July, 2006

A Model for Integral Sustainable Design Explored through Daylighting

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Available at: https://works.bepress.com/mark_dekay/8/
A MODEL FOR INTEGRAL SUSTAINABLE DESIGN
EXPLORED THROUGH DAYLIGHTING

ABSTRACT

This paper briefly introduces the fundamentals of an Integral Theory of Sustainable Design, drawing on the writings of American philosopher, Ken Wilber, including concepts of multiple perspectives (quadrants) and multiple levels of development complexity. It explores the implications for an integral approach to sustainable design. Integral Theory's multiple perspectives include basic perspectival distinctions of behaviors, systems, cultures, and experiences. For sustainable design, this approach includes subjective and objective value spheres in developing effective solutions to environmental problems. Each of these perspectives can be understood as unfolding in stages or waves of complexity, yielding a matrix of viewpoints and concerns. Daylighting is explored in greater detail, proposing an integral daylighting framework of four perspectives and three levels of complexity: the 12 Niches of Architectural Daylighting. The Bigelow Chapel at the United Theological Seminary in New Brighton, Minnesota is used as a case study for understanding architectural daylighting via the integral lens.

1. AN INCLUSIVE SUSTAINABILITY

Given the exponential rate of ecological trends, we ask the question, How might we, as designers, look beyond the current limits of our approach to environmental technology and ecological design to establish more integral approaches to sustainability issues, taking the next step in our collective evolution?

Until recently, the discipline of architecture has been mired in adversarial distinctions, such as “art vs. science,” “design vs. technology,” and “analysis vs. creativity.” Perhaps because of the dominance of empirically-based sustainability perspectives, students of architecture commonly equate sustainability with technology and sustainable technology with quantifiable energy efficiency or its visible hardware, such as photovoltaic collectors. To be certain, there have been notable exceptions to the tendency to reduce ecologically sustainable design to the objective value sphere or to mere performance. However, while sustainable design is increasingly associated with performance measures, the wider profession is increasingly ideologically pluralistic. Despite this plurality, architecture and ecologically sustainable design, in particular, seem to have no collective framework for navigating and transcending the fragmented pluralism that entrenches academia and practice, locks intellectual camps into epic battles, and confounds design students to no end.

One of the profound insights that arose out of the conversations between the first generation of Society of Building Science Educators (SBSE) members was that architecture is a complex reality that includes social, technological, and aesthetic values spheres, and that this complexity cannot be reduced to any one of these spheres. Therefore, often these sustainable design educators work to place objective technology within context of subjective experience and inter-subjective cultural meaning. The basic intuition is that there are "multiple natures" to designing with nature. Duane Elgin, states: “The ‘ecological’ challenges we face are not even purely physical. Many are social and spiritual as well. It is difficult to imagine a positive future that does not value, integrate, and balance three major ecologies.” He goes on to describe 1) a “physical ecology that is sustainable,” 2) a “social ecology that is satisfying,” and 3) a “spiritual ecology that is soulful.” (1)

Much of sustainable or “green” design, such as the approach exemplified by the U.S. Green Building Council's (USGBC)
program for Leadership in Energy and Environmental Design (LEED), is based on an objective-only approach. Missing are subjective and inter-subjective perspectives. As an example, there are no LEED credits for creating experiences of beauty, none for creating or fitting to ecological order, and none for placing people into rich symbolic relationships with nature. Quality and subjectivity do not appear on this horizon. This is not to argue for de-valuing this approach, only to point out its partialness. In fact, high-performance green approaches to building design are absolutely necessary.

