UNIVERSITY OF CINCINNATI

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I, Ervin Perviz

hereby submit this work as part of the requirements for the degree of:

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The Cincinnati Museum of Black and White Photography

This work and its defense approved by:

Chair: **George_Thomas_Bible**

Gordon_Simmons

The Cincinnati Museum of Black and White Photography

Ervin Perviz
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University of Cincinnati, Cincinnati, Ohio
College of Design, Architecture, Art and Planning
Master of Architecture, Class of 2007

Miami University, Oxford, Ohio
Batchelor of Arts in Architecture, June 2003

Committee Chair #1: Thomas Bible
Committee Chair #2: Gordon Simmons

ABSTRACT

My thesis is about writing with natural light. The idea is to use natural light to sculpt and define spaces. These light constructed enclosures would portray complexity, intensity and dynamicity of the sunlight appropriated to the specific use of the respective spaces they generate. The product of such approach is intended to be read and not viewed.

The intension is to create a museum of black and white photography that allows participants not just to see the displays but also to sense and individually interpret the spatial conditions created by natural light. Within this approach, light is employed to bridge the distance between the building, the users and the essence of the black and white photography.

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INTRODUCTION

To understand light one needs not to look up its definition in the dictionary for it may give you an abbreviated and rather insular overview of its properties. In scientific terms light can be summarized as an electromagnetic radiation that has a particular wavelength, while an anatomic scientist can look at it as the sensation aroused by stimulation of the visual receptors. In both cases the definitions are precise and factual. It is when we come to the worlds of art and architecture that the notion of light becomes ominous and often ignored. Technological dependency on sun has long been extinct and few of us truly understand the complexity, movement and significance of the sunlight. Recent sustainability movements have raised the awareness of natural light within architectural community but only in terms of building performance and energy savings. I feel that there is much more to natural light than currently utilized and that is what I will try to prove through this thesis study.

My thesis looks at natural light and its ability to sculpt and define architectural spaces. The interest arouse from a quarter long exploration of the sunlight whose purpose was to understand a material at the cellular level, analyze its composition and understand its behavior. Through this study I have discovered and started to understand the multidimensionality of the sunlight and the possibilities that exist within it. The question now is how these characteristics can find their place in architecture?

Some of my initial studies revolved around pinhole cameras which were used to track the sun movement over a certain period of time. This process of exposure and development

of images led me to the realm of photography. Once introduced to the photography it was easy to realize that this field was completely dependent on light and that a lot could be taken from such a process and be applied to architecture. It did not take long before I had decided to focus my studies solely on the black and white photography. It appeared to me that black and white photographs did more to evoke an emotion and create a mood than its colored counterpart. Lack of color allowed for greater emphasis on the forms within the photograph but it also introduced an element of ambiguity which permitted the viewer to engage with its content on a more personal basis. It was this idea of reading into something rather than just viewing it that seemed worth further exploration.

Given the circumstances I had decided to design a museum of black and white photography. The museum will allow participants not just to see the displays but also to sense and individually interpret the spatial conditions created by natural light. Within this approach, light is employed to bridge the distance between the building, the users and the essence of the black and white photography.

The idea is to start with completely dark spaces and add light as necessary. Depending on the desired conditions, the sunlight will be defused, reflected, filtered or concentrated as it enters the building. These light constructed enclosures would portray complexity, intensity and dynamicity of the sunlight appropriated to the specific use of the respective spaces they generate. Users will be presented with variety of spaces ranging from the very dark to the ones entirely flooded with light. One could argue that for this reason no place would be equally committed to all of its users since the meaning would change

depending on the users' education, demographics, nationalities, etc. It is the users' individual input that will complete the space. The product of such approach is intended to be read and not viewed.

The second and just as important aspect of the museum is its night time presence. The building is set to enhance the site through its night glow but without completely polluting the surroundings with unnecessary light. The light will slip out of the building only through carefully placed openings and in a very subtle manner, transforming the city block into a desired walk-through place. The idea is to create a night time outdoor gallery space which would be open to everyone and at anytime.

The museum is set to be located in downtown Cincinnati. The site itself is composed of two alleyways dissecting a city block into four quadrants. The narrow corridors provide a dark origin for the museum to spring from and like a tree in a forest spread itself in search of natural light. The urban environment will also impose certain limitations in terms of orientation and space which will further restrict or even guide this project.

The outcome will hopefully give birth to a new strategy when dealing with natural light in architecture. It will expose the potentials of the sunlight that few have ever capitalized on and it will send out an invitation for further exploration of this precious and underutilized natural element.

