DAYLIGHT AS A METAPHOR FOR ARCHITECTURE

Martin Schwartz

Associate Professor, College of Architecture and Design, Lawrence Technological University, Michigan, USA. ORCID ID: 0000-0001-6303-6893

ABSTRACT

It is the premise of this paper that the influence of daylight on the very conception of architectural space and form is as essential as the presence, in spaces, of daylight, itself. We may study daylight and measure it with remarkable accuracy and valuable consequences. However, the value of daylight to the inhabitant and the designer runs deeper than quantification, simple navigation, or assigned symbolism. Daylight instigates good design decisions and generates architecture, and the way daylight operates may be considered to have a metaphorical relationship with architecture.

KEYWORDS

Daylight, sunlight, quality of light, metaphor, design process

1.0 INTRODUCTION

This paper makes four assertions about the study of daylight in architecture. First, and most importantly, it is this paper's premise that the influence of daylight on the initial conception of architectural space and form is as essential as its visible presence and its measurable properties. Second, it proposes that the performance of daylight resulting from the relationship between the sun and the earth may be understood as a metaphor for the way that architecture performs. Third, this relationship is additionally evidenced in the curiously complementary, sometimes antagonistic, qualities we find in the performance of daylight as they are likewise inherent in the performance of architecture. Finally, as a result of these shared performance characteristics, not only is the performance of daylight an appropriate model for architectural design, but as the dual qualities are reconciled in the design process, daylight and architecture share a critical reciprocal relationship, as one informs the other.

Accommodating the simultaneous and sometimes conflicting need for enclosure and openness constitutes the central opportunity and essential dilemma of architecture. The commonly used word, "place," suggests enclosure while daylight demands openings. But in the design process, the accommodation of enclosure to openness and light inevitably evokes issues well beyond the need for illumination: it elicits responses to a range of human needs and desires. For this reason, the study of daylight in architecture—the reconciliation of open and closed—is crucial to making a comprehensive and coherent space. When it works, it results in architecture: an intelligent, inhabitable, illuminated, meaningful, navigable, legible, and coherent place.

To understand daylight in architecture and to accommodate the range of human needs and interests, we need to know how daylight works. It is then possible to understand the performance characteristics of light in buildings as more than optical necessity, visual delight, curated metrics, or cultural symbols, but as meaningful qualities that may be expressed verbally as metaphors. The metaphors enable us to understand new ideas (in architecture) by associating them with things we already know (in daylight).

2.0 METAPHOR: A WORKING DEFINITION

A metaphor is a figure of speech in which a word or phrase is applied to an object or action to which it is not literally applicable. A metaphor represents a conceptual process in which two things, each belonging to a different domain of knowledge, are compared at some level of similarity in a relationship that typically involves some incongruity as we are describing something that is not strictly true. Metaphors

transfer meaning from one realm to another to deepen the understanding of one realm with the assistance of the other, and in often surprising ways. The most common device of this type is an "image metaphor," which tells us that something looks like something else. Here, however, we are identifying a "relational metaphor," one that explains how one system works so that we may appraise the performance of the other system. (Plowright 2020)

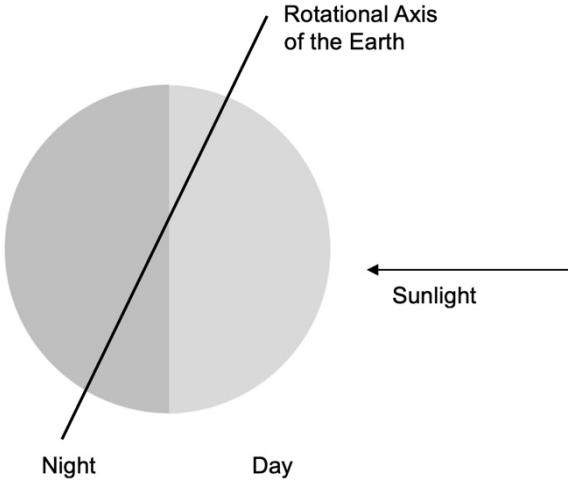

Figure 1: The relationship of the earth, on its tilted axis and the sun.

