light and form

Perception in the Built Environment

by

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Bachelor of Arts in Architecture
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dedication

To the loving memory of my mother.
LIGHT AND FORM:  
Perception in the Built Environment

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ABSTRACT

The purpose of this thesis is to investigate how light and form affect the experience of place—that is, influence human response—and to understand some principles of manipulating light and form to achieve these responses. The thesis is a journey through many paths and places; some are literal in their expression of the author's ideas, others are more subtly experienced.

Six physical settings have been chosen which relate to path and place and the connections between the two. Each of these settings provides a different opportunity for light and form to enhance the experience of place. Observations are made in each setting, and are then studied through built references, diagrams, and discussion. The method of exploration and presentation is primarily graphical, as it should be, because it is through our sense of sight that we best appreciate light and form.

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INTRODUCTION

Throughout history artists and architects have captured the quality of light to emphasize the feeling and expression of a particular setting. Architects have manipulated form and material to evoke moods ranging from subtle/gentle softness in intimate spaces to stately grandeur in places of distinction or worship. Unfortunately, much of this sensitivity has been lost in recent decades. This thesis is intended to help revive such sensitivity through the exploration of light and its relationship with form, space, and feeling. It is hoped this thesis will be useful as a source of reference to start you thinking about light in new ways.

Webster's Dictionary defines light in many ways. In the prosaic sense it is defined as "electro-magnetic radiation [which] makes vision possible." Subsequently it defines light as "something which enlightens or informs." This thesis is seen as a departure in architectural terms from the latter notion. Louis Kahn spoke of light as the giver of all presence, the measure of things already made. He knew that in order to appreciate form it must first be revealed in light, as light and form are inseparable and together determine the organization of space.

There are many interesting aspects of light and form one can study. This thesis chooses to explore an environmental/experiential approach to dealing with light and form. It does not concern itself with
visual or textural effects; neither does it explore the quantitative aspects as measured with light meters. During the early stages of the work, when references were being gathered, light level readings were taken in several buildings to see how the quantity of light corresponded to the experience of the setting. While some relationship was observed, there was too much environmental information—such as relative differences of illumination and the brightness of the surroundings—for a light meter to interpret. The eye and the brain can synthesize these components much more sensitively than the mechanical instrument.

"Variations in the quantity of light can be ignored, for though they can be measured with the help of instruments, we ourselves are hardly aware of them. The adaptability of the human eye is surprisingly great. Bright sunlight may be 250,000 times more intense than moonlight and yet we can see the same forms in the light of the moon as we can in broad daylight. The amount of light reflected from a white surface in winter is less than that reflected from a black surface of the same size in summer but still we see the white as white and the black as black. And we can clearly distinguish a black letter on a white background."  

Rasmussen, Experiencing Architecture, p. 187.
INTRODUCTION

If we intend to provide an environment where clarity of use and a sense of place exist, it is important to understand how the mind receives and processes information about the environment. Light, or more accurately, sight is the primary medium through which our world is perceived. Vision, the perception of light, is the most powerful of the five senses. It is the dominating receptor of information from the physical world, conditioning our imagination and memory and determining how things appear in the mind.

To analyze how our reactions are influenced by the built environment, several settings were chosen for study. These settings relate to path and place, and represent sets of patterns combining light and form in different ways. The settings explored include: direction of movement, change of direction, change in level, sense of place, orienting space, and entry progression. Each chapter begins with a generic discussion of the patterns for a given setting. To illustrate and test these ideas, several buildings are then studied for each setting. By definition, the general patterns result in repetition of certain elements among the references presented. However, the individual character of a setting within any building is determined by a unique combination, variation, and articulation of those elements.
INTRODUCTION

In settings that relate to movement, it is particularly important to understand the context in which the references are viewed. Therefore each building is introduced by its geographical location, climatic conditions, and general morphology. The latter is discussed in terms of specific organization of light, space and form within each building. Once this context is established the issues of the particular setting are discussed. Several buildings appear in more than one setting. To keep each setting discussion intact and complete, the general introduction repeats each time the building is used.

"I have mentioned elements which should be visible in the work, this should not be taken to mean that the work should consist solely of elements."

Klee, Paul Klee, 1961, p. 77
This section introduces the principles which determine the way light and form operate in our world. A slightly technical discussion will describe the physical relationships between the sources of light and the surfaces illuminated by them. This background is useful to keep in mind while exploring the settings discussed in this thesis.

Light: Sources and Effects

The sun is the source of all light in nature. The earth's atmosphere however, modifies this light in many ways. It reflects as much as one third of the light it receives. Of the remaining light which does penetrate the atmosphere, part is absorbed and re-radiated as heat energy. Another part is diffused in the atmosphere, scattered in all directions by dust particles and
INTRODUCTION

air molecules; some of this diffuse light is directed to the earth from all parts of the sky. When the sky is clear a large portion of sunlight penetrates the atmosphere directly. It is important to realize that when light is present we see it only when it is reflected by some material, whether surfaces or particles in the air.
INTRODUCTION

Direct Sunlight

The nature of direct sunlight can be described as having three basic characteristics. First, it is the most intense source of illumination, providing (on an unobstructed horizontal plane) six to ten times the illumination provided by the sky. Second, because the distance between the earth and sun is so great, the light rays reaching the earth can be considered parallel. Third, this light is dynamic; the direction of the rays, relative to a point on the earth's surface, changes in a predictable manner caused by the earth's rotation and orbit around the sun.

The cycles of the sun and the earth have the most profound effect on the light received by a point on the earth, they affect the angle, intensity and duration of the light. As the earth rotates about its axis, the angle and intensity of the light change. In the morning and evening, the sun is low in the sky and not as bright as it is at noon, when it reaches its highest point in the sky the earth's
INTRODUCTION

protective atmosphere causes this difference. If there were no atmosphere the level of illumination would not vary—we would perceive only light and dark; very bright and very dark. During the day when the sun is directly overhead, the light draws through the least amount of atmosphere to the earth’s surface. A shadow cast from an object under such a high, intense light would be short. This type of light tends to render surfaces nearly featureless. The modeling of the surface becomes flat; causing this texture to appear as a two dimensional pattern.
INTRODUCTION

When the sun is near the horizon, light must pass through more atmosphere. The particles in the atmosphere, or optical air mass, absorb and scatter the light, so the more optical air mass traversed by the light the less its intensity. The virtue of this low angled light is well known among photographers. It produces long, raking shadows, which, as they graze a surface, intensify the contrast, bring out three dimensionality, and reveal texture and form.
INTRODUCTION

The intensity of sunlight and skylight received on an unobstructed horizontal plane varies on a typical clear day, as illustrated in this graph. Both the direct component from the sun and the sky component of the light climb to a maximum at noon and fall off in the evening.

