daylight will reduce the need for artificial light, and thus energy consumption.
- Encourage natural ventilation throughout the house, to reduce the need for mechanical cooling.
- Select low-VOC emitting materials to reduce indoor air pollutants.

The design proposal integrates passive cooling and passive solar with active user participation. By harnessing the natural light and allowing it to flood the main circulation zone (Fig.10), activities are framed and highlighted by light.

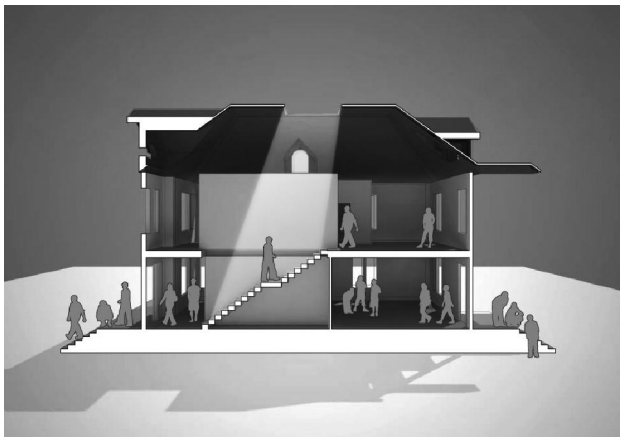

Figure 10: Section through 1251 Bryden Road House, Columbus, Ohio

By taking advantage of the prevailing northwest winds at the front entry and its relationship to the staircase, a natural stack effect is created. As warm air rises, it is released through the operable skylights centered over the vertical circulation. Utilizing both cross ventilation (Fig.11) and stack effect principles, the reliance on mechanical cooling is greatly reduced. By harnessing the phenomenal conditions of daylight and wind, the design employs sustainable strategies and responds to the poetic dimension of human experience by actively engaging participants through all their senses as they ascend and descend the main circulation.

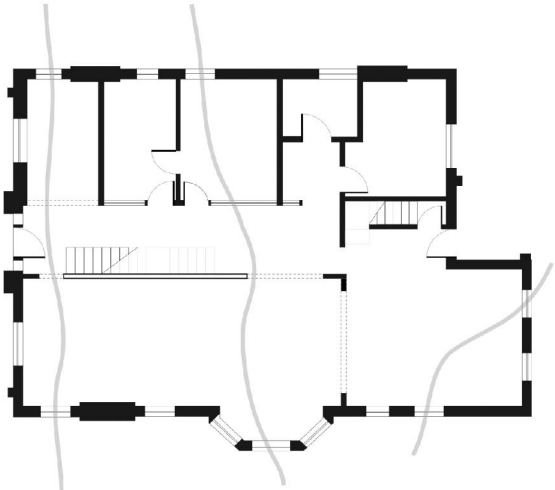

Figure 11: 1251 Bryden Road House Plan, Columbus, Ohio

OUTREACH AND ENGAGEMENT

This design/build and evaluate course serves as a pilot project. A primary aim is to develop an Outreach and Engagement Partnership between the University and the Federation of Settlement houses in central Ohio and to develop a service-learning course. This partnership benefits the students by providing them with a real context within which to work and learn, and it serves the community by providing sustainable design services that would not otherwise be economically feasible.

The service-learning initiative is based on two criteria: the first is a *discipline-based project***;** the second is a *direct service* to the community through tutoring and mentoring. The current project integrates both of these, first by creating an opportunity for students to respond to the environmental and socio-economic conditions of the site, as well as the poetic experience of inhabitation. Secondly, the partnership provides *direct service* so that students work directly with Settlement House staff and teen art students, enabling program expansion and fostering social sustainability.

This mutually beneficial relationship provides students with opportunities to learn outside the classroom. Working directly with local residents and community leaders, students can exchange design knowledge and identify how each Settlement House can implement sustainable building practices. The process fosters collaboration and trust between the University and community; it fosters students' sense of social responsibility and cultivates environmental awareness and cultural sensitivity to place and people.

Further, a community organization benefits from innovative student design work. The rebuilding efforts are an opportunity to bring design practices and resources, usually reserved for select groups of society to an underserved and historically disenfranchised community. The poetics of spatial experience need not be reserved for museums and centers of higher learning. One of the basic human requirements is the need to dwell, and one of the central human acts is the act of inhabiting, of connecting ourselves, however temporarily, with a place on the planet, which belongs to us, and to which we belong. [10] The integration of the natural world in our interior spaces has the potential to transform experiences of the everyday.

Project assessment With the assistance of a professional and academic interdisciplinary team, students will monitor the impact of the project on the community and 'active' user participation. Post-occupancy evaluation will be a critical component to assess the social, environmental, and economic outcomes of the project. Specific tools will be employed to evaluate these criteria and help inform building strategies and techniques for successful future engagement. Students will develop methods of assessment at baseline and post renovation to measure physical quantities: light, temperature and humidity, and the metaphysical qualities: the existential experience of interior space.

CONCLUSION

The study seeks to identify ways to enhance user experience and engage the occupant as 'active' participants in interior spaces. A piece of architecture should not become transparent in its utilitarian and rational motives; it has to maintain its impenetrable secret and mystery in order to ignite our imagination and emotions. [11]

Sustainability is multi-faceted; it is not a one-size-fits-all methodology that applies to different environmental, economic and socio-political contexts. It is more akin to a living organism in a constant flux of change and adaptation that must be cared for from within. With this in mind, the intention for the University outreach and student engagement is to assist in the development of tools and production of spaces that contribute to the exchange of values and knowledge to foster and nurture the well-being of the individual and sustain community.

Embedded in the acronym "Passive Low Energy Architecture" (PLEA) is the urgent request for sustainable practices that include human emotional response.

ACKNOWLEDGEMENTS. I wish to acknowledge the assistance of Jade Naro, and Jason McGee, and the special help of Kathryn Melsop.

REFERENCES

1. Turrell, J. 2008. *Art:21–Art in the Twenty-First Century.* Light Portal. Available at: http://www.photofool.com/2008/04/03/light-portal/ [Accessed 01 October 2008].
2. ibid
3. Bachelard, G. 1964. *Poetics of Space*. Beacon Press, USA.
4. Cache, B., 2004. *Phylogenesis, FOA's Ark*. In Kipnis, J., Actar Press, Forward.
5. Moore, S., 2007. *The Green Braid, An ACSA Reader*. NY, NY, Routledge.
6. Hawkes, D. 2008. *Environmental Imagination*. Great Britain, Cromwell Press.
7. Tanizaki, J. 1977. In C. Moore, *In Praise of Shadows*. UK. Leete's Island Books, Inc. Forward.
8. Holl, S., www.steven holl
9. Malnar, J.M., and Vodvarka, F. 2004. *Sensory Design*. Minneapolis, MN. University of Minnesota Press.
10. Tanizaki, J. 1977. In C. Moore, *In Praise of Shadows*. UK. Leete's Island Books, Inc. Forward.
11. Hawkes, D. 2008. *Environmental Imagination.* Great Britain, Cromwell Press.