2. INTEGRAL THEORY

One emerging theory base that may be helpful is Integral Theory. An integral theory begins with the assumption that everyone is right – at least partially – and seeks to fashion an intellectual framework that both transcends and includes differences. Simply put, an integrally-informed approach to sustainable design (or anything else) challenges us to hold multiple simultaneous perspectives and to address different levels of awareness across the spectrum of human development. Integral Theory is a model that could help design educators and practitioners reconsider the scope, breadth, and multifaceted aspects of sustainability. Integral Theory is based on a cross-cultural comparison of human knowledge, experience, and inquiry. (2, 3)

Integral Theory’s approach, often called All-Quadrants, All-Levels, or AQAL for short, advocates a comprehensive approach that takes into account in addressing any situation the factors of (4):

1. All quadrants (various values spheres, such as experience, meaning, behaviors, and systems),
2. All levels of holarchic depth (for instance, body, mind, and spirit),
3. All lines of human development (such as moral, psychosexual, emotional, and cognitive),
4. All states of consciousness (such as waking, dreaming, deep sleep, and meditative), and
5. All types of human personalities (such as masculine and feminine, Myers-Briggs, or other personality types).

While this may sound extraordinarily complicated, the idea is that this is about the simplest model that can account for or map the complexity of humans and their universe. In this paper, we will limit our study to the two most fundamental aspects of the integral model: quadrants and levels.

2.1 The Four Terrains of Integral Theory

At its most essential level, Integral Theory organizes variables for any problem into a matrix of quadrants that intersect individual and collective phenomena with objective and subjective knowledge. These combined variables reveal the following considerations: 1) Experiences: self and consciousness; 2) Behaviors: science, mechanics and performance, 3) Cultures: meaning, worldviews, and symbolism, and 4) Systems: social and natural ecologies and contexts. See Figure 1. Michael Zimmerman, Tulane philosopher, notes that “the quadrant perspectives correspond generally to the four ways in which universities divide research methodologies (that is, truth-claim generating practices or paradigms): fine arts (UL), humanities (LL), natural sciences (UR), and social and systemic natural sciences (LR).” (5)

Often the two right-hand quadrants, both objective, are considered together, yielding three value spheres, associated with Self (UL), Culture (LL) and Nature (UR/LR), or alternatively, Art, Morals, and Science. Wilber refers to these as “The Big Three,” noting that each domain can be associated with the fundamental language distinctions of I, WE, and IT/ITS, or first-, second-, and third-person perspectives.

2.2 The Four Terrains of Integral Ecology

Hargens, in his landmark article on Integral Ecology, uses the AQAL approach to examine environmental issues and solutions by four "terrains" of inquiry, viewing the environment from the perspective of each of the four quadrants (see Fig. 2): "Behavioral Terrain (behaviors at all levels of organization); Experiences Terrain (experiences at all levels of perception); Systems Terrain (systems at all levels of ecological and social intersection); and Cultural Terrain (cultures at all levels of mutual resonance and understanding). These Four Terrains are foundational to Integral Ecology, a complex representational and nonrepresentational ecology of environmental phenomena." (6)
2.3 The Four Terrains of Sustainable Design

Engineering typically collapses everything to the upper right quadrant—as do environmental behaviorism, value-engineering, cost-benefit analysis, building codes, construction specifications, and most versions of high-performance building design. Green architecture, systems approaches to building, and ecological and regenerative design all collapse reality to the lower right quadrant, or in its more inclusive form, to the right side of the four-quadrant matrix. Everything fits neatly within the "web-of-life." Wilber calls this subtle reductionism, as contrasted with the gross reductionism of the upper right. Left out are both left-hand quadrants, both individual and collective interiors.

Architectural design is a discipline that, whatever one’s intentions or whatever its purpose or function, requires the shaping of form. In the end, something is built or it is not a building. We can then ask, —From an integral sustainability perspective, how shall we shape form? In each quadrant, what is the designer’s intention? See Figure 3.

1. From the perspective of Behaviors, (UR), the design question is, How shall we shape form to maximize performance? In this terrain, good form minimizes resource consumption and pollution while maximizing preservation and recycling.

2. From the perspective of Systems, (LR), the design question is, How shall we shape form to guide flow? In this terrain, good form solves for ecological pattern by creating structure in the built environment that best accommodates ecological processes through mimicry of and fitness to the context of natural ecosystems.

3. From the perspective of Cultures, (LL), the design question is, How shall we shape form to manifest meaning? In this terrain, good form reveals and expresses “the patterns that connect” in ways that celebrate the beauty of natural order, place inhabitants into relationship with living systems (or their idea of nature), and situate human habitation in bioregional place.

