I, Nicolas Dellett Lawson, hereby submit this as part of the requirements for the degree of:

Master of Architecture

in:

School of Architecture and Interior Design

It is entitled:

Light and Human Response

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Light and Human Response

A thesis submitted to:
University of Cincinnati:
Division of Research and Advanced Studies

In partial fulfillment of the requirements for the degree of:
Master of Architecture
School of Architecture and Interior Design (SAID)
College of Design, Architecture, Art, and Planning (DAAP)

2003 by:
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Abstract

Through light, an understanding of the built environment is developed. Light’s interaction with space engages the sense of vision, conveying information about color, texture, and shape. The mind interprets this information to generate a primary comprehension of the physical environment, identifying materiality, understanding spatial dimension and depth, and making daily human function possible. Complimenting the analytical understanding, the experiential quality of a space has the ability to amplify perception. The manipulation of light causes primal associations, rooted within our evolution, to stir in the subconscious; activating the mind to question and understand intangible influences on the space. Stimulating thought and emotion using light, a complexity in spatial comprehension develops. The heightened perception fosters an increase in aptitude as the mind functions on a multitude of levels. Applied to centers for learning, the increase in mental capacity as promoted by light can modify and enhance the educational environment.
"Architecture is the masterly, correct and magnificent play of masses brought to
together in light."

- Le Corbusier

The motivation for this thesis is in response to my experience of a simple
architectural space, the light it contained, and how the variations in light dramatically
changed my perception of the environment. It was simply a wall, an orthogonal
planar surface inherently void in color, which adopted life through natural and
artificial light reflected off metallic and colored surfaces. The quality of light on that
wall shifted with the onset of day, the passage of time, and the setting of the sun.
The stark canvas told the quality of light and space.
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Light is the single most influential element in the perception of reality and the comprehension of one’s environment. The fascination with light has shaped the way we function from the onset of existence, inspiring the organization of our lives. As an object of worship, originating from the gods as the giver of life, light has been memorialized in the construction of pyramids, temples, and cathedrals. The fascination with light is so deeply rooted that it extends beyond faith. Associated with earliest stages of development, our bodily cycle responds to light. Our biological and emotional responses can be linked directly to light. For these reasons, we are compelled to build spaces that materialize light.

"...Light is the silent universal expression of the greatest force our senses can grasp."
- Thomas Wilfred

To understand the role of light in architecture one must differentiate between the functional need for adequate illumination and the ability of light to engage the visual senses and enchant the mind. Illumination is a preliminary environmental component that represents a lighting level of enough intensity to transfer information to the optical system. The mind processes this information and generates a simple understanding of the physical environment, extending little beyond what the body needs to function. Illumination allows the body to carry out visual tasks and comprehend tangible spatial relationships. In contrast, light has the potential transcend the bodily interpretation of the environment, amplifying the spatial understanding by stimulating the visual senses in a manner not fundamentally associated with the function of sight. Contrasts in lighting intensity, color transference through bounced light, or reflection influencing a space from an unknown origin can attain a dynamic visual engagement. Thus, light can create spatial connections with objects outside the boundaries of a physical volume by suggesting interrelations among geometric forms. Stretching sensory input beyond the physical bounds of a space stimulates an increase in mental activity as the mind attempts to gain a rational understanding about its environment. Through these intangible spatial relationships, the mind is engaged in lateral thought as it attempts to comprehend contextual influences, fostering an increase in aptitude. By complementing this heightened mental activity with avenues of exploration within a structure, the sense of discovery and learning is promoted.
With light’s ability to enhance the perception of space and induce an increase in learning potential, the logical means of built exploration would be a center for learning. By applying the properties of light and perception to a grade school, the learning potential of the environment can be greatly increased. With the current factory model school functioning at a deploring level of success, this exploration is not only fitting, but also needed. The rigidity of current school organization does little to promote learning through discovery. Using light in the design of a grade school, combined with a complex ordering of geometry, a highly innovative space can be derived.
Vision and Evolution

The biological association with light is a topic that is well rooted in the depths of our evolution. The origin for the association with light can be observed in the development of the human eye and our sense of vision. The human eye evolved over millions of years through iterations of mutation and natural selection. Possibly originating as a light-sensitive pigmented spot on the skin, its development involved a complex series of changes to result in an ordering of complex parts with astounding abilities. Scientists hypothesize that the mode for evolution was that an ability to perceive light gave some tiny survival advantage, such as the ability to evade a predator. Through random mutations, this light sensitive patch generated a depression to make “vision” a little sharper. Eventually these light sensitive cells evolved into the retina, the layer of cells and pigment at the back of the eye. As the aperture of the depression closed, a lens formed over the opening. Filling with fluid, the eye gained its convex curvature allowing the eye to focus concentrations of light onto the visual receptors. Examples of every stage of this evolution can be found in living species today.¹

As sight developed, it became the primary sense for our perception of the physical environment. Humans learned to function in periods of light when the use of our eyes was the most effective. The dependence on vision increased through natural selection, aiding humans to find food and evade danger. Eventually, the understanding of our context became almost entirely based on vision, and in turn dependent on light. Light became the medium from which we understood the world around us.

With the development of vision, and the associated dependence on light, came the ability to perceive and question the influences on our environment. Our understanding of the world became directly associated with the phenomena of light and its various sources, the sun, moon, and stars. The cycle of the sun defined our day, stirring the body and mind to a state of consciousness at daybreak and calming its activity with setting of the sun. As the body adapted to this cycle of light, our awareness was alerted towards other responses in the environment. We noticed that other living organisms responded to light, in particular plant life. Vegetation thrives in periods of light and dies in the seclusion of shadow. At the rise of morning sun, flowers bloom and the plant’s direction orients towards the source of light.

¹ PBS. WGBH Educational Foundation and Clear Blue Sky Productions, Inc. 2001 <http://www.pbs.org/wgbh/evolution/library/01/1/1_011_01.html> (02 May 2003)
In response to this complex ordering and association with light, human comprehension becomes heliocentric. The light of the sun orders our understanding and existence. “When sun strikes a thing, light becomes aware of itself, and the thing gains its presence. Thus, day and night, earth and sky, come into being, and we comprehend the meaning of the first words: “let there be light!”2

Fig. 03 Flower oriented toward the sun.

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**Culture and Order**

Our development, evolution aided by light and vision, supplies us with a dynamic perception of our environment. The rise and fall of the sun, the cycle of daily life, and the adaptation of our physical function places an astounding importance on the role of the sun. “This dazzling energy which is able to bring the entire planet to life, appear and disappear free of the material world, and pervade the universe as a cosmic power, carries rather spine-tingling intimations of some greater force than we can imagine.”\(^3\) The questioning and reverence for this phenomena has propelled us to order our life in response to the rising of the sun. Our civilizations began to orient themselves towards the easterly horizon to greet the rising sun. Initially, this did not carry the modern impact of grided control over the landscape, but as a direction of sleep and worship. The rising sun, being the element to shake the dreams of the subconscious mind and wake the body for the day, directed the orientation of sleep. The attempt to understand what controlled and shaped life established the religious orientation towards the sun.

Early religions attempted to rationalize the phenomena of light, the influential force that trafficked the sky and gave life to earth. Questioning such a power resulted in the earliest deities. Surely, only divine action could cause such phenomena. These dynamic celestial bodies, the sun, moon, stars, and planets, occupied the vaults of heaven, a region alive with cosmic powers. Their impact on earth gave life to the shadows, altered the oceans and tides, brought seasonal rains, and marked the passage of time. The intangible nature of these sources of light, and the impact they had on the comprehension of existence, make it easy for us today to comprehend how light could be formalized into a religious apotheosis.\(^4\)

Various religions practice have considered luminosity as a means of transcending the earthly world, and reaching a point of spiritual enlightenment. For example, many eastern schools of Yoga focus meditation on luminous things, such as the sun, moon, fire, smoke, or mist, as points of departure for spiritual transcendence. “The understanding of light as an airborne phenomenon enabled religious man to begin to relate actively to celestial powers, to personally engage and creatively participate with the emitted rays.”\(^5\) The enthralled interaction with light eventually prompted man to create structures to organize, rationalize, and ultimately materialize light as a tangible element of worship. The inspiration to build with light as a guiding force has led to the construction of some of the most captivating man-

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3 Henry Plummer, p.17  
4 Apotheosis: Elevation to a preeminent or transcendent position; glorification  
5 Henry Plummer, p.17
made worlds. Light materializes in temples, mosques, churches, synagogues, and shrines as a focus for worship.

Perhaps the earliest manifestation of light in built form is the ordering of monolithic rock at Stonehenge in Wiltshire, England. This circular composition is ordered with a heelstone oriented towards the point of sunrise at mid summer. With hundreds of similar stone landscapes constructed across Europe, this methodology establishes a precedent for solar oriented construction.6

Another culture to develop a lasting architectural response to the materialization of light is the ancient Egyptians. Among their remains we find interior environments that utilize material to capture and reflect minimal amounts of sunlight within interior spaces. Using light colored alabaster in conjunction with clerestory windows allowed for the subtle fade of light to shadow within hypostyle halls7. Associating rejuvenation of life on earth with light, they applied it towards the worship of deities as well as reincarnation for the afterlife. For this reason, we find objects of worship as well as burial masks cast in gold and inlayed with colored glass to capture and reflect the dimmest of light. The most monumental structures of Egyptian culture are the pyramids and obelisks that dot the valley. Designed with the intent to capture the first and last light of day they were clad in light colored stone and capped with gold to shine as beacons of light over the still dark desert floor.

