

The Architecture of Light

Advanced Studio V

A4105 Section 14

Fall 2015

GSAPP

Jeffrey Inaba, ji2129@columbia.edu

Draft: 1 September 2015



Artificial lighting and haze

The Weather Project, Olafur Eliasson

Light

Light will be the source of inspiration for developing advanced building proposals - with the acknowledgement that buildings are illuminated largely through artificial means. As part of modern architecture's narrative, access to natural light was celebrated as one of the greatest benefits of new technology. The advent of steel frame and reinforced concrete construction allowed building exteriors to have open porous facades that let in greater levels of daylight. But it was clear even then that only limited amounts of natural light work best for buildings. To provide a comfortable environment in which people live and work, the challenge in architecture is not to get more light into buildings, but to theorize just how much to bring in, and to what formal, experiential, and environmental ends. The studio will explore this challenge with the understanding that artificial light is neither the evil twin of natural light nor an element inconsistent with good architecture. Rather, applying a combination of this basic element in its

technologically produced as well as natural form can be the basis of an inventive approach to design that places an emphasis on luminous effects.

Modernist Mythology

Light was elevated to mythical status in the writings of modern architects. It was celebrated as the great human benefit of the new architecture, and one might argue, championed to even a greater degree than technology. For example, we are told that modernized construction methods led to technical achievements such as taller buildings, the result of which was greater exposure to daylight – a vital part of healthier living conditions for inhabitants. In other words, technology was not framed as a vehicle leading to advances in construction or form making per se but as a means to improve the lives of occupants. It was not presented as a mere tool or instrument that changed the capacity, massing or proportion of buildings, but as a modern resource whose ultimate purpose was to enrich the human experience physically and spiritually.

Subsequent advances in reinforced concrete construction figured into further human-centered narratives about light in modern architecture. These more plastic forms were said to channel daylight into the interior creating a 'play of light' or luminous visual effect as the natural light cast upon sculpted surfaces. Exteriors could now not only be expressed as a grid of free facade openings, but also as shaped perforations designed to direct daylight into the building for dramatic visual and emotional effect. Even its use as means to limit solar exposure was exalted as an experience of light. The modernist brise soleil or 'sun breaker' was introduced as an element that could bounce or reflect onto the surface of the ceiling in order to illuminate the interior in addition to protecting the space from intense daylight. The concrete construction was also said to produce a bodily effect by providing a thermal mass to moderate the temperature of the interior. When this passive strategy was applied in conjunction with the brise soleil and operable windows, buildings acted like a technology, a technology in the service of enjoying the human sensations brought about by the introduction of natural light and air. In other words, the term 'technology' was transposed from its role in building construction to act as a metaphor for describing what architecture can do to enliven the human experience, in this case, with architecture mythologized as the technology of light and air.

The pathos invoked in reference to light certainly has contributed to the poetic way it is discussed today. From LeCorbusier to Louis Kahn and beyond, architects have employed a rhapsodic language to describe the beauty of natural light. In lyrical descriptions, daylight has been referred to as a source of true wonderment. It has been romanticized as a quality desired by people across locations and cultures, and also an element that conjures human delight more than any other in architecture, since daylight was and is said to be both the wellspring of metaphysical as well as bodily nourishment.

While Kahn's writings about light might appear to verge on the mystical, in very precise terms he affirmed and restated the modernist idea that light is inseparable from architecture. He described it as the remainder of architectural mass - the undeniable thing that results from the form of a building. Paraphrasing Kahn, architectural forms produce light; and only because of light do we experience architecture as form and space. In line with his thinking, one might even argue that it possesses a unique status in our field. It is essential to the definition of good modern architecture from the standpoint of very different perspectives. Because light is vital both to the experience of buildings and necessary for the reading of building forms, it is crucial to the description and interpretation of projects through the historical lens of ritual, phenomenology, geography, and autonomy. Depending on one's point of view, either you want and need to talk about light, or you can't find a way to talk around it.

Integrity

The discourse about natural light lent a certain sense of integrity to works of modern architecture. Their abstract simple forms could be said to have a reason for being in so far as they served the purpose of framing and producing qualities of natural light as well as facilitating the circulation of fresh air. It is no surprise then that the introduction of artificial light in combination with air conditioning was considered to be a disappointing compromise for modern architectural design. In contrast to a modernist ethos that drew a direct connection between form, technology, and access to daylight, artificial light and the conditioned environment would require architects to rethink the relationship between design, technology and inhabitation, not to mention cope with the sense of loss and nostalgia which we are in many ways still reacting to today.