The kind and level of illumination are obviously dependent on the orientation of a place as well. To illustrate the significance of orientation on light intensity, this graph plots the illumination on vertical planes in the four cardinal directions. Planes facing north receive a uniform diffuse light which changes minimally through the day. South facing planes receive a strong, direct light which changes dramatically as the sun moves, east and west facing planes experience intense, abrupt changes in light as the sun rises and sets, and more gradual changes as the sun moves from the eastern to the western hemispheres.
INTRODUCTION

We have seen how the earth's rotation on its axis changes the angle and intensity of sunlight. The earth's orbit around the sun affects the angle and intensity as well, because the earth's axis is tilted at 23.5° out of its orbital plane; this tilt remains constant as we orbit the sun: in the summer months the northern hemisphere is slanted toward the sun and receives more hours of light. At the same time, the sun's rays are closer to perpendicular to the earth's surface (less optical air mass for the light to pass through) during the winter months this situation is reversed, and the northern hemisphere receives fewer hours of sunshine, at a lower angle, while the southern hemisphere receives more light. The angle, intensity, and
INTRODUCTION
duration of sunlight vary significantly with latitude as well. The
continental United States lies roughly between 30 and 50 degrees
north latitude, with Cambridge at 42.2°N. Living at this latitude
gives us a particular understanding of the seasonal changes of the
sun. We receive about nine hours of daylight in the winter and
fourteen in the summer, and thus associate day and night with light
and dark.

In Finland (where many places studied in this thesis lie), however,
people tend to associate summer and winter with light and dark.
Finland lies between sixty and seventy degrees north latitude. It
receives only a few minutes of direct light in the winter as the sun
peeks over the horizon to the south, but in the summer the sun
circles overhead nearly 24 hours a day. These extremes have a
profound effect on the direction and quality of light. The low
angled winter sun casts long, dark shadows and produces vivid
contrasts. The winter sun casts a warm twilight glow on surfaces
such as the brick walls of the Otaniemi Polytechnic Institute. In
comparison, the high summer sun casts short shadows and produces a
muted quality of light.
Skylight

Skylight is the light diffused by the earth's atmosphere before reaching the earth's surface. The brightness of the sky varies, depending on cloud cover, solar location, and humidity.

A clear sky is brightest in the area around the sun, and fairly bright at the horizon. The luminance distribution of a clear sky changes throughout the day as a function of the sun's location and atmospheric conditions. The light from the sky generally mutes contrast by filling in the shadows. The degree to which the shadows are affected by the sky is determined by the brightness of the sky and the degree of enclosure (the amount of sky obstructed) surrounding the object casting the shadow. The diffuse light also increases the amount of detail expressed in the surfaces grazed by light.

Unlike a clear sky, which is bright at the horizon, an overcast sky is generally three times brighter directly overhead, at the zenith than at the horizon. An overcast sky often produces more light than a clear blue sky (ignoring the sun) because the clouds in an overcast sky reflect and diffuse light, while a clear sky has little reflective substance. As opposed to the clear sky distribution, which varies with orientation, the luminance of an overcast sky is
symmetrical about the zenith, so that the illumination on vertical planes is independent of their compass orientation. The diffuse light from an overcast sky produces a flat, shadowless light because it comes equally from all parts of the sky. Textured surfaces become featureless, and difficult for the eye to discern form and texture. Within enclosed space, however, this light becomes moderately directional when part of the sky is obscured by the enclosure. This light produces soft shadows and tonal gradation as in this Vermeer painting.
INTRODUCTION

Reflected Light

While direct and diffuse light are usually considered the primary sources of light, reflected light is often a significant contributor to the illumination of a space. The way light reflects off surfaces is determined by two factors. The reflectance of a surface determines the amount of light reflected. The finish of a surface determines the way in which the light reflects. At one extreme, smooth surfaces such as polished metal or mirrors produce specular reflections, where the angle of reflection is equal and opposite to the angle of incidence. On the other hand, a pure matt finish scatters the light equally in all directions, regardless of the angle of incidence. Almost all materials in the built environment lie between these two extremes. These semi-specular surfaces reflect more of the light at an angle equal, and opposite to the angle of incidence.
INTRODUCTION

The most important aspect of reflected light is that it can illuminate surfaces not directly lit by other sources, and it illuminates the surfaces differently than direct sources. Reflected light generally is strongest when coming from below or from the side (on its first bounce), rather than from above. Although indirect, reflected light can be the most important source of illumination in a space. This is clear in this photograph by Robert Farber. Light reflected by the door illuminates the back edge of the woman’s legs and deliniates thier form. The brightness of the reflected light contrasts with her silhouette and emphasizes her shape.
direction of movement
"People are by nature phototropic - they move toward the light."
This is a basic principle that forms a common thread throughout these settings. Objects in the light are knowable; what is in the dark is unseen and unfamiliar. We commonly associate open and light spaces with public places; narrow and dark spaces feel more private, and people tend not to gravitate there. The use of light and illuminated surfaces can reinforce a particular direction of movement in several ways: through the repetition of light and shadow, by the use of linear light (in which surfaces parallel to the direction of movement are illuminated), and through vanishing perspective, which intensifies the feeling of continuous movement.
INTRODUCTION

No matter how strong these reinforcements are, if there is no light visible at the end of the path—no goal—it is not a place through which to move.

"If the places where the light falls are not the places we are meant to go toward, or if the light is uniform, the environment is giving information which contradicts its own meaning."  

1 Alexander, A Pattern Language, p. 645.
2 Ibid, p. 646.
INTRODUCTION

The direction of movement can be displaced, but as long as you can see the displacement in illuminated surfaces there still seems to be a continuity in the access.
NORTHGATE HALL

Former architecture building
U.C. Berkeley
John Galen Howard
1906

Climate: warm, moist summer
mild, wet winter
Latitude: 37.8°N

The plan is organized around a central courtyard which provides a large perimeter area for admitting light. The primary circulation system is lit naturally. A corridor moving along the edge of the courtyard is lit from the side, and when it is engulfed by the building mass it becomes skylight. A cascade of stairs along the north side of the courtyard receives direct light from the south. In the winter, the low angled southern sun fills this space, providing a pleasant, warm place; it is not uncommon to find groups of people

2.05
lining the steps when the sun is out. In the summer, when the sun is high, these steps are directly lit only at the window edge, so that the space remains cool and pleasant. Studios adjacent to this stairway receive generous and consistent light through large expanses of north facing glazing.

The Low angled southern sun penetrating the space in the winter.
In the winter, direct sunlight penetrates through the space and shines on the north wall of the corridor. It brings warmth and illumination throughout the morning. Strong shadows are cast across the corridor because of the sun's low angle.

In the summer the sun is high in the sky and penetrates only a few feet. Deciduous trees in the courtyard soften the intensity of the direct light and bring dappled light to the surfaces of the corridor.
Throughout the year, ambient light fills the space and illuminates the surfaces more uniformly. The light from the sky has a more significant effect on filling in shadows than inter-reflected light because of the dark surface finishes in the space. Because of these dark finishes, there is no reflected light to mute the shadows, and so the contrast between light and dark is preserved in diffuse as well as direct light.

The low angled southern sun penetrating the space in the winter.
As the windows repeat along the corridor, they produce a light/no light rhythm. The windows step up through the space, leading your eye vertically in the direction of movement.

Mullions give a smaller scale repetition of light/no light to reinforce the rhythm above. They form a screen which breaks up the light and reduce the glare. Repetition of the mullion grid brings a comfortable familiarity to what is less clear farther along the path.
An unseen skylight in the distance illuminates a solid wall surface and provides a goal for movement.