An example of the reverence for light in the Egyptian structure of belief is Colossi of Memnon located on the plane of the Thebes. From their vantage point on the west bank of the Nile River, these seventy-foot tall statues face east towards the point of sunrise at the winter solstice. The foreshortening of daylight continues to this point where it is combated by the stare of the figures gleaming in the early morning light. It is the point where the sun itself struggles for its own rebirth.8

Subsequent western religions diverted from the worship of the sun, however retained reverence towards luminous matter. Greek temples were constructed of layered stone to generate oscillations of light and dark. The articulations in column fluting were a contributing factor in the development of this aesthetic. Columns played an additional role in the shading of the dark rectilinear geometry of the naos9. From the shadowy depths, a sculpture of the god made of

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7 Ibid, p. 67-89
8 Henry Plummer, p. 19
9 Naos: The inner room or sanctuary of an ancient Greek or Roman temple, in which the statue of the god was situated
ivory and gold would glimmer from the faintest of light. With many of the temples oriented towards the east, at times “toward the rising sun of the deity’s feast day in the year of the temple’s dedication.” We can speculate that these sky-oriented temples placed their gold clad deities in the shaft of morning light in a manner similar to spaces of worship in Egyptian culture.\textsuperscript{10}

Within early Roman culture, the presence of light is less important in places of worship. The Pantheon in Rome, Italy however makes use of oculus at the apex of the dome that casts light into the interior. The resulting shaft of sunlight solidifies into a beam as contacts the damp, dusty air of the interior. It is speculated that as the spotlight of sun roamed the interior it would have cast light on divinities set into wall niches.

Christianity marks the next significant shift in the rationalization of light within the physical realm. The Christian belief structure views materialized light as a spiritual phenomenon. According to Genesis, on the first day god proclaimed, “Let there be light, and there was light.” However it was not until the fourth day that he said, “Let there be lights in the firmament of the heaven to divide the day from the night...”\textsuperscript{11} This sequence of creation still places importance on the sun, moon, and stars, but recognizes ambient light to be of a different and higher order. The light around us preceded the creation of a source, making the materialization of light on earth a spiritually significant gift from the creator. Light is the origin of existence.

Following the concept of creation is the symbolism of Christ as light on earth. His earthly presence is essentially void of logical origin, with his only source of existence being God’s infusion of the Virgin Mary by a ray of light. Christmas,

\textsuperscript{10} Vincent Scully \textit{The Earth, the Temple, and the Gods.} New York, 1969 p.44.
\textsuperscript{11} Gen. 1:1-19. KJV
the birth date of Christ, was officially declared to be on December 25th by Roman Emperor Aurelian in the year 274 AD, the winter solstice of that year. Similar to the concept of the Colossi of Memnon in Egypt, the fading light of day returns with the light of Christ to illuminate the world. According to scriptures, the point of his birth was marked by lights and a bright star, and that he glowed from within.

The most influential metaphysics of the Christian belief system on European architecture was the identification of luminosity with heaven. The biblical motivation for this association lies in the “city of god” being the “city of light.” With the church being an earthly manifestation of heaven, every attempt was made to construct a space that held light. The concept of the church was to generate a fabric of light within the volume to symbolize a heavenly presence, an earthly light void of a source.

Early churches were still dependant on the heavy construction methods of the time, limiting the possibility for large expanses of glass. Instead, these early Christian churches of Ravenna and Byzantium relied on gold leaf mosaics on the walls and ceilings to reflect what little light was permitted to enter the structure. The faint shimmering in the shadows gave the impression of light emanating from the heavy stone wall.

The quest for more luminous matter spawned the development of the gothic cathedral. The stretched skeletal frame with external buttress supports vaulted the nave towards the heavens. The ribbed structure allowed for the infill of large expanses of translucent colored glass to solidify light within the structure. With gothic architecture, the Christian materialization of the “city of god” became a delicate, light filled, cage of stone and glass. The interior became a play of deep shadow and vibrant colored light.

The post medieval church evolved from the elaborate structural systems and high vaults of the gothic era and utilized a complex layering of visual screens. The controlled frames views into deep interior spaces in conjunction with hidden light sources created a foreground, middle ground, and background, all with variations in lighting condition. The resulting mysterious glow from the depths of the sequence gave the impression that the light of paradise was mysteriously contained within the volume.

Many current practices have deviated from the reverence for the sun and light as a spiritual element that orders our existence. Possibly, in part due to the

13 Revelation 21:22-24. KJV
14 Henry Plummer, p.19-21
declining cultural fascination with religious explanation of existence. The focus instead shifts towards the emotional quality of space. Still not easily rationalized, it is recognized that, “light ‘colours’ things and ‘tunes’ men, and determine the atmosphere or mood of the place. The mood is the comprehensive ground on which everything appears. Certainly, moods change with weather, the season, and the occasion. But behind the changes, the mood of the place persists.”\textsuperscript{15} The concept of crafting and emotional position with light is the force that beckons us to create. “Every time we form something with our hands, manufacturing or working a material, and then deploying that configuration in space, we have created a structure that modulates light in a specific way.”\textsuperscript{16} The spiritual transcendence no longer lies in light itself, but the psychological impact it has on the human psyche.

\textsuperscript{15} Christian Norberg-Schulz, p.5
\textsuperscript{16} Henry Plummer, p.11
Scientific Understanding

The rationalization of light as phenomena eventually diverted from the function of religious belief to become rooted in the systematic understanding of science. As a provable hypothesis, science began to supply answers for the presence of light in the environment. The rising of the sun, organization of the stars, and our relationship amongst them could finally be answered in rational explanation. The heliocentric model for the universe, as conceived by Nicolaus Copernicus and explored by Galileo, gave logic to the phenomena of sunrise that ordered our existence and baffled early man. Early astronomy and logic were greatly contested for their disregard of religious belief, yet as the supporting evidence for scientific discovery mounted, science was turned to as the sole explanation of stimuli supplied by the physical environment.

By applying science to the phenomenon of light, we gain an understanding of what light is composed, how it originates, and ultimately how it can be manipulated. With the physical makeup of light being varied wavelengths of energy, visible light falling within a restricted spectrum, an understanding of its behaviors, or properties, can be established. The phenomena of refracted light, as present in the fine mist of a rainbow, can be easily recreated in a laboratory using a white light and a prism to separate the various wavelengths of visible light into their component base. The property of light refraction is also easily shown through the visual bending of objects inserted in water. The molecules of water distort and modify the direction of light through the substance.

Reflection represents another property of light that impacts the visual environment. Light bounces in directions responding to the angle of incidence to the object. This geometric property is however modified by the physical makeup of the surface at point of contact. The reflectivity of the surface and its color can modify the resulting rays of light. Through science, this result of this interaction can be predicted through a series of algorithms. The best example for this property is elaborated upon in the Cornell Box where the physical reality of color transference is calculated using digital rendering engines and metered in comparison to the realistic model. In this example, it is apparent how the singular light source bounced off the colored walls, transferring color to the monochromatic geometries within the scene. The amplitude of this reaction is affected by the shininess of the surface. Possibly the best example of this property within our daily environment is the metallic finish of cars and water. The principal of reflected light explains the

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17 Andrew Fraknoi, David Morrison, Sidney Wolff, *Voyages Through the Universe* Harcourt, Inc. 2000, p.15-37
intrigue of northern light. Indirect sunlight from the north has added warmth in color while maintaining a moderate intensity.

“…This quiet morning light reflected, how many times from grass and trees and clouds entered my north room touching the walls with grass and clouds and trees…”
- William Carlos Williams, To Mark Anthony in Heaven: page 51

An accurate understanding of light cannot be thoroughly explored without recognizing the influence of color. Color, as communicated by light, has a drastic impact on our visual system, not the mention our physiological and psychological response. Functioning on the fringe of calculable science, the rationalization of color lies in such charts as the Munsell hue, value, and chroma scales in color space, which breaks light down into its component groups and intensities. Hue functions as the change of color within the spectrum, chroma functions outwards along the spokes and represents the change from gray within the spectrum “saturation”, and value moves vertically measuring the darkness or lightness of a color. Understanding the relationship between colors can help produce a variety of predictable results.

The color wheel, a circular diagram in which primary and intermediate colors are arranged sequentially so that related colors are next to each other and complementary colors are opposite, establishes the most fundamental understanding of color. Set in relation to each other, contrasting colors have the potential to drain each other of hue when placed in an unbalanced composition. For example, in Figure 21 the central red square is of the same hue in each composition. When placed on a background color field that is closely related to the compliment (left), its intensity is increased, and visually it is pushed forward in composition. Contrastingly, when placed on a color field of closely related hue, the value is less intense and visually it drops back in space. Utilizing this principal in composition, complimentary colors have the ability to generate a vibrating tension between their boundaries (Fig. 22). This stimulation is visually more engaging than colors of less contrast (left). The property of residual color image, or afterimage, demonstrates a dramatic impact of complimentary color on visual perception. In Figure 23, if you were to stare at the purple dot for 30 seconds and then stare at the blank square adjacent, the complimentary color, green, shows up as the afterimage.

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in response to the eye’s adjustment. This explains one of the major components in Goethe’s “Theory of Colors” where he wrote, “If we look long through a blue pane of glass, everything afterwards appears in sunshine to the naked eye, even if the sky is gray and the scene colorless.”20 This effect is because the eye has adapted to the blue light given the prolonged exposure. With removal of blue, the eye maintains an impression in compliment, seeing yellow-orange in every aspect of the environment.