4. From the perspective of Experiences, (UL), the design question is, How shall we shape form to engender experience? In this terrain, good form orchestrates rich human experiences and creates centering places conducive to self-aware transformation, in which we can become most authentically who we are.

From each of these varied perspectives on design, the nature of sustainable design and of nature itself show up quite differently. Yet, many sustainable design approaches are primarily grounded in the upper right (science/mechanics) quadrant of the matrix. This expanded multi-perspectival view can enable designers to more comprehensively address the complexity of today’s ecological challenges by including the individual, cultural, and social dimensions that contribute to the creation of a sustainable world.

3. TWELVE NICHES OF INTEGRAL THEORY

In addition to the terrain perspectives, Integral Theory recognizes that all four quadrants show growth, development, or evolution, exhibiting stages or levels as unfolding waves. As a simple example, we can consider a developmental system with three levels of complexity along one of many potential developmental lines in each quadrant. In the Behaviors quadrant, (UR), bodily structure expands from gross to subtle to causal. In the Systems quadrant (LR), social systems expand from simple groups to complex systems to
global systems. In the Cultures quadrant (LL), collective values develop from egocentric to ethnocentric to worldcentric. In the Experiences quadrant (UL), the individual sense of self unfolds from body to mind to spirit. When these three levels of development are overlaid on the four quadrants we get the Integral Institute’s diagram in Figure 4.

3.1 The Twelve Niches of Daylighting

Considering intersections of levels and quadrants, we can interpret a sustainable design version of Hargens’ twelve niches. We will use daylighting as a vehicle to consider an AQAL design approach. Basically, we can characterize each quadrant’s perspective on daylighting as follows:

1. Behaviors quadrant (UR): Light behaving predictably.
2. Systems quadrant (LR): Light responding to context(s).
3. Cultures quadrant (LL): Light manifesting meaning(s).
4. Experiences quadrant (UL): Light engendering experience(s).

Figure 5 uses daylighting as an example of how the twelve niches could integrally-inform sustainable design thinking, allowing a designer to move beyond objective physical performance to also consider rich experiential, ethical, moral, and social implications of light. It helps one to place the concrete expression of architecture within larger contexts, such as the workings of the human self and mind and within rich ecological networks.
4. INTEGRAL THEORY APPLIED: BIGELOW CHAPEL, UNITED THEOLOGICAL SEMINARY

To explore an integrally-informed approach to understanding architecture, we will consider daylighting at the United Theological Seminary's Bigelow Chapel in New Brighton, Minnesota. Architects Joan Sorrano (Design Principal) and John Cook (Project Architect), from Hammel, Green and Abrahamson (HGA), created a chapel to support a diverse and multi-denominational community that embraces a variety of liberal religious faiths and spiritual practices. The 2,200 square foot sanctuary is a simple rectilinear plan, oriented with the length on a north-south axis. The new chapel completes the east side of a “U-shaped” campus plan (with the central green space of the “U” open to the north). Constructed of concrete, steel, and glass, this elegant modernist box is wrapped on the inside with a sweeping curvilinear translucent wall of quilted maple (thin 1/32” maple veneer sandwiched within acrylic panels). See Fig. 6.

Fig. 6: Exterior and interior of the west façade

4.1 Behaviors (UR): Light Behaving Predictably

From the “behaviors quadrant” (UR) we consider the objective, measurable, and quantitative factors of daylighting design. The essential design question here is: How shall we shape form to maximize performance? At the Bigelow chapel this includes the varied strategies that are employed to ensure sufficient illumination for the tasks that occur in the chapel, including reading, lecturing, singing, meditation, discussion, and performances of all types. The building sitting as well as the thin depth of the plan and multilateral lighting in the section are critical design features to realize the desired quantity, quality, and control of daylighting. Control of direct sun to promote thermal and visual comfort is accomplished by the high clerestory windows, discrete interior shade on the south for summer, the diffusion of light on the west maple wall, and the translucent fins on the exterior of the building. Photometric studies (see Fig. 7) reveal that although the illuminance levels are sufficient throughout the year, additional levels of control are needed in the late afternoon in the summer to mediate direct sunlight from the west.