Stair nosings carry light across the space, in a rhythm of light/no light on the ground plane. Tiers of stairs group the light, which provides another scale. The regular but not uniform rhythm of light leads the eye upward through the space.
Climate: warm, moist summer
cold, damp winter
Latitude: 42.2°N
The five buildings which comprise
this complex are joined into a
cohesive whole by a central
interior courtyard and linear
circulation systems. The plan is
dominated by the strong
directional spine of a skylit
interior street, which runs
east-west along the northern most
building. Bisecting this is a
perpendicular street originating
at Harvard Yard; it is not
daylight, so a passer-through moves
toward the light of the
intersection. Ample daylight
penetrates the complex in several
ways: the buildings are all
narrow in section, and the
primary east-west spine repeats
above as in side-lit corridor.

West Corridor
Leading to the intersection of
the axes from the west end of the
building, this corridor passes
between the opaque masses of the
auditoriums and classes. It is
top lit by a continuous skylight.
Direct Sunlight

The south facing skylight catches direct light and brightly illuminates surfaces upper most in the space.

Diffuse Skylight

Also light the surfaces inside, creating a well-lit space during the day.
HARVARD SCIENCE CENTER

DIRECTION OF MOVEMENT

2.16
The railing reflects a continuous band of light through the length of the corridor, and thus forms a primary clue for establishing the direction of movement.

The narrow but deep dimension of the mullion breaks up the light, reinforces the direction of movement by repetition, and sets up a pattern of repetition in lower elements.

Mullions and piers reinforce the direction of movement differently from continuous bands of light; they lead the eye through the space and mark time as you move by.

The wall is virtually invisible. Its broad, dark surface is highlighted by the repetition of small points of light on the piers and beam ends which frame it.

Light coming through the door at the end of the corridor provides an important clue or target for movement through.
In addition to the skylight, this portion of the interior street is illuminated by a south facing window wall that looks into the courtyard. This connection provides orientation within the Science Center complex.

Direct light enters through the unprotected skylight and window wall and covers a large amount of surface area: walls, floor, etc., producing strong contrasts and repetitions.
Diffuse Skylight

On clear days diffuse light mutes the contrast provided by direct light. On cloudy days, the space is uniformly lighted by diffuse light and contrast and repetition are significantly reduced.

Bounced Light

Reflected light illuminates the underside of the upper walkway and mutes contrast by filling in shadows.
Again, the railing of the walkway above establishes the direction of movement through a continuous band of light.

The mullions of the skylight cast shadows on the floor. This repetition of light—no light is repeated in the beam ends and piers as before.

Lines of light reflected off the mullions creates a strong perspective, which leads the eye forward. The strong pattern of the mullions on both wall and ceiling defines the entire volume.

Light at the end of the corridor provides a goal which to move toward.
Czechoslovakia

Climate: warm, moist summer
cold, damp winter
Latitude: 49.1°N

Arcades on the ground floor of the three story houses in Telc provide a continuous arcade along the edge of the town square. The square is roughly five times as long as it is wide, which creates a strong direction for the town's only thoroughfare. The sunlight in Telc creates sharp contrast between light and shadow. Strong direct light fills the town square; as it penetrates the edge of the surrounding arcade it forms a transition between the open square and the dark houses beyond.

Direct Light
Enters through arched openings and sets up a strong contrast with the shadow of columns.
Direction of Movement

Ambient illumination only slightly reduces the contrast between light and shadow.

Most importantly, bounced light illuminates the inner wall and under surfaces of the arcade, and thus defines the volume.
Sunlight entering between the columns produces a light/no light pattern which recedes in perspective, leading the eye on.

Reflected light which illuminates the vaults and walls helps define the space. These surfaces are also seen in perspective, which enhances the direction of movement.
HOLYOKE CENTER

Cambridge, Massachusetts
Jose Luis Sert
1965

Climate: warm, hot summer
    cold, damp winter
Latitude: 42.2°N

Harvard University's Holyoke Center houses the administration and health center for the university. The ground floor is given over to commercial use which fronts on Dunster and Holyoke Streets. Shops also line the interior "street" which forms the long axis of the site. This "street" was conceived as a link between the housing across Mt. Auburn Street and Harvard Yard.

The overall massing of the building juxtaposes narrow parts that allow for maximum penetration of light into the building as well as surrounding streets. The interior street
that penetrates longitudinally through the site is lit along its southern edge by a continuous clerestory. The effect of this interior street could be stronger if it were top lit rather than side lit (a la Hertzberger's concert hall, see Change of Direction).

The facades of Holyoke Center are composed of clear glass and white, translucent panels and a brise-soleil. While these components produce interesting effects aesthetically on the exterior, the translucent panels produce a painful glare on the interior.
The interior street, lit from the south, is open at both ends so that the passer through is well aware of the proximity of the outside. The path opens wide at either end, providing a gracious transition to the street.

Enters through the clerestory and provides the strongest clue for movement.
Diffuse Light

Reduces contrast by illuminating the entire space.

Bounced Light

Illuminates the ceiling, making the building above feel lighter in mass and thus more comfortable.
A band of light down the center of the "street" dominates the view and clearly marks the primary direction of movement.

The clerestory bathes the upper part of each pier in light, providing a rhythm of light-no light throughout the space.

Bounced light washes the ceiling, whose longitudinal groupings of coffers reinforce the direction of movement.

Large openings at either end of the "street" frame a broad expanse of reflected light and provide a strong focus to lead you through the building.
change of direction
Changing one's direction of movement has two basic aspects: one, recognizing the place where a change occurs and a decision must be made; and two, recognizing elements which present enough information to choose in which direction to move. Because we tend to move to or with the light, the use of light can provide a strong clue for such a decision.

The place of change is generally a larger volume than the path to or through it. The path opens up at an intersection to give space to make a decision, and because more people are converging here. Opening up the volume also allows more light to enter, providing new opportunities for influencing movement. Because the intersection is a place at which
to stop to choose, the light can be more static too. Pools of light provide a goal for movement, which we assume will be a place of some activity. By making these pools of light repeat in a particular direction or differing the size of the pools, the change becomes apparent.

Light can also animate the physical elements. By illuminating surfaces which face in other directions from the original, or by changing the direction of the source of light itself (as in a progression of skylighting), we are guided through the building.
NORTHGATE HALL

Former Architecture Building
U.C. Berkeley
John Galen Howard
1906

Climate: warm, moist summer
warm, wet winter
Latitude: 37.8° N

The plan of Northgate Hall is
organized around a central
courtyard which provides a large
perimeter area for admitting
light. The primary circulation
system is lit naturally. A
corridor moving along the edge of
the courtyard is lit from the
side, and when it is engulfed by
the building mass it becomes
skylit.

A cascade of stairs along the
north side of the courtyard
receives direct light from the
south. In the winter, the low
angled southern sun fills this
space, providing a pleasant, warm
place; it is not uncommon to find
groups of people lining the steps
when the sun is out. In the
summer, when the sun is high,
these steps are directly lit only
at the window edge, so that the
space remains cool and pleasant.
Studios adjacent to this stairway
receive generous and consistent
light through large expanses of
north-facing glazing.
Direct Sunlight

3.04

Diffuse Skylight

3.05

NORTHGATE HALL

CHANGE OF DIRECTION

Eneters through a large peaked skylight directly above the intersection.

Also filters through the skylight, providing ambient illumination throughout the space.

Although both types of light enter at the same location, the close association between the source and the place allows direct light clearly to dominate the place of decision.

65
The primary clue is a pool of light at the bottom of the stair, announcing a decision place.

Rhythm of light-no light provides a strong visual focus, and leads the eyes upward indicating the continuation of the major axis.

Stepping the low wall reinforces the longitudinal direction by repeating a light-no light rhythm, less frequent than that of the steps.