Architecturally, the concept of residual color image most dramatically affected the chromatic makeup of the hospital environment. The historic hospital model was a brightly lit structure of all white décor and stainless steel instruments. The flaw in this composition however was realized by the surgical team. Also clad in white, the surgical team would stare into the red of the body cavity under high lighting conditions for prolonged periods of time. When vision was diverted, the residual image of internal organs was projected on every surface, be that human or architectural. To combat the effects of residual image, modern hospital environments and surgical smocks are finished in a blue-green color, the compliment of red, to balance the visual image.21

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21 Frank Mahnke, p.28-29
Perception

Light can be preliminary comprehended as being the components that represent psychological responses and scientific properties such as wavelength and reflection. While seemingly separate, these polar methods of comprehension effectively function in tandem to amplify the individual’s perception and understanding of his environment. The mind subconsciously filters fields of varied lighting intensity to determine points of focus, spatial depth, and ultimately a hierarchy of visual importance. Rational thought places emphasis on objects in light, for in the presence of light physical form begins to develop an identity. When composed in layers this begins to influence our understanding of spatial composition “From the optic-happy realm of material an detail to the connection of space development in the light of foreground, middle ground, and distant view, architecture is manifest in perception.”22 Folds and undulations in geometry are disclosed through the gradation of light to shadow across the surface. The contrast in value gives spatial depth to the variances in geometry and orientation to the composition. With increased intensity in light and interaction with color, the nuances in hue begin to suggest materiality and establish a visual weight, while the tactile properties of the material are suggested by the reflectivity of the surface. With the relationship between light and surface, we perceive the texturing of light as it becomes manifested in physical form.

“When sun strikes a thing, light becomes aware of itself, and the thing gains its presence.”23 It is only through this interaction with surface that light can be perceived as an element within the composition. As light interacts with the surface, it is modified in its direction, intensity, and hue. This mutation of initial light is not only transmitted to the visual receptors of the occupant, but is transferred to adjacent surfaces to build a complexity of light and color stratification.

The transference of information from physical surfaces, through light, to the eye not only aids in the comprehension of the physical environment, but also contributes to the viewer’s perception of his surroundings. The union of materiality and hue work together to develop an impression of the physical space. Further modified by the contrasts in light and shadow, this collection of physical information is derived by scientific principles and synthesized with recalled memory to generate an impression of emotion. “Science remains essentially mysterious, yet our daily scientific and phenomenal experiences shape our lives; experience sets a

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22 Steven Holl, p.56
23 Christian Norberg-Schulz, p.5
new frame from which we interpret what we perceive.”24 This representation of cognitive thought drives human perception of spatial relationships, forcing us to recognize parallels between visual stimuli and their associated experience. In order to develop a distinction between variations in associated experience triggered by environmental influences, importance is placed on the articulation of surface and light.

“Light can be read both as the phenomenon of light in words and the pressure of light in science. Language without sentences, just like natural light, has essences that transcend specific meanings and purposes. Language becomes a form of light while light becomes language. Face to face with light in volume, luminous space becomes dreamlike. A moment of intense sensibility ignites the intuition. ‘Sideways, forward, backward… the empty words of light are spoken in utter silence.”25

Fundamentally, the perception of light in the daily environment is controlled by the tandem function of two contrasting elements. The source component of light initiated the interaction with space, material, and color. Through its presence in composition, we identify the physical makeup of the environment. However, it is through its negative, shadow, that we gain contrast in the visual sense. The void of shadow, effectively removed from our physical understanding of matter, establishes a complex duality in sensory input. With an understanding of these components of visual stimulation, a manipulation of the physical environment through their interaction can be attained.

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24 Steven Holl, p.14
25 Ibid, p.104
Light

The terminology used in this discourse must be clarified through the separation of phenomenal properties of light and scientific characteristics of illumination. Light represents a modifier to the physical environment that triggers an emotional response through visual perception. Its interaction with surface establishes its identity, as well as describes the composition of the volume. Removed from each other, neither element, light or surface, can exist visually in the absence of the other. Without light, there would not be communication of physical information to the eye, without surface there would not be an medium for light to materialize on.

“The study of light, therefore, is something more than a mere investigation of illumination. Light and things belong together, and every place has its light. Light, things, and places can only be understood in their mutual relationship. The phenomenology of things and places is also the phenomenology of light.”

By the interaction with built form, the quality of light has the ability to modify the perception of space. “The mysteries of the science of light approach the physiological delights of natural light in architecture: the faint glow of dim reflected daylight, the sheen of a plaster wall in a wash of sunlight, and the variations between heavy shadows and light shadows with reflected color.” The involvement of light with our environment evokes our understanding of places, things, and experiences. The manner in which it transfers color, reflects from sheen of polished stone, and inhabits the air heavy with moisture causes an emotional impression to be generated. Light gives mood to what it touches.

In the human psyche, the attraction to light focuses our attention and purpose in being. “Glimmering lights are intimations of latent worlds, giving hope an inspiration to what may be our most fundamental need - a cosmic foothold in a dark void.” Light supplies the force that drives our existence, ordering life, giving purpose, and supplying clarity to the visual environment.

26 Christian Norberg-Schulz, p.5
27 Steven Holl, p.111
28 Henry Plummer, p.79
Shadow

The reality of space is not only understood through the presence of light, but in its counterpart of shadow. The optically void element of shadow does much to the visual system, and ultimately the mind. Through the ambiguity of shadow, the mind is initially forced to function at a heightened level to synthesize a physical understanding from the ambiguous shards of visual information. The mind struggles to generate a rational form as the body adjusts to the reduction in illumination intensity. The mind functions independently from the retina, thought functions to generate a concept of surrounding while the eye attempts to adapt to the limited level of light and develop clarity to the realistic physical space. Aside from this initial moment of imaginative fertility, the void of shadow is essentially a non-energetic phenomena. Once the mind synthesizes its environmental surroundings the deprivation of sensory stimuli causes mental function to go dormant.20

“If we keep the eyes open in a totally dark place, a certain sense of privation is experienced. The organ is abandoned to itself; it retires into itself. That stimulating and grateful contact is wanting by means of which it is connected with the external world, and becomes part of a whole.”30

The duality of shadow and light allow us to understand the full environmental spectrum of light. Ranging from the penumbra, total eclipse of light in pure shadow, to the umbra, the partial eclipse of light, the physics of light and shadow lend dynamic to the perception of space. The contrast in lighting levels, and the potential for visual rhythm, make the play of light and shadow on material surface the loudspeaker of our perceived reality. “…Light and shade are the loudspeakers of this architecture of truth, tranquility and strength. Nothing further can add to it…”31 The phenomena of light and shadow bestow both clarity and ambiguity to the physical environment. By this interrelation of contrasting elements, a complex perception of material and space is generated.

“…A phosphorescent jewel gives off its glow and color in the dark and looses its beauty in the light of day. Were it not for shadows, there would be no beauty…”32

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20 Henry Plummer, p.81
Application and Understanding

The introduction of light into architectural form has a varies in methods, all of which carry an inherit variation in perception. Bringing natural light into the interior space is dependant in part on orientation and sun angle, but effectively functions on basic concepts. The most basic methods of application and perception are aperture, wall, and bounce.

The simplest application speaks of the origin of the window. The aperture puncture in a surface, clad in glass, represents the most fundamental method of application. This method is however inherently flawed in the perception of the interior environment. Light entering the window aperture must transverse the interior space to its point of diffusion, the opposing wall. By the time bounced light returns to the surface containing the aperture, it is of a significantly lowered intensity. The perception of the interior pace is overpowered by such contrast in illumination. The wall containing the source for light is effectively in shadow due to the sharp contrast with the intense light (Fig. 30). The ambiguity of shadow dulls the experiential quality of the interior volume.33

In response, the design approach for aperture lighting shifted towards the corner of the interior space. By inserting a window element in the corner position, the light source is located adjacent to the surface for diffusion. It is common for such apertures to adopt a linear nature, stretching from floor to ceiling in order to eliminate the sill and header silhouette conditions. Light bouncing off the side wall would fill the space and drastically reduce the contrast between opening and wall. This reduces the potential for sensory deprivation, and allows for a more clear perception of the interior material and surface articulation. These approaches are also applicable for skylight conditions.

The wall method of interior lighting is a product of curtain wall construction. In this method, the entire elevation of a wall is replaced with a glazing system. The problem of contrast due to distance from point of diffuser as noted in the aperture method is relieved by the flooding of light to the interior space and the removal of contextual wall that would adopt the contrast in light. Perception of the interior space is however the principal supplier of contrasting lighting levels. The single directing flooding of light to the enclosed environment creates a visual flattening to all elements from either perspective. From the front elevation, detail in color and shadow is washed out by the abundance of light and lack of visual contrast. From the rear elevation, all of the object are placed in silhouette (Fig. 31).

33 Sergio Los Carlo Scarpa Taschen, Italy 1999, p.38-40
Almost functioning at the level of sensory deprivation, this method of lighting must be incorporated carefully. In order to keep a stimulating interior environment that is not draining on the visual sense there must be balance in lighting levels. This can be attained by juxtaposing window walls on the interior space, or complimenting the expanse of glass with artificial lighting. The orientation of the space in relation to the sun is also of importance when considering the intensity of direct illumination washing the space.

The final functioning element for the introduction of light to the interior environment is through indirect or bounced lighting (Fig. 32). In this method light is introduced to a space through an intermediary. The perception of this lighting environment is far more favorable than the direct methods. The resulting diffuse light has the ability to develop character and information that would not be possible with source illumination. Through bounced light color information, texture, finish, and spatial relationship are able to be transferred between adjacent spaces.
Practice and Principles
Luis Kahn

The work of Louis Kahn represents an extensive exploration in the materialization of natural light within a built environment. His portfolio of completed works establishes an evolving methodology for the insertion of light into an interior space. Natural light was directed though punched openings in walls and ceilings, reflected off structural objects, deflected by screening panels, and accepted through lighting fixtures. His methods for the control and modulation of light escalated in complexity from earlier light filtration systems in the 1930’s and 40’s, controlled by overhangs and trellises, to the layered approach of the 1960’s and 70’s, where light seemingly penetrated the structural mass. Kahn functioned on the concept that “We were born of light. The seasons are felt through light. We only know the world as it is evoked by light...” Uniting these ideas with the skillful manipulation of form resulted in the creation of dynamic spatial compositions that intrigue the visual senses.