4.2 Systems (LR): Light Responding to Context

From the perspective of the “systems quadrant” (LR) we examine ways context and process can shape and inform design, including social and ecological systems thinking. With daylighting, this may include response to the bioregional, climatic, and ecological context of a particular locale and the integration of issues across topics and scales. The design questions for the systems quadrant are: How shall we shape form to guide flow? and How can we shape form to fit larger contexts? At the Bigelow Chapel, “systems” issues concern the site context and ecological fit. The chapel elegantly completes and frames the eastern side of the campus, contributing to a pattern larger than itself. The size, scale, and positioning of windows weaves together the interior and exterior through varied views into the north woods, green space, and meditation garden. The social systems, or ways that the activities and programmatic needs are supported, can also be considered for daylighting. Spatial versatility accommodates a great range of activities. Warm diffuse light is punctuated by carefully located discrete view windows. The warm enveloping daylight creates a space that supports formal services and simple meeting or gatherings.

4.3 Culture (LL): Light Manifesting Meaning

From the perspective of the “cultures quadrant” (LL) we can consider the inter-subjective meanings that people collectively create. The essential design question in this quadrant is: How shall we shape form to manifest meaning? The
Bigelow Chapel is designed as a sacred space to inspire people from diverse spiritual traditions. Daylighting was used to provide constantly changing qualities of light, views, and connections with nature. The entry processional moves visitors gradually down a gentle slope to the interior of the chapel, which is sited at grade with the landscape. This design creates an intimate relationship with nature, which together with the luminous, layered qualities of the space, situates one in a shimmering world of connections extending beyond the physical self. Wilson Yates, the former President of the seminary, explains: “When guests walk through the chapel and suddenly get to the sanctuary, everyone becomes silent. They’re truly touched or moved by the space itself.” (7) The diffuse light, warmth of the maple panels, nature views, and intimate scale create a quiet, contemplative space.

4.4 Experience (UL): Light Engendering Experiences

From the perspective of the “experiences quadrant” (UL), we can consider the physical, emotional, and spiritual aspects of individual awareness. At the Bigelow Chapel, Joan Sarrano used the three qualities of “intimacy, warmth, and light” to shape and inform the design and experience of the sanctuary. Music Director Mary Bohman and seminarians Kelli Clement and Monica Tajibnapas use words such as "enveloping," "womb-like," and "soothing and comforting" to describe their experiences in the space. (8) Joan Sorrano radically transforms traditional notions of liturgical space associated with mosques, temples, and cathedrals, in which darkness and shadow play critical roles in creating a sense of reverence, awe, and mystery. At Bigelow, high illumination, dynamic and changing light, glowing, warm materials, intimate scale, and seasonal views of nature create an intimate contemplative experience.

5. CONCLUSIONS

While this examination of Bigelow Chapel illustrates how one might interpret architecture through multiple perspectives, it does not reveal how integral theory might inform design by changing design methods or concepts. For scope limits, we have not analyzed the chapel from a developmental (levels) lens. One premise of integral theory is that more expansive perspectives of the world and human consciousness are necessary to meet the diverse ecological, social, cultural, ethical, and technological challenges of the twenty-first century. Species interdependence and human's role in shaping a sustainable future require new approaches that include, yet expand the current emphasis of sustainable design on scientific-objective measures. As Wilbur explains in *A Theory of Everything*, “None of the levels or lines or quadrants are meant in any sort of rigid, predetermined, judgmental fashion. The point of developmental research is not to pigeonhole people or judge them inferior or superior, but to act as guidelines for possible potentials that are not being utilized.” (2) The implication for design is not that each building should address all twelve niches, but rather, that one can be integrally-informed by this expanded view and, thus, be aware of what is and what is not included. One can consider each quadrant and level to question whether or not the issues embedded in the each niche are relevant for the project at hand.

6. ACKNOWLEDGMENTS:

The authors gratefully acknowledge Molly Felde, Kim Imhoff, Natasha Skogerboe, Angie Smith Varpness, and Keegan Furfaro from the Department of Architecture at the University of Minnesota for their assistance with the daylight study and graphics for the Bigelow Chapel.

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