The band of bright light on the upper part of the wall gives form to the darkness of the void suggesting a lateral shift in the path. In contrast, the walls leading to the intersection are dark.

A small window in the distance brings only a small amount of light into this otherwise void space. This darkness discourages movement in.
OTANIEMI INSTITUTE OF TECHNOLOGY

Otaniemi, Finland
Alvar Aalto
1964

Climate: mild, moist summer
very cold winter,
with snowfall
Latitude: 60.2°N

From the large curving auditorium
emanates the orthogonal plan of
the building complex. The
buildings organize a series of
closed and open-ended courtyards
which bring light into the
structures and unite them with
the landscape. Within the
Institute complex four main
groups can be distinguished: the
administration, the general
division, the geographic-geodesic
division, and the architectural
division.
Along the linear parts of the complex, building sections are narrow and sidelit, and daylight is the primary source of illumination. Others parts are deeper and illuminated from above, such as the covered courtyard, auditorium, lecture halls, and meeting rooms. Top lighting in these places becomes unique and very special, because the depth of the apertures and subtle use of materials and forms produce gentle gradations of light over the building surfaces.
Because Aalto did not differentiate between natural and artificial light, electric light is used in much the same way as daylight, employing the same architectural elements for both. For example, electric lamps over the skylights enhance their effect during the long hours of winter darkness.
Windows at Stairways
Tall Windows Set into the Jogs of the Corner Behind the Auditorium
Illuminate the Stairway Directly and also Sidelight the Walls
CHANGE OF DIRECTION

Light Morphology
A range of associations with light can be experienced throughout the Institute: moving along the light, in the light, under the light, and to the light. You generally don't move to lit sources like windows, but towards surfaces which are sidelit by windows; the perpendicular orientation of these surfaces indicates the change of direction. Because the windows are usually not seen frontally, glare is reduced.
Direct Light

Enters through deep skylights, bounces repeatedly and is brought down vertically in spotlights on the floor.

Diffuse Light

Employed in much the same way, having very little difference in effect. The sun and sky provide for the illumination of the surfaces within the space. In particular, the surfaces here integrate with the openings to become whole systems that indicate the options for movement. This integration produces striking clarity and a direct association among light, form and movement.
A curving procession of round skylights leads the eye around the back of the auditorium, implying the option to move around in that direction. These skylights provide repeating pools of light, extending the decision point into a continuous zone.

These rectangular panels carry streaks of light to the skylights which circumscribe the space. The extreme edge reinforces the line of the skylights, while the direction of the recesses leads your eye to the stairs.

The walls directly ahead carry planes of light in from the windows, announcing the presence of adjacent stairs.
Climate: warm, moist summer
cold, damp winter
Latitude: 42.2°N

The plan is organized around two perpendicular interior streets.
Where they cross, the ceiling opens up to the light. The "street" originating on the Harvard Yard side of the building moves through shadow to the light of the crossing. The direction of the cross "street" is informed by the light which enters through the continuous skylight above the path.

West Corridor
Leading to the intersection of the axes from the west end of the building, this corridor passes between the opaque masses of the auditoriums and classes. It is top lit by a continuous skylight that widens at the intersection of the two paths.
Direct Sunlight

Enters through enlarged portion of skylight over intersection; creates strong contrasts with shadows as light changes through the afternoon.

Diffuse Light

Also enters through skylight; mutes contrasts in the afternoon; in the morning or on cloudy days provides ambient illumination.
These surfaces provide the primary clue for the choice of direction by virtue of their high brightness and large area. Direction of skylight informs option to move laterally.

A pool of light interrupts the directionality of the light along the primary interior street and announces lateral option.

You can see light from the courtyard from the intersection, which attracts attention with a spatial understanding of what is beyond.

Floor, perpendicular wall plane, and long wall remain the same. Dark ceiling immediately above in the photograph intensifies the experience of moving into the light area of the intersection.
Surfaces (from east)

Floor

Perpendicular Wall Plane (Pier)

Longitudinal Wall

3.32

Ceiling

Exterior

A pool of light provides the primary clue of the decision place and by its direction informs the option to move laterally.

Reflects light from the skylight to announce the perpendicular direction.

Void in lit surface announces passage into the perpendicular interior street.

The dark ceiling intensifies the experience of moving into the lit area of the node.

Light at the end of the corridor invites you to continue along this path.
Utrecht, Holland
Herman Hertzberger
1979

Climate: warm, moist summer
mild, wet winter
Latitude: 51.9°N

The concert hall is the main and central structure of the music center. This volume is encircled by a lower structure containing shops and offices. A toplit interior street rings the concert hall, providing access to the commercial spaces and to the concert hall itself. More importantly, this street helps form a link to reunite the old town with the Hoog Catherine Shopping Mall.

Hertzberger employed three major ideas to strengthen this link. By adding shops and offices to the program he brought daytime life to the evening dominated use. Light enters the street vertically, conjuring associations with typical exterior city streets. The use of concrete and masonry further emphasizes the public feeling of the street primarily because these hard surfaces are not commonly found on building interiors.

The light and structure work closely with each other in this building. The interior street is walled on one side with masonry and is open and colonnaded on the other. The illuminated vertical walls surfaces reflects the light to provide a relatively even distribution
throughout the space. This reflected light also helps illuminate the areas behind the colonnade. The columns form the brightest elements in the space to create a light-no light rhythm that marches along the street. This rhythm marks time and distance as you move through and gives order to the street.
Hertzberger employs many methods to bring light into the music center. Glass block walls admit light horizontally, yet keep the effect of a solid mass dominating the exterior. In contrast, steel and glass sash windows provide a lightweight permeable screen.
A ten foot wide continuous skylight provides illumination for the entire length of the interior street. At each intersection, where the street changes direction, the space opens up and a grid of skylights brings in more light to announce the change of direction.

Enters through a deep skylight above and is broken up by bouncing repeatedly off interior walls. These inter-reflections transform the direct light into diffuse light. During short periods of the day, direct light will illuminate the floor directly.

Also enters through the skylight above and filters down to provide a relatively uniform, soft illumination throughout the space.
Enters through a large, flat grid of skylights above, brightly illuminating the walls and floors. This produces a higher level of illumination than the interior street as well as strong contrasts and highlights.

Enters in the same manner, providing a level of ambient illumination higher than that of the street because of the larger glazed opening.
This interior street leads into the node where the change of direction occurs.

The direction of movement into the intersection has been established by the brightly illuminated bands of the upper floor slab and walls and by a progression of lit column capitals.
VREDEenburg MUSIC CENTER

Floor

Walls

Skylights

Upper Walkway

CHANGE OF DIRECTION

Pools of direct light on the floor mark the place of decision as you enter.

The continuity of lit walls and column capitals inform the directional change as they move diagonally through the space.

The orientation of the skylight structure reinforces the diagonal direction of movement. The effect is further enhanced by the repetition of the grid sections, which recede into perspective.

These brightly lit, planar surfaces introduce the perpendicular change in direction.
SAN GIMIGNANO

Italy

Climate: warm, moist summer
      mild, wet winter
Latitude: 43.20°N

San Gimignano is a fortified city located in the Tuscan region, 18 miles from Siena. Historically, farming has been the principal industry. Parts of the ancient fortifications are still intact, including city walls and gates, and 12 towers, which numbered 72 in 1350.
Morphology

The town is characterized by narrow streets that widen at their intersections to form small plazas. Towers dominate the skyline.