Kahn’s work at the Kimbell Art Museum came to its realization when the union of geometry and light was reached. “My mind is full of Roman greatness and the vault so etched itself in my mind that, though I cannot employ it, it’s there always ready. And the vault seems to be the best. And I realize that the light must come from the highest point where the light is best in its zenith.”34 The relationship between light and geometry was so holistic that the resulting form became the most influential component of the building. The insertion of a direct/indirect natural lighting fixture into the apex of the raised vaults brought sunlight to the interior of the building, diffusing it off the half barrel. The positioning and geometry of the fixtures was calculated scientifically according to the angle of incidence of the sun in relation to the longitudinal slot in the vault. Incorporated in the geometric lighting solution was the potential for a shaft of unfiltered light to penetrate the space, divulging its true intensity.

“An architecture must have the religion of light. A sense of light as the giver of all presences. Every building, every room must be in natural light because natural light gives the mood of day. The season of the year is brought into a room. It can even be said that a sun never knew how great it was until it struck the side of a building. When a light enters a room, it is your light and nobody else’s. It belongs to that room. The Kimbell Art Museum uses all natural light.”35

34 Louis I. Kahn Light is the Theme Louis I. Kahn and the Kimbell Art Museum Kimbell Art Foundation, Fort Worth, TX. p.33
35 R. S. Wurman. What will be has always been: The words of Louis I. Kahn; Comments on the library. Phillips Exeter Academy, Exeter, 1972 p.216
In Figure 33 the dynamics in lighting conditions are easily identified against the travertine infill and concrete structure of the building. The diffuse lighting from the perforated aluminum deflector at the apex of the vault supplies much of the functional light for the space. Its intensity adjusting with the changes in season and time of day would establish a relation to external influences, altering the perception and mood of the interior space. A more active demarcation for the passage of time remains in the shaft of direct illumination that enters the space and navigates the wall, responding to the sun. The union of easily identified structural geometry, the scientific understanding of reflected light, and the almost spiritual quality of articulated natural light makes this building one of Kahn’s most successful projects.

In the National Capital of Bangladesh, Kahn employed a number of complex methods for introducing light to the interior spaces. Most of these methods focused on the use of large volume light shafts, which both impacted the geometry as well as introduced light to recessed interior spaces. Externally expressed, the union between functioning geometry and light was once again apparent. Kahn developed this approach by inverting the concept of the column with spaces of light. The dark mass of the column now became hollow and the source of light, while spaces of light became filled with mass. Adjusting the scale of the hollow column, its walls were now able to give light to the space through large geometric apertures. The heroic scale of the light shaft also allows it to become occupied space within the composition. In Figure 34 the light shaft adjacent to the prayer room is shown from the interior. The cylindrical column is shown engaging the rectilinear geometry of the interior volume. The large expanse of the skylight opening floods the interior of the shaft with natural light. Before entering the prayer room, the light is bounced and diffused within the column. From the interior space, the contrast in lighting intensity between light shaft and room interior places a sharp distinction between the two volumes. Working with the geometry, the light effectively dissolves the corner of the space and the cylindrical nature of the light shafts adjacent lift the eye upward. This is due to the clarity in understanding of the environment of the light shaft. At the lower levels, the illumination level is adequate for developing an understanding of the geometry, due to this comprehension the geometry is accepted and dismissed from active thought. Due to the low contrast and high lighting intensity at the level closer to the skylight, the nature of the space is not easily understood, causing the mind to focus on it.

Le Corbusier

The architecture of Le Corbusier has focused on the assembly of masses in light to generate a memorable emotional response. Through the organization and composition of physical masses in controlled lighting, a dynamic architectural language is created. He believed the relationship between the material and light established the fundamental elements required for the perception and relation to one’s environment. "Space and light and order. Those are the things that men need just as much as they need bread or a place to sleep." With this concept of understanding, he articulated his architecture in a manner that modified light through its interaction with surface texture and color. Many of his projects functioned as articulated canvases for the play and discovery of light.

"Light and shade are the loudspeakers of this architecture of truth, tranquility and strength. Nothing further could add to it."37
- Le Corbusier

His work at La Tourette in Lyon, France represented a complex understanding of the play between light, color, and form. At a point in his career where his stature permitted him to negate the battery of justifications and explanations in design, the progress of the monastery was unhindered by external misunderstandings. The origins of the design are rooted in the practice of the occupants, elaborating on how their concepts could be represented in form. The Dominicans at La Tourette refer to divine transcendence to open an era organized by rational thought and fundamental doubt. They attempt to confront the intellectual understanding with divine word. Not being a practicing believer by the strict sense of the word, Corbusier interpreted their belief structure to maintain a religious absolute in the world while his architecture communicates an indescribable to the world.38

The design originated with the poverty-associated aesthetic of concrete, directly relating to the occupant’s vow. The articulation of this material is almost dreamlike in clarity through the utilization of rough formwork. The aesthetic plays with natural light in a manner that evokes thought in order to develop a level of clarity in edge and face. The minute modulation of light on exterior surfaces masks the understanding of material and plane through points of high contrast between light and shadow. In the main celebratory interior space, the church, the monolithic

38 Dominique Lyon, La Corbusier alive Vilo International Paris, 2000, p.170
quality of material is abundant. The grey of concrete is present on the surface of walls where it maintains a subtly variation in hue responding to the framework. With the floor and ceiling matching in finish treatment, the interior space is almost at a point of sensory deprivation. Accompanied by alters and other furnishings that did little to add to the visual backdrop, the interior was almost entirely void of stimuli. The stale environment was easily understood, representing the association with the typical logic driven rationalization prevalent in the secular world.

Contrasting this sterile environment, Corb introduced the element of light as modifier to the space. Representing the spiritual influence on the rational world, the light brought modification, meaning, and life to the dull texture of the interior environment. The contrasting quality of light was not in relation to the typical understanding of light vs. dark, but in juxtaposition of meaning and understanding supplied by divine element vs. the simple environmental comprehension associated with the unenlightened mind.

Within the interior, there are several concepts at work to attain an evolving and dynamic interaction between light, surface, and occupant. In Figure 35, the most profound interaction of light with the space is through the insertion of color into the static environment. The principal of contrasting colors is at work in relation between the primary colors. Edges are well defined and sharp to the sense of vision, contrasting the ambiguous articulation of the concrete detailing. These colors are then transferred through the bounce of light to lend hue to the grey of the interior volume. This establishes a union between light, color, and surface, an in turn the union between the religious word and the worldly understanding. Also functioning in this image is the principal of contrast in silhouette. The slicing aperture of light at the back of the composition places the middle ground of the wall in shadow. This juxtaposition forces the visual system to focus on the quality of low light in the foreground as modified through the color transferred from the skylights.

Figure 36 further elaborates on the stark nature of the interior environment. All physical elements that clutter perception are removed from the environment as Corbusier works to attain the feeling of an “unspeakable architecture.” With nearly all stimuli removed from the environment, the occupant finds it necessary to embody the feeling derived from the space.\(^{39}\) In the church, the stark pallet of concrete is again set in the ambiguity of low light and shadow. The lowered intensity of illumination is further aided by the contrasting lighting level supplied

\(^{39}\) Ibid, p.178
from the chapel space beyond. With the large skylights in the adjacent space, the lighting is maintained at a much higher level, with only subtle variations in intensity over the course of a day. This light and dark contrast established the primary mode of perception for the space. They work together to produce a pallet that is easily understood, covers the spectrum of value and hue, balances in lighting intensity, and still does not detract for the focus of the space. Although having variety in stimuli, the space as a whole is perceived as a static given the lack of alteration in environmental conditions. This element supports a point for visual engagement and focus in the composition. The shaft of natural light that is introduced into the composition becomes the element of foreground focus. Establishing a relationship with the skylights in intensity and variation, it functions as a beacon within the dimly lit space. The light activates the perception of the interior space as it alters in intensity and angle in response to the sun. Its symbolism and evolving compositional quality set in contrast to the static nature of the visual pallet marks it as an element of focus. The mind begins to draw connections between the alterations in the shaft of light with the subtleties in change perceived in the adjacent chapel space. A spiritual understanding is brought to the environment of rational thought, manifesting the churched meaning and purpose in visual composition.

In Figure 37, the stark contrast between articulated visual stimuli and sensory deprivation in environment is at work. The environment is activated as colored light modifies the space from its apertures of insertion. Corbusier made a careful consideration in this means of inserting light. With the reduced lighting level in the chamber like space, the apertures were used to channel indirect light into the space. This produced a lower level in contrast, allowing the eye to still perceive the interior wall without it being placed in total silhouette. The contrasting level in lighting is still enough to define the sharp edges on the apertures in relation to the wall. In this instance, light and color begin to detail an understanding of the physical makeup of the space. By light, the reality of color is brought into the space. Also disclosed is the perceived thickness of the wall through the interaction of light with the angled shelf at the base of the opening.
Steven Holl

The work of Steven Holl focuses on a variety of principles in illumination and composition. His mode of departure for many of his designs is the contrast between opposing points of perception. The best functioning example of this is the analysis of a parallax condition. In parallax there is a deviation between two vantage points and how they perceive the same element in composition. Typically associated with astronomy, parallax is a method of triangulation used to calculate distances between heavenly bodies within the solar system. By contemplating alternate points of perception within a structure, Holl generates dynamic forms that alter in appearance based on vantage point. The varied point of view also applied to the application of light within the interior environment. Functioning off the principals of umbra and penumbra, the total and partial eclipse of light, he manipulated the method of integration of light into the space. These concepts are then applied to the integration an relation of natural light to the mass of the structure.