3.0 THE CYCLES OF DAYLIGHT

The orbit of the earth around the sun, the rotation of the earth on its axis, and the relaxed tilt of the axis relative to the sun overlap in cycles. (Figure 1) Observable as periods of light and darkness, these cyclical relationships are additionally, if less predictably, modified by climate, weather, geography, and human activity. It is easy to forecast with astonishing accuracy where, on any given day of the year and at any given time of day, the sun may be seen in the sky. However, it is nearly impossible to describe what the character of the daylight will be on that day.

The regular appearance of sun and daylight and their companion conditions of darkness and dimness confer an order on our world every day. The working relationship of the earth and sun, their rotations and orbits, establish regular, predictable, observable, rhythms in our lives. This relationship is the basis for our measurement of time. Time may be a construct of the mind, as St. Augustine claimed, (Burdick 2017) but this construct is configured around the alternation of day and night and the rotation of the seasons, all results of the cyclical relationship of the sun and earth. Of most interest to us is that the rhythms are ceaseless and incontrovertible, yet subject to improvisation.

4.0 DAYLIGHT AS A METAPHOR FOR ARCHITECTURE

The essential organization of a building begins with responses to the need for daylight or darkness. Daylight establishes order in a range of dimensions: location, orientation, circulation, materials, the suggestion of public and private zones, the disposition of openness, and the discovery of edges. Architectural order is characterized by the stability of defined enclosure, its proportioned spaces, surface textures, and apertures. It is brought to life by the variations in daylight, much like a musical theme and variations in which a constant pulse plays host to a flow of evolving ideas.

Sun and its light manifest as a visible, ordering presence in our lives, and its variations are apparent, even tangible. Over the course of the day, sunlight waxes and wanes as it strikes surfaces and is captured on them. Architecture—enclosure—becomes meaningful as daylight appears and disappears, as the sun crosses the sky, as shadow and light move across surfaces, transgress boundaries, and touch contours. We do not see light in mid-air, but when it strikes a surface. We depend on architecture to capture light and reorganize it for us. This is the medium of architecture at work. This is how daylight becomes a metaphor for architecture: in the possibility of change within a fixed system, in the accommodation of stability to variation: the infinite in the finite.

5.0 ORDER

T.S. Eliot wrote, “For it is ultimately the function of art, in imposing a credible order upon ordinary reality, and thereby eliciting some perception of an order *in* reality, to bring us to a condition of serenity, stillness, and reconciliation…” (Eliot 1951)This is where the meaning of architecture most reliably resides, in just how it distills a satisfying, spatial and temporal order from reality. The instruments of the medium of architecture in this task are its bounding surfaces, their materials and textures of the surfaces, the interruptions—contours and the apertures—in those surfaces, and the spaces configured to gather light and shadow: courtyards and city squares, porches and arcades, balconies, and window bays. And, subject to these solar cycles, the spaces and surfaces of architecture cannot help but be responsive to time.

Our sense of direction and its characteristics are similarly referenced to the sun and sky and to the cardinal orientations, north, east, south, and west. The sky and its light are allied with our sense of up and down. We expect light to come from above and to throw shadows downward. An image that defies this expectation is typically ambiguous and disorienting. Architecture improvises knowingly or, on occasion, strategically deviates from these expectations, but always respects them to reinforce our sense of orientation, a condition of order. Without daylight, our sense of orientation is disturbed; a building insufficiently daylighted leaves us unable to fully locate ourselves in the world, much less navigate through it.