Tower

The tower is brightly lit by both direct and diffuse light throughout the day. In contrast, the streets at the base are narrow and dark, shadowed by the buildings which line both sides.
CHANGE OF DIRECTION
The vertical masonry wall of the tower brings light to the ground. The large area of this lit surface announces the place of the direction change from a great distance. The left hand tower informs the larger, regional scale.
PEABODY TERRACE

Harvard University
Cambridge, Massachusetts
Jose Luis Sert
1962-1964

Climate: warm, moist summer
cold, damp winter
Latitude: 42.2°N

The intention behind Harvard's married student housing was to create a community - to bring people together by providing spaces and facilities which support social interaction. The plan is organized around three courtyards and a pedestrian promenade, linking Cambridge with the Charles River. Five hundred apartments are arranged in a group of four low buildings, recalling the height and volume of its neighbors, and three towers necessary for a more intense use of the land.
The high angled sun is the principal element brightly illuminating horizontal surfaces and creating high contrast.
Ground

The path moves through shadow to the light of the crossing. A pool of light at the crossing provides the primary clue to the decision point, and by its direction informs the options to move in either direction.

Wall

The linear strip of light on top of the low wall emphasizes the perpendicular direction.
change in level
INTRODUCTION

In the natural environment we ascend toward the light. This is a basic physical phenomenon, for the earth receives light primarily from above. When we move up to one level from another, closer to the sun and sky, we move toward the light. Conversely, when we descend we move away from the light. Through day-to-day experience we subconsciously develop an association between ascending and moving toward the light.
INTRODUCTION

Daylight brought in from above can be used to announce vertical access and recall this association, strengthening our understanding of the setting.

This hypothesis is exemplified by the four works that follow, showing the associations we make as we move through the built environment.
GLASGOW SCHOOL OF ART

Glasgow, Scotland
Charles Rennie Mackintosh
1897-1909

Climate: Warm, moist summer
        mild, wet winter
Latitude: 55.8°N

The Glasgow School of Art
occupies a narrow urban site,
sloping down to the south. The
plan is organized in an "E" form
which is common to this period,
when daylight was still
considered the primary source of
illumination. This form provides
a greater surface area for light
to penetrate the building. The
solid edge of the "E" addresses
the street to the north and
contains four floors of studios.
The south side of the building is fragmented and complex by comparison, containing a museum, library, and boardroom in the arms of the "E," and corridors in the main block.

The studios on the north side of the building occupy high volumes with large expanses of north-facing glass to bring in the constant, diffuse light of the north sky. On the first level of the building, the rooms are partially below grade; to bring ample light into these studios, large sloping skylights span roughly 14 feet between the building and the street.
In constrast, solid masonry walls with punched openings for windows characterize the south elevation. Skylights dominate the roof, providing toplighting for many of the interior spaces.

On the interior, Mackintosh achieves a range of feelings and associations by manipulating the building edge to transform the light. In the loggia - a south-facing passageway adjacent to the composition room - a peaceful sense of place is achieved through low stone vaults lit by generous bay windows. Many of the corridors are illuminated by repeating windows or skylights that produce a light-no light rhythm. A large skylight illuminates a major stairway leading from the entrance foyer up to the museum.
A peaked skylight over the museum and the stairs leading to it is glazed with frosted glass. The diffused light produced by this glazing filters down to illuminate the surfaces of the stairwell and museum.

The brightly lit stairwell contrasts with the dimly lit entrance hall, drawing you in and up to the museum.
Nosings reflect the light to produce a light-no light rhythm that leads the eye up through the space. The narrow band of light reflected by the top of the stringer reinforces this direction.

Tall, thin balusters acknowledge the verticality of the space. This direction is reinforced by the post that extends up from the bottom step to support the second floor.

The illuminated diagonal stringer suggests the continuity of movement beyond the first landing.

The largest and brightest surface visible from below announces the goal.
PEDAGOGICAL UNIVERSITY

Jyvaskyla, Finland
Alvar Aalto
1953

Climate: mild, moist summer
very cold winter,
with snowfall
Latitude: 62.2°N

Jyvaskyla is primarily a college town. The Pedagogical University serves not only as a school, but also as the city's intellectual center with its lecture, concert, and meeting halls. The university buildings are laid out in the form of a "U" and surround the campus. The building widths are narrow to provide ample light to the interiors.

The main building is fan-shaped, generated from the second floor auditorium. Solid masonry walls contrast with the full height, open glazing to create a strong solid/void relationship. Columns
supporting the auditorium allow the first floor foyer to be completely open. This space is interrupted by three open stairways to the auditorium. A large expanse of glazed wall enhances the open feeling of the foyer by making an emphatic connection to the forest immediately outside.
In addition to windows, skylights and clerestories provide illumination in many spaces. The foyer, surrounded by a large expanse of glass, receives ample and balanced illumination throughout. The stair hall adjacent to the foyer is top-lit by six deep-welled skylights. These skylights highlight the stairs in an otherwise dimly lit space. The surfaces of the light wells have a matt white (semi-specular) finish which diffuses the light. Because these skylights are exceptionally deep, direct light bounces back and forth repeatedly so that the resulting diffused light enters the space vertically. This puts the light directly over the stairs, emphasizing that element within the larger space.
Diffuse Skylight

The deep-welled skylights bring diffuse light into the space vertically as they do with direct light.

Direct of Diffuse Light

The actual source of light determines only the intensity, not the distribution of light and therefore is not a crucial factor in announcing the vertical access.
CHANGE IN LEVEL
Light reflecting off the flat top of the railing acknowledges the angle of ascent. This continuous surface of light delineates an edge and informs the movement. The position and inclination of these wide surfaces work together to reflect more light in the direction of the entry. This emphasizes the stairway, making it dominant within the space.

The light reflected from the surfaces of the treads combine with the shadows of the risers to create a light-no light rhythm which leads the eye up through the space. The steps are grouped with intermediate landings which add another layer of rhythm to the ascent.
The horizontal aspect of the stairs' ascent is reinforced by the light reflected off of the horizontal edges of the upper floors. The luminance of these surfaces is emphasized by shadows cast into the void by the balconies behind them.

The directional repetition of the skylights produces a light-no light rhythm that moves through the space to the top of the stair.

The major surfaces of the whole volume are planar and subdued, contrasting with the screen-like quality and activity in the lit surfaces associated with the stair. This further enhances the public nature of the stair.
Sperlonga

Italy

Climate: warm, dry summer
mild, damp winter
Latitude: 41.2°N

Sperlonga is a small fishing
village a few hours south of
Rome. It is characterized by a
labyrinth of walkways, stairs,
and tunnels forming vertical and
horizontal connections throughout
the village. These narrow
winding passageways are enclosed
by whitewashed walls. Walkways
wrap around the three sides of
the promontory and occasionally
make their way to the water's
edge.
Direct Skylight

Reflects repeatedly off the whitewashed walls of the passageway; providing backlighting for surfaces not directly illuminated by the sun. During certain parts of the day the sun enters vertically, illuminating the street directly.

Diffuse Skylight

Reduces the strong contrast built up by shadows and direct light. On overcast days exposed surfaces are even more uniformly illuminated. Since many spaces are not exposed to the sky, a progression in and out of the light continues through the village.
Direct light, penetrating vertically, illuminates the stair treads. This produces a light-no light rhythm with the dark risers that leads the eye up along the path.