“The movement of sunlight exerts relational forces on spatial definition, engaging the body of a stationary building.”

In Figure 38, Holl is playing with the tactile quality of reflected light within a composition. Within a volume that is essentially void in chroma, the insertion of bounced hue in composition begins to disclose the reality of its physical composition. Building with varied intensities of light and contrasting colors, the stark space becomes alive with energy through the medium of light. The principle of contrasting hue is complimented by the varied intensity of light in the chapel of St. Ignatius (Fig. 39). The contrasting methods of illumination, bounced and aperture, are joint be alterations in hue, and set apart in composition by the contrast between planes. The sensory deprivation of the foreground element in silhouette aids to focus both vision and thought on the articulation of light.

Figure 40 amplifies the contrast in compositional elements discussed thus far by introducing an articulation in material surface. The subtleties in modeled finish allow light to be manipulated and generate minimal gradations of value.

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40 Andrew Fraknoi, p.379
41 Steven Holl, p.31
James Turrell

The work of James Turrell is mostly focused on the design installations. He explored the varying manners that light engages the visual senses and inhabits space. There is no question that his work as a whole is architecturally based, established in material, environment, and human interaction. His work is motivated with altering the perception of a physical space through the articulation of light, and the power it has in modification and ambiguity.

"Light is a powerful substance. We have a primal connection to it. But, for something so powerful, situations for its felt presence are fragile ... I like to work with it so that you feel it physically, so you feel the presence of light inhabiting a space..."

- James Turrell

In the generation of inhabitable space, Turrell exploits the potential of light to overpower our sense of perception. Through sharp contrast and color washed pallet, the mind has difficulty rationalizing the environment. In the To Be Sung performance space (Fig. 41) the properties of light are simple, but the comprehension of the space is confused. Functioning almost on the edge of sensory deprivation, there is little variation in input stimuli. The mind however remains active, captivated in the simple play of contrasting hues. Even the insertion of foreground elements, effectively in silhouette, are reduced in composition by the monochromatic nature. This principle of ambiguous fields of light and the sensory...
reaction is utilized in the functional spaces associated with this skyspace work (Fig. 42 & 43). Questioning is brought about though the seemingly tactile quality of light introduced in the rectilinear oculus in the center of the ceiling. Using a knife-edge trim, Turrell effectively reduced the quality of ambient light to a planar color. With the perceived materiality of this element, the visual system is tricked into misinterpreting the bound of the physical space. It is only when elements of interference are introduced, such as clouds or a jet, that the reality of the space can be understood. To maintain the duality in function at night, the space is capped with an illuminated surface. By eliminating edges from the visual composition, the perception of continuous space, or planar light, can be maintained. To reduce the impact to contrast between aperture and surface, interior lights are used to raise the level of illumination at the ceiling.

In the _Wide Out_ instillation (Fig. 44), the overpowering nature of light is exploited. The sense of the space is only explored in the pallet of subtle variations in hue. The large rectilinear aperture is again flooded with a quality of light that transfers into the environment and fills the space. The sense of vision is overpowered while the mind struggles to rationalize the physical makeup of the space in light.

Perception is again deceived in the more artistic composition represented in _Milk Run II_ (Fig. 45). With varied transparency and illuminated support space, the composition is an articulation of light that is material in itself. The painting with intangible elements makes the piece highly experiential, and although static, very stimulating in the function of thought. The clarity in the composition and rigidity in visual lines are once again influenced by contrasting colors. The visual energy is amplified through the chromatic nature of the composition, the inability to conceive its material makeup, and the vibrant quality of transferred light.
**Concept**

“Through light the physical world is able to undergo a heightening of existence, its lifeless chunks turned into ravishing and incandescent fabrics.”
-Henry Plummer, Poetics of Light

Light is the energy that allows elements of built form to be perceived, material and color to be communicated, and a holistic understanding of the environment to develop. Stemming from the foundations of our evolution, light has attained a series of phenomenal understandings as humans struggled to rationalize and order their world. The effect of light on the perception of our environment generates an emotional response to the sensory experience. The environmental stimulus is subconsciously associated with response, creating an experience that is retained in memory. The memory of this relationship is then applied towards other elements of similar environmental stimuli. Functioning in compliment is the scientific rationalization of what the eye perceives. This method analyzes the visual input with understood principals of scientific logic, such as reflection. Functioning independently, either mode of perception results only in a simple comprehension of the physical space.

A complex understanding of space can be attained through layering the residual association of phenomenal experience with its scientific rationalization. This compound perception recalls the experience and emotional response of the space, but further explores the input stimuli by applying scientific properties to the interpretation of the scene. The compiling of phenomenal understanding, how we instinctively interpret the feel of a space, with the scientific understanding, the knowledge based rationalization of the experience, results in an enhanced perception of space. By varying the levels that the mind interoperaes visual input, an increase in metal activity can be created. The heightened awareness that this produces can be coupled with an increasingly complex spatial environment to further the thought process. With the mind alert, nuances in spatial arrangement, materiality, and color can be disclosed through the careful manipulation of light within the interior environment. Externally, the roll of light in perception proclaims the quality and organization of interior volumes and transfers it to the context of the site. The outward expression of space, through the transfer of light, denotes the weight and order of the built form, influencing the perception of contextual space.
Functioning in a time when the average American spends 90% of their time indoors, an increased importance on the articulation of interior environments. Daily human existence within the built environment has become shrouded in a filter of monotony, perpetuated by budget construction, materials, and methodologies. The result to this progression is the abundance of banal physical environments over the American landscape. Most daily functions are contained within the stale confines of painted gypsum board, vinyl tile, acoustical drop ceilings, and big box construction. The average person can function without ever being engrossed with their surroundings, further dulling the emotional stimulation. “As a catalyst for change, architecture’s ability to shape our daily experiences in material and detail is subtle yet powerful. When sensory experience is intensified, psychological dimensions are engaged.” This concept is manifested in historical work pertaining to government and religion. Articulation of detail, control of light, and monumentality generate a sense of majesty that confronts the occupant, developing an identity unique to its function. The imagery and emotional impact of soaring stained glass set in contrast to the skeletal structure of a gothic cathedral, or the ordered stance of Doric columns and pediment boasting democracy in front of a city hall are not easily mistaken. This engages the senses and sets the experience apart from works associated with more daily function.

With the absence of stimuli for the development of a unique emotional response, the building can only be perceived in the physical sense of dimension and function. This reduction in sensory input limits the comprehension of space and effectively reduces the occupant’s capacity for lateral thought. To attain a healthy mental capacity, the occupant must be exposed to visual stimulation that establishes an emotional distinction between habitable spaces. “Thought and feeling should merge to provide a new catalyst for the imagination.” With the incorporation of detail and light into the physical environment, the occupant can begin to become enthralled with their surroundings on the emotional level. The commonplace will begin to develop an identity above that of dimensional space. The manipulation of light, color, and shadow in physical space will disclose characteristics of the enclosure that contribute to the mood of place. The way a sliver of clerestory light pendulums across the surface of a wall, varying its intensity with time of day or weather, lends an understanding to the position a place has within a larger spectrum. The mind then tangents beyond the physical confines to reflect on intangible


43 Holl, p.71

44 Ibid., p.144.
influences outside the container. “In chromatic space, light is phenomena, mystery, and wavelength.” 45 With latitude of thought, as perpetuated by light, a layering in spatial perception is built and a unique identity is derived. By incorporating this methodology in the design of everyday environments, a heightening of emotional and psychological health can be reached generating an increase in aptitude. Sensory impact, spatial perception, and mental alertness, functioning in unison, can heighten the human experience beyond the common.

Tracing the justification for this latent spatial comprehension through scientific and phenomenal experiences, we regress to the primordial development of the human mind. At the foundations of human development, light did more than contribute to spatial ambiance; it functioned as an origin for life.

“Over millennia of observation, especially during that remote past when the collective human mind was being slowly formed, our ancestors must have gained a direct association between luminosity and living energy - seeing that light was indeed a catalytic force on our planet. We might expect that the way we see today is still bound to this fundamental correlation in the phenomenal world, a causal reality that our senses perceive and which directly affects our bodies.” 46

With the presence of light, surface is brought into existence. The plasticity of light, electromagnetic radiation falling within the visual spectrum, defines the characteristics of surface, allowing its properties to become realized and perceived. The manner that light interacts with material and texture to yield direction, clarity, and color brings static forms to life. The importance of light and object orientation develops its greatest impact through the absorption and reflection of light. This phenomenon can be best realized through the mediums of milled lumber and cut stone. Light plays off the subtleties and striations of the material to produce an invigorating playground of surface detail and visual depth within a purely two-dimensional surface. Despite the shared physical characteristics and interdependencies of composite space, the interaction of light with surface can be perceived in materials detached from their context. Alone, surface materials can be visually enhanced and modified by the application of strategic lighting, planned color selection, and adjacencies. The characteristics of bounced light impacts color composition on objects within close proximity. Through the interaction of light and surface, light itself becomes realized in its existence. The intensity, hue, and direction of light can only be perceived through its contact and interaction with

46 Henry Plummer, p.13
surface. It is only through such play of light and surface, that space can come to exist.

"The sun never knew how great it was until it hit the side of a building."
- Louis Kahn

Architecture of shadows emerges to add and inverted experience to the component of light. It provides a contrasting background to further amplify the surfaces that are directly impacted by light. This backdrop to visual existence is generated through material texture and surface overlap in conjunction with direct, oblique illumination. As light is blocked from contact with the surface, the surface is removed from the iterations of recognition and interaction associated with the architectural environment. Material in shadow fails to gain an identity by its separation from the source of light and therefore does not take and active influence on the understanding of space. Functioning without any interaction with light and surface, material in shadow becomes void in the visual experience. Its material finish, color, orientation, and presence are irrelevant in the defining of perceptible space. Shadow becomes an unknown, questionable in its physical composition. The visual voids of shadow prompts the occupant to question the bounds of perceived space. The ambiguity of voids in shadow are perceived through the interpellation of visible materials and their undulations of projection set in contrast concavity.