6.0 COHERENCE

We seek order in our lives through architecture, a coherence achieved when several elements align with a single objective. Seeking coherence, the two systems, architecture and daylight, accommodate each other through shared, seemingly paradoxical, but complementary qualities. Daylight is consistent and everchanging; assertive and receptive--it may give or receive form; it is a necessity for life, but may be, at other times, a threat to life; it separates and connects; it may engulf or itself be surrounded: it may define a space or be defined; and although, at a given moment, one of its characteristics may appear to prevail, daylight typically exhibits a simultaneity: its multiple personalities and paradoxical conditions exist at the same time. (Schwartz 2025)

Architecture reconciles these incongruities to develop spatial and temporal sense. They establish the essential spatial and temporal factors of enclosure: then and now, here and there, inside and outside, up and down, us and them. We negotiate our place in the world by employing carefully considered degrees of enclosure. Coherent architecture is legible and perceivable, and develops a range of connections between nature (daylight) and the boundaries of our spaces (architecture).

Figure 2: The city plan of Ur, with public courts and streets oriented at a diagonal relative to the north-south and east west axes, and morning shadows cast from the east. (After Shepperson)

7.0 EVIDENCE

7.1. The influence of daylight on the conception of architectural space and form

The Mesopotamian city of Ur was designed to elicit the most favorable micro-conditions from a harsh climate of extreme heat in summer and large temperature differentials between night and day. According to archaeologist Mary Shepperson, streets and spaces were oriented to recognize the order of daylight with its grid rotated at a diagonal relative to the intersecting north-south and east-west axes. (Shepperson 2017) (Figure 2) Shepperson observes that in a north-south-east-west city grid, streets oriented north-south, shaded by its buildings for all but mid-day, create comfortable social spaces for both sides, but in east-west streets, buildings on the south side cast a consistent shadow for most of the day favoring the south side, particularly in summer. In Mesopotamian cities, however, a diagonally rotated urban pattern was instituted as it offered the best overall conditions. (Shepperson 2009) Some benefits of the orthogonal grid were sacrificed so that buildings on both sides of the street annually received both sun and shade, creating a more equable daily distribution of light and shadow, in particular, more of the latter. In city-building, as early as Mesopotamia, daylight was consciously and thoughtfully managed with architectural forms for living, working, and symbolic objectives. More recently, the Eixample, the nineteenth-century expansion of Barcelona, (Figure 3) takes advantage of this configuration for the same reasons. (Urbano n.d.)

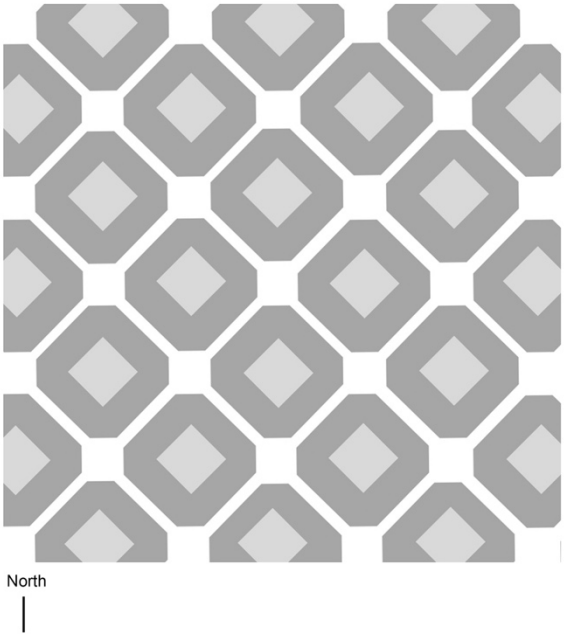

Figure 3: Diagram of the cty block, street, and inner-block courtyards, oriented at a diagonal relative to the north-south and east west axes, in the Eixample district of Barcelona

The traditional practices of architecture, including daylighting and climatic design, were known to modern architects who declared themselves otherwise to be revolutionaries. Le Corbusier's Villa Savoye, for example, occupies a site large enough to accommodate the structure at any building orientation. Clearly, the architect made a conscious decision as to its siting. He oriented the Villa Savoye so that it was rotated diagonally to the north-south and east-west axes so that all elevations receive sun at some time of the year. Additionally, the Villa has an open terrace on the main floor that uses its white, surrounding surfaces to capture sun, again available to all terrace elevations at some time during the year. The terrace elevations reflect sunlight into the adjacent interior spaces, particularly in the living room. As a result, that room receives sunlight from two opposite sides, morning and afternoon, through its ribbon windows and bounced from the terrace walls. It is as if the sun were coming from two directions. The history of architecture is one of the generation of places as a direct response to sun daylight.