The upper walls in this view are open to the sky and will always be brighter than those protected by buildings overhead. Because they also receive significant reflected light, these walls clearly present the option to ascent. This choice is further suggested by the shadow line at the base of the wall which runs continuously up the stair.
VREDENBURG MUSIC CENTER

Utrecht, Holland
Herman Hertzberger
1979

Climate: warm, moist summer
mild, wet winter
Latitude: 51.9°N

The concert hall is the main and central structure of the music center. This volume is encircled by a lower structure containing shops and offices. A illuminated interior street rings the concert hall, providing access to the commercial spaces and to the concert hall itself. More importantly, this street helps form a link to reunite the old town with the Hoog Catherine Shopping Mall.

Hertzberger employed three major ideas to strengthen this link. By adding shops and offices to the program he brought daytime life to the evening dominated use. Light enters the street vertically, conjuring associations with typical exterior city streets. The use of concrete and masonry further emphasizes the public feeling of the street primarily because these hard surfaces are not commonly found on building interiors.

The light and structure work closely with each other in this building. The interior street is walled on one side with masonry and is open and colonnaded on the other. The illuminated vertical wall surface reflects the light to provide a relatively even distribution
throughout the space. This reflected light also helps illuminate the areas behind the colonnade. The columns form the brightest elements in the space to create a light-no light rhythm that marches along the street. This rhythm marks time and distance as you move through and gives order to the street.
A ten-foot wide continuous skylight provides illumination for the entire length of the interior street. At each intersection, where the street changes direction, the space opens up and a grid of skylights brings in more light to announce the change of direction.

The space opens up in the direction of the continuing street and towards a stairwell. The upper walkway is illuminated by the skylight, creating a bright horizontal band which indicates the change of direction. The stair leading to the second floor is a dominant feature in the field of view because it is bright in contrast with the shadow cast by the walkway.
Direct Sunlight

Enters through the grid of skylights and penetrates the stairwell during certain times of the day. The strength of this light further enhances the contrast with the shadow cast by the walkway above.

Diffuse Skylight

Has a similar effect as direct light, but the contrast is not as sharp. Therefore it is not critical whether the light entering is direct, or diffuse.
The wall surfaces at the stair landing are brightly illuminated, allowing the volume to visually pull you in. This is the strongest "force" acting. The white railings pick up a small portion of available light and contributes minimally to the movement up the stairs.

As you move into the enclosed stair landing (illuminated vertically from the skylights above) you ascend to the second floor, led by the light of the open volume above.
sense of place
"Now, of course, it is hard to give an exact definition of a 'place.' Essentially a 'place' is a partly enclosed, distinctly identifiable spot within a room... 'Places,' in turn, seem often to be defined by light... [as] very few things have so much effect on the feeling inside a room as the sun shining into it."

It is difficult to describe how to achieve a "sense of place," since we all bring different associations to a particular setting. It seems, however, that there are a few key elements in the making of a place:

- harmonious play of light to reveal the form of the place;
- and a distinct contrast or difference between the light and form of the "place" and that of its surroundings;
- human scale provided by the combination of materials, textures, and form.

Light and form can combine in many different ways, with differing effects. A pool of light highlights a particular spot in a room and makes it a special place within that room. Surfaces and forms washed with light define the volume of a place. Surfaces also enhance the quality of light by changing the color and temperature of the light and giving it texture and form. Light can provide orientation, a connection with the outside world, by having a direction and changing in a predictable fashion through time.

1 Alexander, Christopher. A Pattern Language, p. 645
SENSE OF PLACE

The light in a "place" is much more contained than it is along a path, where the light is linear and carries off into the distance. In a "place" the light tends to be framed (often with a view) and illuminates the surfaces which enclose the space. The light can be either direct or diffuse, as each lends its own particular character to a place. When the light is diffuse, the feeling tends to be more calm or quiet. When direct light is screened or broken up by mullions, there is a stronger sense of scale and thus of "place."
GLASGOW SCHOOL OF ART

Glasgow, Scotland
Charles Rennie Mackintosh
1897-1909

Climate: warm, moist summer
mild, wet winter
Latitude: 55.8°N

The Glasgow School of Art
occupies a narrow urban site,
sloping to the south. The south
side of the building is comprised
of thick masonry walls with
deep-set, punched windows; it is
occupied by meeting rooms and
corridors. The three arched
loggia discussed here is one such
south-facing passageway.

As light penetrates the depth of
the space, it illuminates the
back walls and the intrados of
the arches most brightly,
creating a dynamic three-
dimensional quality.

The direct light on the broad
planes of the windows and floor
completes the sense of enclosure
in this room.
Small scale references in the window mullions and brick along the heavy, low masonry forms, also add to the sense of place.

By contrast, adjacent to this loggia is a hall with glazed top and side walls which gets no relief from the intense southern light.
VILLA MAIREA

Noormarkku, Finland
Alvar Aalto
1939

Climate: mild, moist summer
very cold winter
with snowfall
Latitude: 61.5°

Villa Mairea occupies a hill-top site in the midst of a pine forest. Its U-shaped plan faces a courtyard, while walls, columns, and screens are combined in different ways for a variety of contrasting spatial effects inside.
The reference here is a study located just off the living room, which faces south and so receives direct light. A diagonal stream of light marks the place of activity within the room, a chess table. Books lining the wall and the wood cabinets below give warmth and scale to the room.
MOUNT ANGEL LIBRARY

Benedictine Abbey
Mount Angel, Oregon
Alvar Aalto
1970

Climate: Warm, moist summer
mild, wet winter
Latitude: 45.1°N

The Mount Angel Library occupies
the crest of a hill overlooking
the broad valley below. To the
abbey yard the library appears as
a simple one story building,
preserving the original character
of the site. On the other side,
the structure uses the slope of
the hill and descends three
stories to achieve the necessary
volume for the library. This
side is much more articulated,
grabbing the light and bringing
it into the main reading areas of
the library. A large curving
clerestory pops through the flat
roof to illuminate the central
reading area, while a clerestory
at the edge of the building carves into the building fabric itself illuminating the carrels. In contrast, the stack area is more dimly lit, which allows the reading area to become a special place within the library.
Soft, diffuse light descends into the central reading space from the curving clerestory. The sense of place that exists here is created by the quiet quality of the light alone; large, volume-defining elements are only peripheral.
5.12
The columns gently bring light down from the clerestory to the tabletops of the reading area. A flush column-beam connection allows light to descend without interruption by shadow—another subtle continuity of light.

5.11
Frequently spaced lamps provide scale and suggest a smaller, personal volume within the larger space.
EXETER LIBRARY
Phillips Exeter Academy
Exeter, New Hampshire
Louis I. Kahn
1972

Climate: warm, moist summer
cold, damp winter
Latitude: 43°N

The library is located on a rural
 campus, surrounded by lawn and
 scattered trees. A grand top-lit
 volume organizes the plan and
 serves as an entrance hall. Two
 concentric "doughnuts" surround
 this volume. The inner, concrete
 one supports the stacks, while
 the outer doughnut, built of
 brick piers, contains the reading
 areas and study carrels. The
 color and scale of the brick
 combine with other materials in
 light to bring a special feeling
 to the library... "a place where
 a man can bring his book to the
 light."