In the near absence of light, the realm of unknown takes over. This is applicable in the instances where light is applied only to strategic surfaces within the composition to enhance the user interaction and understanding with that particular element. Light is only able to directly communicate with singular surfaces within the composition. The relation between light and the occupant is greatly diminished, if not all but eliminated. In this iteration, it is the absence of light that takes over as the defining element in the spatial understanding. In the absence of light, the perception of the environment is generated through mental interpolation, not visual input. Form, if at all visible, is reduced to that of a plane and fades into the backdrop of dark hues. All spatial recognition of shadow is dictated by the proximity and understanding of elements in light.

The occupant response to this approach of illumination typically falls into the realm of awe, the questioning of unknown surfaces in relation to the identifiable. The occupant emotionally clings to shreds of identifiable surface, while the mind reels to identify the unknown. The narrowing of the visual spectrum to such a point
drops understanding of physical constraints into a void of darkness, only to amplify those elements in light.

"light displays its brilliance only against a backdrop of darkness."
- Tadao Ando

The interplay of adjacent surfaces influencing the physical makeup of one another, the punched definition of material composition, the impact of color contrasts, and the juxtaposition of shadow and light define the light influenced basis for the human perception of environments. The occupant develops a more comprehensive understanding of space through these interdependencies within the pallet of built form. The relationships establish the foundation for emotional responses experienced in architecture. With the elements of surface and light building their own cognitive presence, the occupant becomes a thing within the architectural space and is impacted by its emotional quality. The occupant's perception of surface and light yield a programmable emotional response that is indicative of a particular stimuli.

"Light has a great influence on human sensitivity. It reaches the depths of one's heart and awakens something asleep there."
- Motoko Ishii

Compiling these dynamic methods for the perception of the physical environment, a layering of understating is created. The mind begins to rationalize light through the demands supplied by the body for visual function, the spirit through divine relation, and the mind through intellectual understanding. Mental awareness is peaked through the undulating complexity and variety of stimuli. The function of thought is effectively increased through the awakening supplied by light in varied input.

If the built environment were controlled by a sever visual monotony, as related to periods of sensory deprivation, the body shutters and function declines. In a number of clinical studies on the effects of a monotonous environment on human function, it was found that the subjects became bored and restless, unable to concentrate. Their level of intelligence was evaluated after a prolonged exposure and was found to have deteriorated. In the state of sensory deprivation, the mind effectively rationalized all elements of stimuli available to it. Once a holistic understanding of the context was derived, the though process went idle. This
suggests a need for a varied exposure to light and other sensations within the environment.\textsuperscript{47}

Applying the need for varied sensory input to the learning environment for school children, the demand is made more important. As part of a study by the University of Michigan in the 1960’s, windows were removed from the learning environment. The functioning concept was that the removal of windows would limit distraction for the external environment. Students would no longer gather at the window during a rain storm or to watch the guy mowing the lawn. By supplementing lighting levels and air circulation through artificial means, a static interior environment was created. The resulting classroom space however lacked variation in environmental conditions. There was no longer a varied condition of stimuli as supplied by natural light and the associated connection to time of day, weather, and season. Over the duration of the experiment, the test scores for those in the windowless classroom began to falter. The attendance of kindergarten children began to slide in contrast those in a traditional school. Interviews with teachers showed increased desires to be outdoors after the school day was over.\textsuperscript{48}

The absence of varied light in the education environment became the mode of failure for the concept of windowless schools. Sensory deprivation of the interior environment limited the learning and functioning abilities of both the student and the teacher. The method of learning became to detached from sensory input to captivate the imagination of youth. In order for a learning environment to function at full potential, there must be adequate visual stimuli as supplied through an interaction with light, color, and spatial understanding.

Recently we have learned a great deal about the functioning of young minds and how they learn. Jean Piaget, a Swiss psychologist in the 1920’s, observed that “infants actually seek environmental stimulation that promoted their intellectual development.”\textsuperscript{49} According to later perceptual learning theorists, children are seen as “learners who assemble and organize material.”\textsuperscript{50} This places a significant importance on the environment in which a child learns. By modifying the school model to create a space that allows for varied elements of stimuli, the educational environment can be greatly improved. Through the use of dynamic lighting conditions, the static assembly of physical forma and material can be further amplified in the quality of perception. Entertaining the minds of youth with the

\textsuperscript{47} Faber Birren, p. 97-109
\textsuperscript{48} University of Michigan, School Environments Research Project. p. 31-56, 89-111
\textsuperscript{50} Ibid, p.80
multiple influences associated with light, the though generation and metacognitive reaction in response to visual perception can enhance the learning potential.

“Children’s early understanding of the perceptual and physical world my jump-start the learning process, even making learning possible...”51 This establishes a direct relation between the importance of stimuli and the ability to think and learn. Through the manipulation of light within a structure the promotes exploration, the basis for our comprehending the phenomenon of light can extend the limits of cognitive thought to push the mind to learn.

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51 Ibid, p.112
**Conclusion**

Functional element, questioned phenomena, rationalized occurrence, light defines the way we perceive the physical world. The role that light plays in the comprehension of the physical environment defines it as the most influential medium for the development of our existence. As light interacts with the environment through the properties of color, reflection, and shadow it establishes a reality and emotion for the banality of surface. Through this use, the mind is activated and learning can be promoted. The principles that establish the foundation for this position are situated in the various manners we perceive light. Light fundamentally meets our needs for visual function and survival, supplements our spiritual pursuit for understanding, and calms that rational thought of mind.

Lights association with our functional need to evolve and survive is stretched over the timeline of our existence. Dependence on the sense of vision for survival and safety has placed light as the most influential stimuli in the development of our perception and comprehension of physical space. Functioning primarily as visual animals, light, and the information it discloses to the optical system, is how we understand. Light satisfies the need of the body.

The spiritual understanding of unexplained phenomena places the worship and divine powers on the element of materialized light. Civilizations have based their belief structure on the intangible quality of light. This questioning and reverence drove them to build and memorialize its nature. The worship of light guided the manipulation of culture. Light supplies the answer to spiritual needs.

The mind has rationalized the phenomenon of light in a manner which can be dissected and analyzed. The scientific properties of light can be predicted and influences on the physical environment can be rationalized. Through the union of light and science, we develop an analytical understanding for the occurrences in our environment.

It is though the union of these methods of spatial comprehension and rationalization of light that the mind can be activated exponentially. The scientific understanding of light cannot dismiss its presence when introduce in a manner that evokes spiritual connections and primordial bodily needs. By building and articulating the variety of means that light can be comprehended by the occupant through the detailed understanding of root connection, the mind is forced to think. This intellectual level is peaked by the desire to understand the modes of sensory input, not only in the scientific manner, but in the means that relate to the spirit and body as well.
Complimenting this layered thought process of sensory stimulation by the exploring minds of youth; the potential for advanced mental activity is amplified. With exposure to the avenues of rationalized light and associated emotion, the metacognitive skills of critical analysis of rational thought are triggered. The child is pushed to critically question not only their own thoughts as they learn, but also the input stimuli that pervades their environment. They again begin to re-examine light, their bodily need, their spiritual intrigue, and their comprehension of the environment through rationalized thought.
**Purpose**

Educational goals differ greatly for the twenty-first century in comparison to earlier times. This must be considered when discussing the “deteriorating qualities of education” in relation to the current standards. The imposition of technology upon the learning environment as a tool for education has prompted a drastic reconsideration in teaching practice. Technology has also worked its way into the screening and surveillance aspects of the educational environment in response to such incidents as the Columbine school massacre. With the education system as a whole experiencing a transition in methods of teaching, security, and organization, it becomes time to reconsider the existing architectural response to this function. “The current factory-model school, while seemingly efficient, is, in fact, grossly inefficient, inappropriate and ultimately inequitable as it requires all children to adapt to the mean.” The current paradigm is placing concentrations of children in schools that are structured for failure rather than success. The learning environment is insufficient in the utilization of technology, ability to provide safety, and most importantly, the ability to promote a diversity in creative learning solutions. By exploring the potential for active involvement of architecture in the educational experience, the idea of school can expand beyond that of containing education, to inspiring learning.

The education typology represents a continuous change in expectations in accomplishments and as well as design. The education environment has developed significantly from the small community school house associated with colonial America. The focus in education has shifted from the concept of learning implemented in the early 1800’s, where the methodology for teaching was simply the transition of spoken word into written text. It wasn’t until the mid 1800’s that it was even conceive that students could compose their own written text as a means of communicating a thought. This profile for education remained a constant until the industrialized methodology of the 1900’s was imposed on the education system. Schools were seen as factories providing education to the masses, transforming the raw material of youth into an educated product. This order and rigor did not enhance the mental development of students, doing little more than train them for the rigid organization of the industrialized workforce. In further emulation of the

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factory model of efficiency came the regiment of standardized tests which would accurately categorize students and generate records of their progress.\textsuperscript{54}

This method of education organization has proven to be counter productive in the development of minds of youth. It forces everyone to function at the level of the average student and development is restricted to the class body, not the individual. Aside from this “all as one” approach in education, the sterile atmosphere of the school working environment is stifling to creativity and detrimental to the learning process. The education space needs to stimulate the mind and push the student to learn. The school model should be conceived with the idea of learning, not efficiency. “Knowledge centered environments extend the “sense-making” in a domain, helping students continually build and apply their emerging “metacognitive” skills - the ability to think critically about their own thoughts.”\textsuperscript{55} By supplying an physical environment in response to the idea of “sense-making”, exploited by the concept of discovery, creativity, and exploration, a structure that takes active participation in the learning process can be created.