This thesis idea steamed from the works of two distinguished individuals that have dedicated their careers and lives to studies of light phenomena. They are James Turrell and James Carpenter. Although both of them are working with light their explorations and findings differ immensely and that is precisely why they were chosen as the guiding models for this study.

James Turrell

James Turrell was born in Los Angeles in 1943. His undergraduate studies at Pomona College focused on psychology and mathematics; only later, in graduate school, did he pursue art. He received an MFA in art from the Claremont Graduate School in Claremont, California. "Turrell's work involves explorations in light and space that speak to viewers without words, impacting the eye, body, and mind with the force of a spiritual awakening."[9]

Through his artistic explorations, Turrell tries to reveal the hidden qualities of light and enhance one's awareness of his/her surroundings and inner person. His approach is highly spiritual and his work targets individual's optical and acoustic perception and it stimulates virtually all of human senses. Such spaces portray meditating and sublime qualities and tend to leave a lasting impression on its visitors. "Intellectually, the sketches, plans and finished works are closely related to the Mendota Stoppages that they do not deal with the architectonic space as a functional, impermeable body but as a place

of transformation which, as a Sensing Space, exists through and in its correlation with its surroundings."[6] Using light, Turrell explores the boundaries and meaning of objects as architectural bodies but he breaks up their structural order and dimensionality. "The dissolution of material boundaries effected by Turrell's light installations does not merely present but enforces a new kind of architectural thinking: as a fragment of time and a changeable, ephemeral appearance through light."[6]

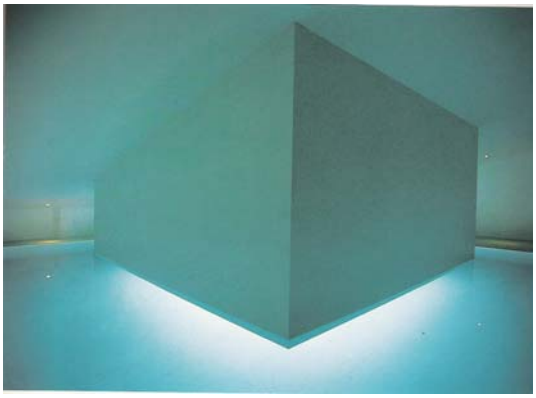
James Turrell believed that generally in architecture people are making forms and not spaces. In this sense, he argued, spaces are created by first making forms and then placing the lights inside, without much thought given to the way light activates the space and gives it a unique character. "In terms of urban situations, one of the biggest mistakes is that by using light to lite the night we close off our perception of the universe…it's just like having the lights on inside of a house – you don't see into the dark."[6]

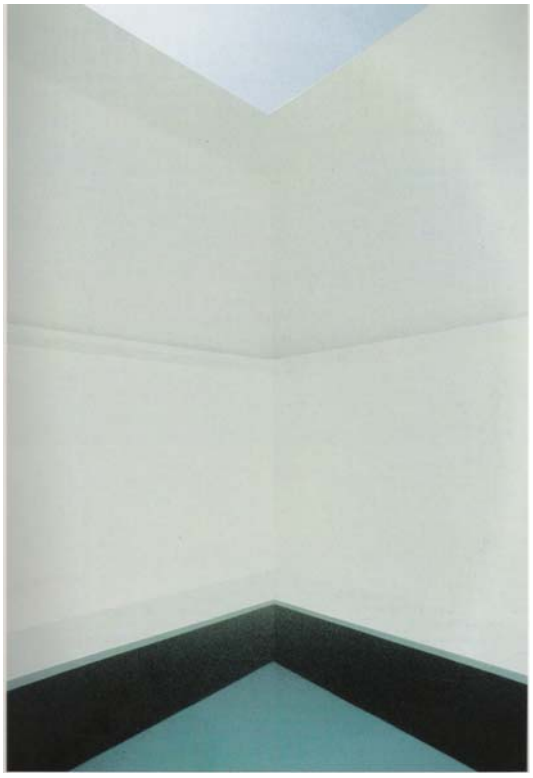
Wolf
Capp Street Project, San Francisco 1984

In 1984, Turrell took part in one of the Capp Street Projects that called for artists to create site-specific works. His project was a small residential house located on a prominent yet intimate street corner. In the inside of the house Turrell installed blue fluorescent lights which were strongly felt through all of

the house openings. The façade of the building was constructed out of a reflecting metal allowing the light to interact with it throughout the course of the day and creating a special quality as the inner and outer lights collided. Turrell also converted the street lighting into a deep green light so that at night the building seemed to be radiating and almost glowing in color. The light escaping to the outside transformed the urban environment into a sensing space which interacted with the strong physical presence of the light-filled structure and turned the viewer's outside feeling into an inside feeling, particularly at night. This way the house is open for interaction not just to its users but to the casual passerby as well.