SENSE OF PLACE
Two-story high windows illuminate the building edge without glare. Brick piers define the large spatial order, while also giving a small scale reference and a warm feeling of permanence as they are bathed in light. Small window slots direct light to the study carrels from the side; the enclosure of the carrel contains the light and defines a highly personal space.
This side window has a sliding teak shutter which allows the user to control light and view in a direct way. This control has a profound effect on the sense of place.
The warm tone of the teak adds to the welcoming feeling of the place, as the light freely washes the surfaces of the wood.
An orienting space connects the different parts of a built environment, as a space common to other locations. If it is brightly lit in contrast to its surroundings, this orienting space forms a strong reference point as you move through the larger place. The orienting space lends familiarity and holds a clear, understandable relationship to the whole building. Whether the light is direct or diffuse has little bearing on the sense of orientation within the building itself. Direct sunlight, however, adds a more complex connection—a relationship with time, season, orientation, and location of the place within the
world outside. Objects within the orienting space provide a more dynamic sense of orientation, as their aspect changes relative to the location of a person moving through.
SAYNATSALO TOWN HALL

Saynatsalo, Finland
Alvar Aalto
1952

Climate: mild, moist summer
very cold winter
with snowfall
Latitude: 62°N

This small complex of building
surround a courtyard which is
raised a story about street
level. A U-shaped building
looking inward on the courtyard
houses the offices, apartments,
and council chambers, but
maintains a quiet intimacy
because of its vertical
separation from the street. A
separate building contains the
public library, which is entered
from the courtyard, and shops
which face outward to the street.
A cascade of grassed terraces
connects the courtyard to the street level, but pedestrian access is located at the opposite corner of the courtyard, making one walk partially around the complex before entering.

Entrance to each building in the complex is made directly through the courtyard. A connection to this large volume of light is therefore established from the beginning.
Light captured by the courtyard is brought inside by the well-glazed corridors along the edges of the building.

As one moves through either building, light entering from the courtyard is ever present, providing a strong sense of orientation.
Exeter Library

Phillips Exeter Academy
Exeter, New Hampshire
Louis I. Kahn
1972

Climate: warm, moist summer
cold, damp winter
Latitude: 42.7°N

Exeter Library is organized around a grand top-lit volume that serves as an entrance hall. From this space the organization of the library immediately unfolds. Two concentric "doughnuts" surround this orienting space: the inner one is constructed of concrete to support the heavy load of stacks. The outer doughnut is built of brick and contains the reading areas. Immense circular openings in the concrete inner structure reveal the books in the stacks, while the open first floor plan makes a direction connection between inside and outside.
Light penetrates the central space and focuses attention inward. The effective building depth is very narrow because light enters the central volume from clerestories above. The two-story reading spaces at the outer edge of the building also aid in bringing light deep into the building.

Plan
Although the building itself is entered at a lower level, the effective entrance to the library is at the base of the orienting space. Stairs are located in the corners of the building and are dimly lit, a contrast which emphasizes the sense of orientation upon entering a new floor. Exiting the stairs on any floor level, one immediately faces the open space and is oriented to the whole building. The stacks are placed so as to preserve access to the light and views of the orienting space. Circulation within each floor is located adjacent to the open volume, further reinforcing the sense of orientation.
EXETER LIBRARY

ORIENTING SPACE
Concrete baffle

6.15

Deep concrete baffles cross diagonally through the top of the orienting space and break up much of the light entering from above. This diffuse light fills the central space without harming the books that line its edges.

Vertical orientation

6.16

Each floor sees a different portion of the circles that are cut into the concrete inner structure. These clues inform one's vertical position in the library.
LOUISIANA MUSEUM

Humlebaek, Denmark
Joergen Bo and Vilhelm Wohlert
1960

Climate: warm, moist summer
mild, wet winter
Latitude: 56°N

The Louisiana Museum was designed
with the notion that the arts can
best be appreciated when they are
shown together in a detached
setting. Located 18 miles north
of Copenhagen on the coast of The
Sound, the site is an old estate
incorporating an existing villa.
The sequence through the museum
holds variety and surprise,
exploiting various connections
and relationships with the light
and landscape.
LOUISIANA MUSEUM

This museum is considerably different in form and character from the other buildings discussed in this setting. The diagram of Louisiana relies on the environment outside for orientation, unlike Exeter and Saynatsalo, which capture space and the light within.

Glazing extends from floor to ceiling along one side of the long linear portion of the museum, flooding the space with light. As a result, the connection with the outside is clear, close, and prolonged.
Upon entering the broader portion of the building, the orientation reverses dramatically, as light is brought in from the opposite direction, capturing a view to the pond for the first time. Beyond this point the space relies more completely on the light itself for orientation, as a roof lantern provides only illumination. At the end of the journey, a visual connection to The Sound is regained. Even though one's relationship to the light varies, the sense of orientation remains throughout because the light is ever present and the connection to the landscape is direct and dramatic.
Entry progression concerns the transition from path to place—generally between more public and more private, and often (but not necessarily) between outdoors and indoors. The sequence which accomplishes such a transition takes advantage of a range of qualities in light and form. Common to all the references is a difference in the light levels of the path and the place, and this change is mediated by the entry progression.

Outdoors to Outdoors
In general, the brighter a space is lit, the more public we assume it to be. This association is closely related to the fact that a public gathering requires a larger volume of space, which in turn allows more light to enter. Conversely, private spaces such as paths and entries tend to be smaller or narrower and more dimly lit. The greater the difference in illumination between the path and the place, the stronger the sense of change between private and public.

Outdoors to Indoors
Given any form of enclosure, the level of illumination inside a building is less than that outside. Although our eyes have an incredible ability to adapt to changes in light levels, the entry transition can make it easier or harder to adapt to the abrupt changes that occur upon entering a building.
INTRODUCTION

A gradual entry progression allows the eye to adapt more easily and therefore is desirable. The space that receives you upon entering seems to work most successfully when it orients you to the rest of the building. Combining the receiving space and orienting space in this way is mutually beneficial.
MAISON CARRÉ

Bazoches-sur-Guyonne, France
Alvar Aalto
1959

Climate: warm, moist summer
        mild, wet winter
Latitude: 44.5°N

The house occupies a hill at the edge of an oak grove, with a panoramic view of the French countryside. Its long, sweeping roof acknowledges the slope of the site, harmoniously blending the building with the landscape.

Constructed for a prominent art dealer, the house was designed to accommodate paintings and sculpture within a family setting. The plan is organized around a central entry and circulation space, which is lit by a large clerestory. The more public spaces in the house face the view to the south, while the private areas face east.
The structural system reinforces this distinction, separating the bedrooms from the rest of the house by a masonry wall that bisects the plan, and respects the orientation to view.
To enter the building one moves under a solid canopy with a view down the hill to the valley, through an enclosed skylight vestibule, and then into the central interior space of the house. Diffuse light enters this receiving space through a clerestory window over the entry door.