7.2. Performance: Daylight as a metaphor for how architecture works

Bagsvaerd Church, near Copenhagen; Jorn Utzon, 1976

As the sun is typically low in the sky in Scandinavian latitudes, Utzon minimized direct

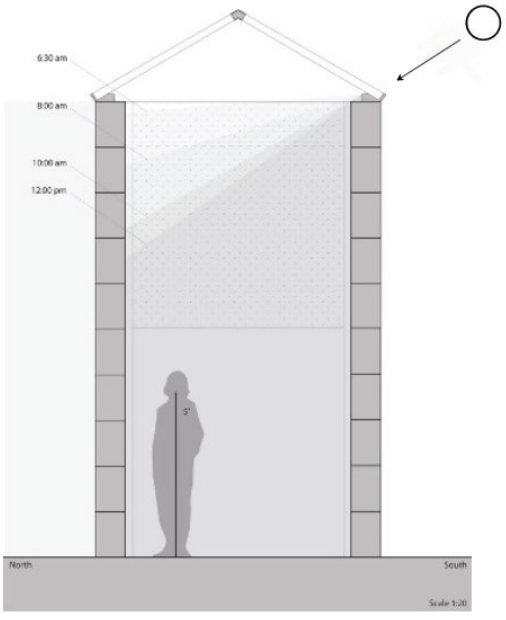

Figure 4: Equinox sun angles in the east-west corridor of Bagsvaerd Church

solar glare by eliminating all but a few window openings in the exterior of the church. He designed the building to capture skylight—diffused light from the top of the sky with minimal sun. (Figure 4) Sun still enters but is well-managed by diffusing wall and ceiling surfaces. Continuous skylights in tall, narrow corridors restrict and diffuse sunlight and share it with other spaces, such as the sanctuary. The high sanctuary clerestory faces west and admits sunlight at the end of the day, but the white, concrete vaults floating above the room diffuse it softly, in stages, before, it reaches our eyes.

Can Lis, near Porto Petro, Mallorca; Jorn Utzon, 1972

Can Lis, Utzon's family home on the Spanish island of Mallorca, employs the same understanding of sun angles to find diffused skylight. (Figure 5) However, as the sun here is high above the horizon, there are no skylights, which minimizes direct sun. Utzon admits skylight from low over the horizon through deep window bays made of stone like the house.

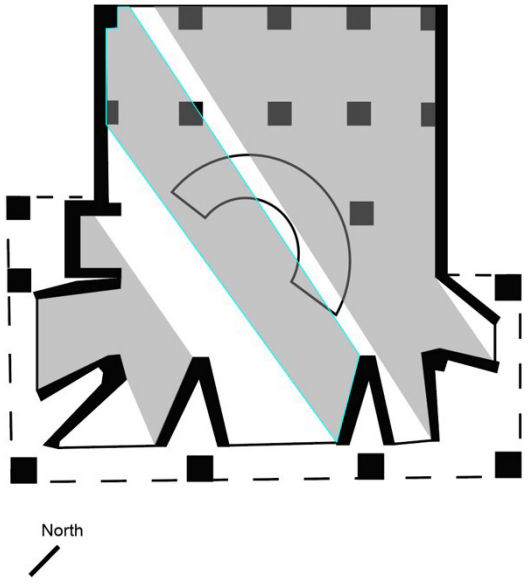

Figure 5: Plan of the living room at Can Lis with early morning December 21 light and shadow pattern

The bays restrict and capture sun, diffusing it into the living room. Sun can be seen and appreciated on the bay surfaces. On those occasions when low-angle sun enters deep into the space through the bays, it is mostly early in the morning and primarily in winter when sunlight is acceptable, even desirable.