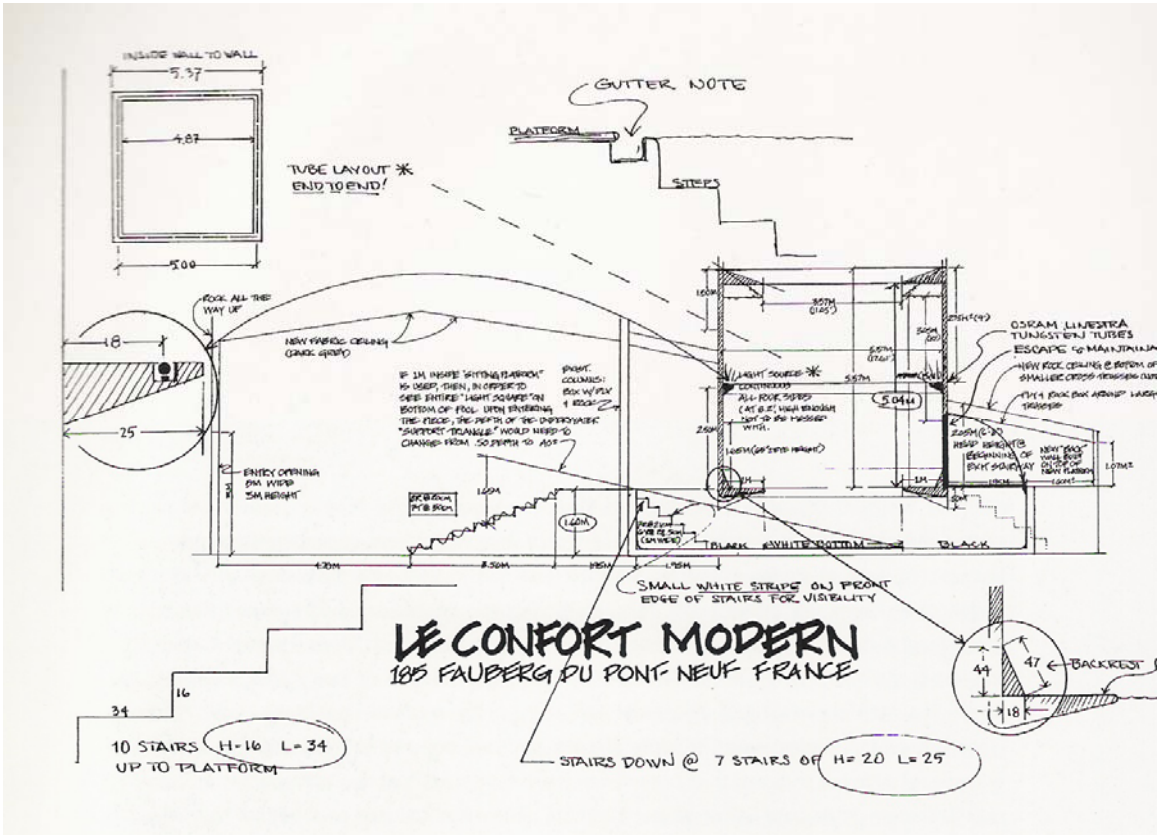
Heavy Water
1991





Heavy Water was realized in 1991 for Le Confort Moderne, Poitiers, and it consists of a 35’ perfect cube housing a swimming pool. The cube itself is situated within a larger swimming pool which serves as the only entrance into the cube. In order for a participant to reach the inside of the space he/she has to completely dive under the water and under the center shaft. It is then that they can use a small platform to sit on and from there view the sky through the Skyspace overhead. The inside of the cube is free of decoration and entirely white placing all of the importance on the opening above. The light that comes in through the Skyspace uniformly washes down the walls and slowly spills out into the pool through the bottom of the cube making the structure seemingly float on the water. The water is used to amplify the sound coming in from

the outside and also for portraying the light that passes through it as a substance.