\textsuperscript{54} John Bransford, p.132
\textsuperscript{55} Kathleen Fulton, p.4
Needs and Desires

The client base for the development of a school represents a detach between the user of the space and those that ultimately absorb the cost of the design. It is the parents of those attending the school that are in a position to influence the design process, and have an impact on the cost of the design. The design philosophy must be communicated verbally as well as through the experience of the architecture in order develop the support of parents. The value of this new concept in educational facilities must also be projected into the urban fabric to stimulate interest and imagination among those who encounter the project and begin to experience its allure. Through raising public interest in the concepts expressed in the design, a desire for interaction with the building will develop. By the union of increased psychological involvement, as promoted through the design, with public perception of the building, the value of the structure will grow. It is through this level of public opinion that a project of this scope can meet the standards set by parents.

Economics and enrollment aside, the true client for this project is the children that would attend the school. They are the ones that will be required to function within its confines for the better part of seven years. The facility will not only functions as a school for a large portion of their development, but will supplement as their playground. Children who occupy this building are likely part of a demographic mostly composed of wealthy city dwellers. With the density of urban living limiting the areas of safe play and exercise, the school also begins to function as a safe haven for physical activity and exploration. Establishing a duality between education and play within the structure creates the primary functional diagram.

The educational portion of the schools function should provide a dynamic learning environment for daily activity, both in structured learning as well as common function within the building. Aside from providing an accessible venue for structured teaching, the space should promote the various modes of exploration and imagination present in youth. This can be accomplished by supplying a departure from the typical school model of level circulation systems. The task of simple classroom transition can be utilized to develop a complex understanding of the spatial environment by providing a circulation system that promotes a variety of creative avenues for exploration and way finding.

The classroom structure should divert from the linear progression of the factory model school. The potential for vertical expansion within the container of the city should facilitate the move upwards in organization. By separating from the ground plan in this manner, distractions of at grade activity can essentially be
removed from the learning environment while maintaining a maximum amount of glazing.

Support facilities should also be included in the structured organization of the school. Functioning primarily as support spaces for physical activity or musical performances, they can be detached from the main axis of the school. The treatment of these spaces need not be as elaborate as the main functional spine of the school’s organization.

The organization of play takes a significant role in the development of the school. There should be places of transition supplied from which the student can pass from the educational side of the structure to the exploration and play realm. Means of creative learning should be provided within the elements of play so the space does not function entirely devoid of learning.
**Design History**

*Fig. 47 Factory model school.*

**Factory Model School:**

The current factory model school represents the mean in functioning schools in the United States today. Its association with the factory efficacy of the assembly line in the early 1900's resulted in a stark, rigid, organization of spaces along a flat linear axis. The stark nature of the environment and organization does little to adapt to the varying modes of learning found in children of the grades school age. In addition to only functioning to serve the average student's learning methods, it does little to adapt the various needs for stimuli as children age.

In order to adapt this dieing concept for education methods of coloration have been used. The superfluous addition of hue to the dank rectilinear corridor however does little to modify the overall effectiveness of the school. There is still little latitude for learning approaches, or varying methods of teaching for that matter.

Along with rigidity of the physical school comes the implications on the education approach. Teaching becomes solely the function of individual teacher working within a static environment. The only opportunity for active learning is contained within the sporadic elements of play. The structure does nothing to contribute, promote, or enhance the learning potential of the educational realm.
Open Plan School:

The concept of open planned schools came into popularity in the 1950’s and 1960’s. Conceptually, the school typology was well thought out and organized. The purpose of the open plan school was to allow for a latitude in teaching methods. By utilizing shared spaces, teachers could effectively teach subjects jointly. By using space partitions, the open floor plate could be subdivided as needed to create pockets of space for a more structured educational approach. In this model the school basically functioned as a basic shelter, contributing only protection from the elements and an controlled environment to the learning process.

The failure mode for this type of education facility was simply distraction. Curious minds, rampant energy, and the short attention span of youth functioned together to create an unsurpassed distraction for the leaning set. It however could be argued that this model functioned too well as its task, promoting more interaction between classes and grades than originally intended. The distraction not only effected the focus of the students, but the teachers. With the absence of walls, other instructions, interferences, and teaching styles were hard to filter out from the daily function of the class.
Windowless School

The windowless classroom represented a horribly failed concept in educational facilities. As a product of study at the School Environments Research Project at the University of Michigan in Ann Arbor, the concept was incorporated in a study contrasting the learning environment with an open plan school. The concept was to remove all external “distractions” from the learning environment and supplement them with artificial lighting and secondary air circulation. The resulting space created a sterile leaning environment by separating the educational realm from the real world. Despite the possibility to focus entirely on the educational approach without competing distractions, the psychological withdraw from varied stimuli began to distract students.

The outcome of this conceptual shift was ultimately declining attendance and lowered participation levels. Students, however amused by the increase area for display of their work, commented on how they did not know whether it had rained, snowed, or if it was sunny out. Surveys of the teachers also revealed an overwhelming desire to be outdoors in the post educational hours. Ultimately the study schools were returned to their original state of windowed walls.56

**New Concepts:**

The new generation of school designs makes a notable improvement over the preceding methodology. Vibrant with life and creative in organization, they engage the senses of youth and beckon them to explore. Through alterations in scale, hue, and physical elevation, their organizations as a whole functions better for a positive contribution to the learning environment. Fostering structured play, group learning, and general exploration becomes the design approach. This interaction is still however only surface deep, leaving little to the depths of imagination. While play is enhanced, lateral thought and emotional exploration are not entertained.

The approach in modification to this shift is active in the intent of the thesis exploration. By generating a fun, inviting, and complex spatial layering as an active contribution to the learning ideal, the approach can be pushed one level farther.
Site

The site is located in the heart of Downtown Chicago, Illinois in the region referred to as the near west side. It becomes an exercise in innovation to transform this parcel of fringe real estate, pinned between arterial functions of the city, into a developable allocation of space. The site envelope is confined and influenced by the functional components of the river, railway, and city grid. The controlled nature of this parcel of resultant space supplies the justification for such an economic venture as a school at this location.

The influence of the Chicago River on the site has been one of change over time. This boundary to the east of the site has been critical in the development of the city of Chicago. As with most industrialized cities, the presence of a public waterway is interregnal in growth. The associated network of lakes over the length of the river prompted industry to spring up along its banks. With the presence of industry came the quantity of physical pollution that can be associated with continuing development. At this point in history the river flowed from its inland tributaries located north and south of the city into Lake Michigan, serving as an efficient means for public waste removal. This temporary fix proved to be catastrophic in 1885 when a bout of heavy storms flushed the river further into the lake allowing the sewage to reach the intake for the city’s water supply. The resulting epidemic of cholera and typhoid claimed the lives of 90,000 Chicagoans.57 To remedy the problem, it was decided to reverse the rivers direction of flow by removing an eight foot high summit in its bed in 1887. The twenty eight mile Sanitary and Ship Canal transversed the summit, redirecting the flow towards the Mississippi River via the Des Plaines and Illinois Rivers. Completed in 1900 it established the south branch as the direction of flow.58

This however was not the culmination for influences on the south branch of the Chicago River. In 1928 construction was started on the proposed straightening of the south branch as first mentioned in Daniel Burnham’s 1907 master plan for the development of the city. A section spanning between Polk and 18th street was moved 850 feet further west of Clark Street to allow for the reorganization of elements south of the loop. For years the bend in the river had restricted the development of the business district and hampered the effectiveness of the railroad. When work ended in 1930, the relocation of the river opened several new roads leading to the loop, allowed the railroads to develop a more functional connection to the loop and develop new terminal facilities, and ultimately greatly increase the value of the adjacent real estate.

The railroads, however only impacting the surface of the site, have played a significant role in establishing Chicago as the pivotal Midwestern metropolis. Between the years of 1850 and 1876, the railroad companies of Chicago, Burlington, and Quincy, Illinois Central, and Pullman established Chicago as a hub for rail commerce and transportation for the Midwestern United States. The importance of this system proved to be enough to relocate a river, and is still prevalent on the site. The Metra Milwaukee North and West lines represent the still functioning vitality of the commuter rail in the daily life of the city.

The final element of arterial function that impacts the site is on typically associated with historical city planning, the grid. In the case of Chicago, the city grid is oriented along the cardinal axis and was imposed initially for the ease of dividing land for sale. This means of organization received several levels of implementation on the infrastructure of the city. The served as a means of organization for the Chicago Tunnel company which mimicked the street grid forty feet below the surface, Chicago Metra through the elevated railway, and portions of the Tunnel and Reservoir Plan (TARP) which controlled storm runoff.