In Utzon's church and residence, works that rival his better-known Sydney Opera House, the unchanging elements of architecture—definitive enclosure and carefully located and configured openings— engage with the unchanging cycles as well as the improvisations of sun and daylight. The notion of a regular theme and its variations are evident in both the performance of daylight and the response of architecture.

7.3. Complements: The incongruous, complementary qualities of light and architecture

Alvar Aalto's work is characterized by several pairs of unlikely, complementary qualities found in daylight and architecture. For example, the work exhibits simultaneous degrees of enclosure and openness, in layers and through spaces within spaces. The spaced are defined, yet fluid,

they assert their presence yet receive their form from responses to external forces, they surround and are surrounded; the various paradoxical qualities co-exist. In culture closely tied to its topography and vegetation, these are qualities discoverable in the landscape, characteristics that are evident through experience, but which are also quantifiable.

Aalto understood the landscape, the rise and fall of the land, and the spatial character of the forest as one who walked it for pleasure and sport, but also as one who knew it to be measurable, from his experience as a surveyor. Geographer Tim Edensor, considering the "entanglement of light and perception," and the ever-changing nature of daylight in the landscape, wrote,

> …we use the shifting availability of light to continuously become attuned to space, movement, and color…Landscape is alive with energies… We can hear the vitality of the landscape in the breezes and raindrops that assail our faces, the sounds of waterand wind, and the smells of decay and growth, yet the most evident agent of vitality is light that pervades the land and sky."(Emphasis by the present author) (Edensor 2017)

The characteristics of the subtle, overlapping personae of landscape spaces are articulated by Lauri Louekari, who wrote,

> … the spatial structure of the forest is typified by *incomplete spatial confinement, free-flowing nature of space, layering of views in the depth direction, clustering of views and the nature of light.* (Louekari 2008)

Aalto's Seinajoki Library is definitively enclosed, yet the interior reflects the complexity and character of the daylighted landscape. (Figure 6) Daylight is filtered through shaded apertures; it is an interior landscape of high and low spaces within spaces; its spaces are delineated yet permeable, connected and separate; they share daylight. Daylight, a component of the landscape, generates the character of the library's spaces, and this daylight is subject to architectural influence.

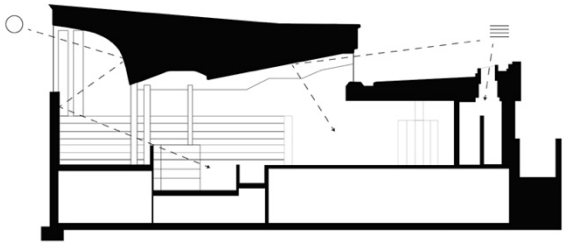

Figure 6: Seinajoki Library section diagram with sun and diffused daylight paths and re-reflections.

Aalto's spaces operate in much the same way daylight does as they are reflective of their immediate circumstances, and as understood through the complementary qualities they share with daylight.

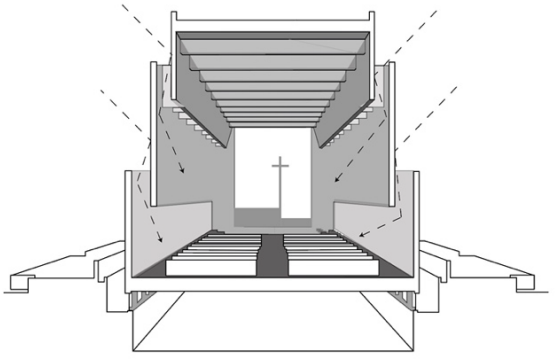

Figure 7: University Reformed Church section diagram with reflected and re-reflected daylight paths.