Ceiling lighting (which was combined with the AC diffusers) complement the areas illuminated by natural daylight.
Borges & Irmão Bank, Vila do Condo, Alvaro Siza

Artificial Light and the Well-tempered Environment

Instead of proposing to return to a more immediate connection to the natural environment and to express that connection in the forms of buildings, the studio will examine hybrid natural and artificial systems and search for an appropriate building language. We will investigate technologies that combine natural and artificial lighting, as well as thermal systems that involve natural ventilation. Through the study of inventive

illumination technologies and thermal strategies we will develop alternative building forms, experiences, and narratives about inhabitation.

The Program

The building will have a mixed-use program, combining two activities that consume some of the highest levels of energy, and which are related to the topic of the studio. They are the office workspace and high-end art gallery. The power draw to illuminate office space is extremely high given the lighting requirement of work areas. The amount for electricity needed for lighting is greater than for any other use in an office building including for computing and cooling. Similarly, the amount of power used to condition the air in a museum-grade art space is exceptionally high because artworks require an environment with stable temperature and humidity settings. Maintaining a constant thermal enclosure is challenging in an art exhibition context because the people entering and exiting the gallery destabilize the temperature and level of humidity, while high concentrations of people occupying a gallery elevates the temperature of the space. These two factors require the environmental control system to condition the air more intensively than other kinds of spaces, increasing the demand for electricity.

The intention of combining the two programs in the context of the studio is to develop a symbiotic environmental relationship between light and temperature that reduces the building's overall energy load.

The building will be about 100,000 square feet in area distributed over multiple floors.

Site

The site will be in Los Angeles because despite the region's architectural history and climate, it has been an elusively challenging place to design buildings that give attention to light and temperature. One of the best-known features of the Southern California's mid-century domestic architecture is the connected interior and exterior space. The ground plane of living and sleeping areas were designed to extend outward to become landscaped terraces. Typically constructed out of the same material, the ground was conceived as a continuous slab. Framing the exterior with large plate glass doors and hinged casement windows, the architecture connected the inside and outside as a holistic environment of light and air. As post-war LA architects received larger commissions, the extended ground plane and operable glass envelope became a feature of commercial and institutional buildings.

While in theory Southern California's climate is favorable to open air living conditions, in reality much of the year the external temperatures necessitate an enclosed conditioned environment. And given the light and air demands of workspaces, LA's mixed-use commercial buildings are artificially lit and generally air-conditioned by a conventional forced air system. The external facades of the majority of mid-sized office buildings are curtain wall construction without sunshades.

Even though there is plenty of sunlight and good weather, and the historical legacy of indoor / outdoor living still looms large in the minds of contemporary architects, in Los Angeles there isn't a strong culture of innovative lighting and thermal design. The studio will engage the history of LA architecture as the studio identifies viable strategies focused on light and climate.

The possibility of an organized studio field trip is currently being explored. An update will be posted before the start of the term.

Note that this is a draft of the syllabus. For updated versions please visit the studio site on Courseworks.

Preliminary Reading References:

Le Corbusier, Toward a New Architecture

Louis Kahn, Light is the Theme

Louis Kahn, Silence and Light

Reyner Banham – Architecture of the Well-Tempered Environment

Sylvia Lavin, Form Follows Libido: Architecture and Richard Neutra in a Psychoanalytic Culture

Kiel Moe, Thermally Active Surfaces in Architecture

Mark Wigley, The Architecture of Atmosphere

Is This Not a Pipe?, Volume 37

Projects References:

Sistine Chapel, Vatican City, Baccio Pontelli

Borges & Irmão Bank, Vila do Condo, Alvaro Siza

Rosen House, Los Angeles, Craig Ellwood

Beinecke Rare Books Library, New Haven, SOM

Bloch Building - The Nelson-Atkins Museum of Art, Kansas City, Steven Holl Architects

Exeter Academy Library, Exeter, Louis Kahn

Yale Center for British Art, New Haven, Louis Kahn

Glass Pavilion, Toledo Art Museum, Toledo, Sanaa

Viipuri Library, Viipuri, Alvar Aalto