At present, the city is going through a period of developmental recovery. With the urban core shocked by the proliferation of sprawl towards the suburbs as propelled by the expanding infrastructure of the highway, construction within the city limits declined sharply. This resulted in the collapse of the overheated commercial real-estate market in 1992. During the late 1990’s Chicago

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61 The Metropolitan Water Reclamation District of Greater Chicago
experienced a resurgence in the urban core, adding more downtown residence than any other American City.\textsuperscript{63} Currently, under the guidance of Mayor Richard M. Daley, Chicago’s Central Area is experiencing a dramatic comeback. This boom in growth has lead the city to contract Skidmore, Owings, and Merrill to develop a Central Area Plan to organize the city’s growth. The plan elaborates on areas of potential and obstacles within the urban fabric by generating a blueprint for essential change. In supplement to this plan, the city has also pledged to maintain and develop the Chicago River as an integral part of the city’s park system by implementing the Riverwalk Master Plan. This plan, already in implementation, establishes a public pedestrian way along the rivers edge within a controlled park setting.

Feeding off these proposals for Chicago’s growth, the site represents a focal point in the developing expansion of the city. Located west of the tributary in the Chicago River where the east and north branch join to flow south (directions based on current flow), it is influenced both by the development of the city’s skyline and riverwalk. Its proximity attaining such buildings as Graham, Anderson, Probst, and White’s Merchandise Mart and Kohn Pederson Fox Associates’ 333 and 191 Wacker Drive, making the vicinity a tourist destination detached from the magnificent mile. Other recent construction in the city depicts a manifestation of the planned development in attempt to retain a residential population within the urban core, making apartments and condominiums a standard implementation in the region. Adjacent to the site is located the newly completed River Bend Condominiums by De Stefano + Partners, which represents the newest residential implementation in the vicinity. This building begins to establish the new north branch of the river walk proposal, as well as filling the requirements of the Central Plan for residential in the area. The site is also effected by the development with the proposal of a “ghost” building, a residential structure that is proposed in the central plan to occupy the site just across the tracks from the project location. The architecture of this building is derived in speculation, based primarily on the parti of River Bend Condominiums. Its massing is considered to be a singular vertical element with parking being pulled upwards to within its base. This would elevate the residential unites to a point where views would not be obstructed by development of the project site.

Existing architectural responses to the site are primarily influenced by the overlay of the city grid onto the natural site context. The resulting spaces is ordered

\textsuperscript{63} Chicago Central Area Plan. July 2002
within the urban development, but respond to the pre-existing element of the river. The hallmark design solution in response to this layering is Kohn, Pedersen, and Fox’s building at 333 Wacker Drive. The building orders to the grid on the east and south elevations, but responds to the bend in the river with a simple radius in elevation. Not only does this reflect the movement in the river, but it effectively terminates and redirects the neighboring elevations around the corner in the city gridiron. Reacting to the language set up by KPF’s building, the river facing elevation of the adjacent River Bend Condominiums by De Stefano adopts a gentle concave arc. The River Bend project also begins to establish a public way along the rivers edge for pedestrian access and mooring locations for sailboats as they await the bridge operators to make their way up the river. Other proposed massings for this area, as depicted in the Central Area Plan, follow suite with this logic of grided order, overlayed with a responding movement.

By proposing the development of the immediate site occupied by my thesis in conjunction with the massing proposal for the high-rise condo on the triangular lot backing it, I can control the functional variables facing the utilization of the location. By responding to the contextual influences, developing the programmatic massing of the tower, and its positioning on the site, a vertical boundary for the project can be generated. This line is supplied by the desirable line of sight from the elevated apartment buildings and their location above multiple floors of parking. The impact is important since the functional insertion of the school on this site is dependant on increase in value of the surrounding development without compromise to their programmatic functioning.
**Site Analysis**

The site volume is constrained by a series of boundaries supplied by the developing city. The area of development becomes a segment of resultant space within the urban fabric. The restrictions imposed by existing boundaries combine to form a contorted geometry elevated above the surface of the site. It becomes the restrictions, established by these impositions, that begins to form the architectural response of the project.

The boundaries are established by recognizing the overlay of conditions that are prevalent in the city’s development. To the east, the Chicago River established an impenetrable border that has remained constant as a respected edge. Within the city, there are no built infringements onto the public zone of the river. Recent modifications to this zone have established an offset of this edge as public domain, creating a walkway around the river’s perimeter. The riverwalk imposition however only needs to be maintained on a single level, be it at grade or elevated. The buildable envelope can occupy this zone as long as circulation along the path is maintained.

The confining edge towards the south of the development is the elevated bridge at Lake Street and its accompaniment of the “L” Green Line to Harlem / Lake above the road deck. The important impact of this bridge to the site is that it supplies a public pedestrian access to the extension of the public river walk. It is a connective component that provides the most direct access to / from the business development of the Loop. The vertical wall of the bridge provides the only element of contextual scale in elevation for the perception of the building mass. This continuous vertical barrier functions as a backstop for the sprawling riverfront site, containing the eye and lending scale to the vertical dimension of the volume.

The restriction towards the west is established by the imposition of the city grid upon the landscape. As continued from the order of the bridge, the road represents a two dimensional scar on the physical landscape. Its ability to contain space is transferred to the building which front its direction of movement. This established concept of the grid is carried into the site in the development of the “ghost” building on the parcel west of the developable envelope.

In plane, the rigid ordering and containment to the site is lost towards the north. This fleeting space is exemplified by the movement supplied by the railway lines as they process through the site, across the order of the grid, and disperse into the landscape. Responding to this movement is the River Bend Condominium, with its narrowed elevation chamfered in response to the track. With little more than the limitations of buildable space, there are no real constraints towards the north.
The vertical development of the site is limited by aesthetics derived from the scaleable height of the “L” towards the south. This limitation is used so that the building does not overpower the contextual landscape. Functionally, the envelope is limited by the line of site from the proposed development of the site backing the property. Based on existing precedence, the tower pulls parking and serviced up under its base. This displaces the apartment complexes to an upper extremity and allows for development along the base. The desire for direct views from the apartments into the city imposed a cap to vertical development.

Finally the slotted boundary of the Metra Rail is forced through the site envelope. The currently functioning railway lines used by the Metra Milwaukee North and West lines and by Amtrak trains from Milwaukee, Wisconsin. This on grade element demands an active response for the insertion of any structure into its vicinity. The frequency of train traffic in this location calls for measures in visual screening, acoustical isolation, and safe pedestrian crossing. In order to effectively develop the site, the railway must be bridged by the building structure to allow access both by pedestrian and vehicle to the envelope of the building. This requires the structural dimension of the building to occupy the air rights over the track in clear span and invade the premises of the backing lot already slated for residential high-rise development. In spanning one element and interacting with another, the energy of the site envelope is amplified through its plasticity.

The resultant space is derived from constraints set aside by the site. The volume is positioned to span the Metra Rails in a manner that would otherwise not be feasible by conventional construction and the demands on high-rise architecture. This supports the positioning of the tower towards the back property and functions as an infill to enclose and bridge a hazard and source of visual and audible pollution. Bridging supplies a duality in function, both for tower value and school function. The benefit to the development of the site for the school is that it removes the direct hazard of train traffic from the commute of young school children. The school would be able to have functional entrances located on the street side of the track and also have joint access to parking from the tower. On the city level, the development helps enhance public space and can provide a visual unifying element between the river walk and the bridge over the river, tying the building into the landscape.
Site Response

The initial site response positioned the building within the constraints set aside by the stipulation on the physical envelope. This however did not detract from the concept organizing the insertion of light into the composition. The building is oriented at a canted angle responding to the bend in the river as well as to the angle of morning sun. This position effected the organization of the classrooms so that they wall method of day lighting would not be washed out by direct sunlight flushing the interior volume. At the angle of morning sunrise in relation to the buildings position in Chicago, the direct light will pass through the opening at such an angle to be diffused by the north wall and floor plate.

As the day progressed, the impact of natural light on the classroom pods themselves would be minimal. This remains true until apex of the sun’s movement when the skylight in the massive ceiling plane no longer eclipses the sun’s rays into the interior of the space. Natural light will crest this point and cast a shaft of unfiltered light down the surface of the primary structural wall. Detailing the classroom interiors to respond actively to this shaft, the volume of the box will be pulled away from the wall with a glass plane. Only the structural truss will penetrate this boundary.

The desired perception on the interior space is the subtle variances in material detail for the vertical wall. Light was to pass along the wall and into the
interior of the classroom to establish a relationship with the wall it vaults from, but
to at the same time function in a questioning state of rational thought. This
questioning is brought about by the separation of the classroom mass from the
surface of the wall with a shaft of light. This departure is to be further amplified by
the contrast in lighting level of the underside of the classroom boxes in comparison
to the washed wall of the space. This time sensitive phenomenon would also
demark the passage of time for the exploration volume and maintain a connection
to a greater power at work outside the tangible realm.

Backing the primary wall lays the circulation core. This space would be
modified in a similar manner with the corner-situated sliver of light. The interior
modification to its presence however is attained in the layering of ramps and their
ambiguous identity in silhouette. Playing off the initial questioning of elements in
partial light, the space would serve to activate the mental understanding in
preparation for the learning day.
Massing Concept

In detail, the classroom box must develop its identity and position within the composition. This task calls for an understanding of its position in relation to the wall as well as the cantilever. In order to attain this perception of the space, the vertical wall is continued up into the classroom box to establish a backer for the education side and a location for class storage. Illuminated by the fore mentioned skylight, the connection of spatial relationship would also be supplemented through the insertion of artificial light within the construction of the mass.

At periods of reduced light, the classroom masses would visually glow from within, boasting the rationalization of light within the mental realm. Education in spotlight would be beamed outward onto the cityscape form within the confines.

The detailing of the separated mass would include ceiling, wall, and floor treatment that would permit the transfer of light from within the space to the adjacent contextual elements. By this interaction, the quality of light would build and adjacent classrooms would begin to influence each other’s quality of light. With the random organization of the elements along the façade, the lighting quality of each space would differ in relation to external influences as supplied by contextual elements.


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