7.4 Accommodation: Daylight and architecture

University Reformed Church, Gunnar Birkerts, Ann Arbor, Michigan USA, 1964

In this small but eloquent church, Birkerts overlays the most enduring element of architecture, its structure, with the play of daylight. (Figure 7) Parallel concrete walls define the enclosing volume and support the roof; the wall planes are separated by windows and skylights. Sun and skylight play off the concrete surfaces and are reflected into the sanctuary.

Daylight and structure organize room illumination, orientation, and circulation. The daylight is supplemented with electric light. The enclosure, structural, and daylighting systems inform each other.

8.0 CONCLUSIONS

Our experience of daylight derives from order. At the same time, this light is characterized by unpredictable variation. All of this is observable in a receptive architecture and, because daylight and architecture reciprocate in this way, it is reasonable to see the former as a metaphor for the latter and for us to experience a special satisfaction in architecture, one of steadiness and durability that is also vulnerable and open to the unexpected. The delicate balance of the familiar and surprising is certainly one reason that the effects of daylight in architecture are fascinating and evocative of moods.

Daylight's several incongruous qualities represent how architecture performs. Light behaves like both an object (particles) and energy (a wave); it is assertive yet receptive of form; it defines and is defined; it separates and connects; it surrounds or is surrounded; it is the source of life and potentially ruinous. In design, we employ those behaviors to establish spatial legibility, calibrate the passage of time, bestow orientation, direct human movement, suggest tectonic clarity, and interpret local circumstances.

In architecture, these incongruities are complementary and they intensify meaning. The poet and essayist John Ciardi wrote that the meaning of a poem "is inseparable from its own performance of itself." (Ciardi 1975) Meaning resides not just in the immediate significance of a series of words in an acceptable syntactic sequence, but in *how a poem works:* how it manages to do what it does, how it uses words, rhythms, sounds, and silences to communicate ideas. The performance of architecture and how it works, as only the medium of architecture can, echoes the performance of daylight to reveal the essential significance of architecture as a spatial medium, the place for human inhabitation.

ACKNOWLEDGMENT

Figures 5, 6, and 7 were drawn by Nicole Anne Schwartz.

REFERENCES

Burdick, Alan. 2017. Why Time Flies. New York: Simon & Schuster.

Ciardi, John. 1975. How Does a Poem Mean. Boston: Houghton Mifflin Company.

Edensor, Tim. 2017. From Light to Dark; Daylight, Illumination, and Gloom. Minneapolis: University of Minnesota Press.

Eliot, T.S. 1951. “Poetry and Drama.” Atlantic Monthly. February.

https://tseliot.com/essays/poetry-and-drama.

Louekari, Lauri. 2008. “Architecture of the Forest: Observations on the relationship between spatial structures in architecture and natural spaces.” Nordic Journal of Architectural Research. Nordic Association for Architectural Research. SINTEF Academic Press. Volume 20. No. 3.

Plowright, Philip D. 2020. Making Architecture Through Being Human. London: Routledge/Taylor & Francis Group.

Schwartz, Martin. 2025. “Why Can’t Architecture be More Like Water.” Interstices: Journal of Architecture and Related Arts – Issue 24, On Water: The Aqueous in Architecture. enigma : he aupiki charitable trust. School of Art + Design, Auckland University of Technology. School of Architecture + Planning, University of Auckland. Fall.

Shepperson, Mary. 2009. “Planning for the Sun; urban forms as a Mesopotamian response to the sun.” World Archaeology. Vol. 41 (3). The Archaeology of Buildings, Milton Park, UK: Taylor & Francis.

Shepperson, Mary. 2017. Sunlight and Shade in the First Cities: A Sensory Archaeology of Early Iraq. Göttingen, Germany: Vandenhoeck & Ruprecht Gmbh & Co.

Urbano, Judith. n.d. “The Cerdà Plan for the Expansion of Barcelona: A Model for Modern City Planning.” Focus 12. https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1323&context=focus.