Once inside, a visitor is quickly oriented to the public realm of the house and reconnected to the familiar view of the valley. Entrance is made perpendicular to the orientation of the public areas, but the wall straight ahead is brightly lit by the clerestory above, leading the eye in. Reinforcing that direction is the descending line of the junction between this white side wall and the dark ceiling. Finally, one is powerfully attracted by the light and view coming through the window-wall at the end of the living room.
HEARST MINING BUILDING

U.C. Berkeley, California
John Galen Howard
1909

Climate: warm, moist summer
         mild, wet winter
Latitude: 37.80\(^\circ\)N

The university's master plan, also designed by Howard, focused the hillside campus along a major axis that leads to a view of San Francisco Bay. Culminating this axis is the Hearst Mining Circle, on which the Mining building fronts. The building is entered through a three story lobby, which is flanked by lecture halls and administrative offices. Within the body of the building behind laboratories and more offices are organized around a central light well. Heavy stone walls form the skin of the building, with deep set windows punched through.
Entry Progression

The building is entered frontally and abruptly through the center of the principal facade. The transition is provided internally, with a ground reception space top lit by three dome-shaped skylights. These provide intermediate illumination for the eye to adapt to the darker interior environment. The facade arches provide a continuity of light from outside to in as it streams through during the day. These arches also refer the space and thus the visitor back to the exterior. The receiving place also clarifies the vertical access and sets up entry point to corridors. Unfortunately the clarity breakdown in the rest of the building, where the circulation spaces are not well lit.
Cambridge, Massachusetts
TAC, BTA, Sert/Jackson
1966-71

Climate: warm, moist summer
cold, damp winter
Latitude: 42.2°N

The courtyard is defined by three
buildings built from 1966 through
1971. The first, on the
northwest side, houses the
offices of The Architects' Collaborative. In 1969 Ben
Thompson Associates built the
glass-walled structure for Design
Research, a high-design clothing
and housewares store. The
courtyard was enclosed in 1971
with the construction of Sert/
Jackson's own office building to
the south. The courtyard now
serves the entrances of TAC and
Sert/Jackson's buildings. More
importantly, this sequence of
built and unbuilt spaces links
Brattle and Mt. Auburn streets
ENTRY PROGRESSION

with pedestrian access through the block.

The plan is organized along a spine of circulation which passes through the southern edge of the courtyard. This spine accesses two buildings beyond the courtyard and connects to Mt. Auburn Street as well.
Passing under the building off Brattle Street provides a contrast of light with the courtyard. The space opens up to the right, creating this courtyard and allowing light to penetrate. The courtyard is clearly distinguishable from the path by a glazed cover over the path. Light from the rear courtyard clarifies the direction of movement through the space.
PIAZZA DEL CAMPO

Siena, Italy

Climate: warm, dry summer
mild, damp winter
Latitude: 43°N

Three small hill towns joined to form the medieval city of Siena, in the heart of Tuscany. The Piazza del Campo developed as a public focus at the geographical center of these towns as they grew. The large open qualities of the Campo are in sharp contrast to the dimly lit, narrow streets that wind through the city. The Campo measures about 320 feet by 420 feet through its center lines. The height of the buildings surrounding the Campo ranges from 60 to 100 feet, forming a strong, continuous wall around the open space.
The experience of entering the Piazza del Campo is quite profound as recalled by Michael Hans von Heppe:

Entering the Piazza del Campo from the dark and narrow streets, one suddenly stands on a wide space full of light. The observer's attention is attracted to the Palazzo Pubblico, which stands at the deepest point of the inclined Campo, as a stage of an antique theatre, surrounded by an uninterrupted sequence of palaces... The visual sense is highly stimulated by the warm, rich colored brick and white marble of the facade of the city hall and the pavement of the piazza, which appear in strong contrast to the distant black and white stripes of the cathedral.

PIAZZA DEL CAMPO

ENTRY PROGRESSION
Siena Streets

The streets that wind through Siena are very narrow, sometimes only 20 feet across, while the building edges are often as high as those of the Campo. These proportions create dark streets and provide a strong contrast to the Campo.

Receiving Space

The Campo, flooded with light from above throughout the day, is a major outdoor gathering place for residents of the city. The experience of entering the Campo is dramatized by the abrupt transition from dark to light underscoring the public feeling of the Campo.
MOUNT ANGEL LIBRARY

Benidictine Abbey
Mount Angel, Oregon
Alvar Aalto
1970

Climate: Warm, moist summer
         mild, wet winter
Latitude: 45.1°N

The Mount Angel Library occupies the crest of a hill overlooking the broad valley below. To the abbey yard the library appears as a simple one story building, preserving the original character of the site. One the other side, the structure uses the slope of the hill and descends three stories to achieve the necessary volume for the library. This side is much more articulated, grabbing the light and bringing it into the main reading areas of the library. A large curving clerestory pops through the flat roof to illuminate the central reading area, while a clerestory
at the edge of the building carves into the building fabric itself illuminating the carrels. In contrast, the stack area is more dimly lit, which allows the reading area to become a special place within the library.

Entry Progression
To enter the library, one first walks along the solid wall of its auditorium, which obscures about one-third of the light from the sky. A two-part screened canopy marks the doorway and more delicately modulates the light overhead. These screens produce a range of brightness both on their form and within their shadows.
Screened Canopy

Lightweight steel members form a kind of brise soleil, blocking out about 40% of the light at eye level. The shadow cast by this section introduces a spatial light-no light rhythm in the screen up above and in its shadow below.

Opaque Canopy

A solid roof on a portion of the canopy obscures all light from the sky, but a wood grid on the underside picks up reflected light from the ground. Complementing each other the opaque portion blocks glare from the sky and casts a solid shadow, while the articulated under surface screens the remaining light and aids in the transition to the interior.
Deep, round skylights at the inside edge of the foyer puncture the thick roof to bring light in vertically. Light enters in the same manner just beyond the glass doors and increases the apparent transparency of the glazing. This light in the foyer continues the sequence of transition into the building itself.

The circulation desk is illuminated by two skylights similar to those in the foyer. From this vantage the organization of the entire library becomes quite clear, as the building is flooded with light from a clerestroy and side windows.
CHRISTIAN SCIENCE CHURCH

Berkeley, California
Bernard Maybeck
1910

Climate: warm, moist summer
mild, wet winter
Latitude: 37.8°N

The church was sited on the corner of a block in a well developed residential neighborhood. A combination of natural and fabricated materials produces striking effects. The structure consists of concrete and redwood, asbestos panels clad the walls, and industrial sash windows incorporate leaded glass. The roof of the nave is supported by hinged redwood trusses that cut diagonally through the space. Elaborated by gothic tracery, these trusses visually dominate the nave.
Heavy concrete and redwood columns supporting the loggia and portico form a dense vertical screen. These columns support a trellis, covered with wistaria vines, that brings dappled light to the ground during the summer.
The loggia contains a two part canopy; formed by a solid gable roof flanked by wistaria covered trellises. In combination with the columns, these elements make a three dimensional screen. The screened quality of light encountered along this loggia greatly enhances the sense of transition from outside to inside.

The enclosed foyer is skylit—the opposite condition of the loggia canopy. The light is screened here also, but to a lesser extent by the structural beams. This continuity of light reinforces the pattern of transition into the church.
Clerestory windows located above the entrance door bring light into the nave. The intensity of this light is tempered by its direction, as light comes over the shoulder of the visitor to lead his path from behind. At this point the nave is open, a side-lit volume which descends slightly to the altar. Thus the clerestory also provides orientation back to the entry points.
Silence and Light: Louis Kahn’s Words

All material in nature, the mountains and the streams and the air and we, are made of Light which has been spent, and this crumpled mass called material casts a shadow, and the shadow belongs to Light.

Louis Kahn
ILLUSTRATIONS

Calligraphy by Wendy Frontiero

Cover

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