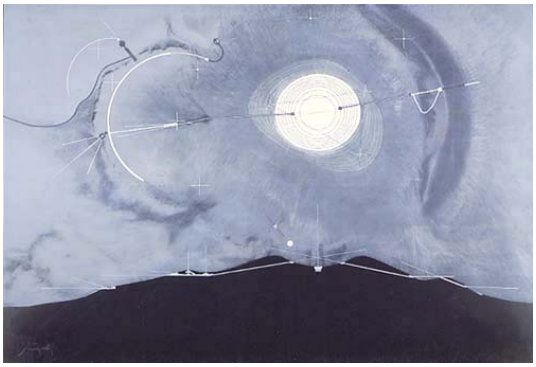


Such environment completely strips down the complexity and activity of everyday life and surrounds one with simplicity and calmness. It is then that one start to truly appreciate and discover inner self and its connection to the vastness of space. In this case Turrell uses light to heighten the participants' senses and awareness of their surroundings without directly making the light their main focus. Light becomes the essential element that bonds all of the other components together and orchestrates the entire experience of the place without ever making a sound.

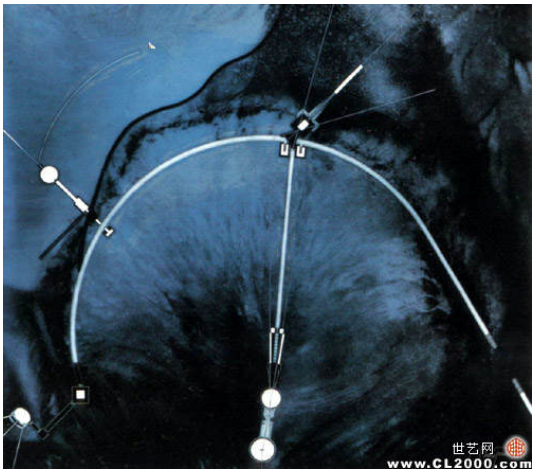
Roden Crater
Flagstaff, Arizona

Roden Crater is Turrell's current project and it is a culmination of over 20 years of work. The crater is part of an existing volcano in the Arizona desert and the idea for its manipulation came as Turrell felt a great desire to work with "larger amounts of space and a more curvilinear sense of the sky space and its limits."[6] This project marked the beginning of moving away from the rectilinear limits of the interior space and into the unpredictable vast outdoors.

Turrell saw the sky as providing enclosure and having a definable shape for whose recognition a size of this volcano could be perfectly utilized. "A crater-shaped space was desired so that it could be formed to effect changes in the perception of the size and shape of the sky."[6] Another important attribute of such space is that it provided a high-altitude site with infrequent cloud



cover, “so that the deeper blue of the sky could be utilized to support a close-in sense of celestial vaulting while in the bottom of crater.”[6] This would allow the desired experience to be heightened and ordered.



The spaces as well as the passageways that have been carved into the interior of the volcano are composed in such way that any events in the sky are reflected within the space. The design is being constructed in phases with an idea that the piece could exist without beginning or end.

Such approach is noticeable in all of Turrell’s installations where he is never concerned with projects being finished in traditional sense, but rather focuses on the experiential aspects of the work. He sees his work more of an art form than architecture and for that it is entirely focused on one’s perception and experience. His work is wide open for interpretation and consequently perceived differently by many. This is his ultimate goal for he merely opens the door to something that has always been there, our environment. He simply casts the light on it.

James Carpenter

James Carpenter graduated in 1972 from the Rhode Island School of Design where he was briefly trained as an architect and than as a sculptor. After school he spent his next ten years working as a consultant to the Corning Glass Works in Corning, New York, which seems to have significantly affected his career choice. There he was exposed to the introduction of new materials such as photo-responsive glass and different forms of vitreous ceramics, which were mostly geared towards architecture where there is always need for refined glass as a new means of manipulating light, shade, and surface effects. This inevitably has led him into exploration of environmental and phenomenological potential of glass and later light.

Unlike Turrell, Carpenter portrays tension of forces and an element of surprise within his designs. His interest rests in the active movement of light overlapped with movement of people and other physical elements, particularly from an urban setting. Carpenter's work is multilayered where the focus is shifted from the visual perception and placed on the interaction of a subject with his/her environment and its spatial constructs. "His work challenges a conventional description of its forms, which also implicates the technique through which architecture organizes the disciplinary controls of that which exceeds its limits."[2]

The work of James Carpenter "seeks to merge ecological and aesthetic goals by exploring the natural world to manifest its material, structural and environmental beauty in the built environment."[8] The guiding principle for his designs comes from light while in

transmission, reflection and refraction which, he believes, leads him to the more complete architectural projects.

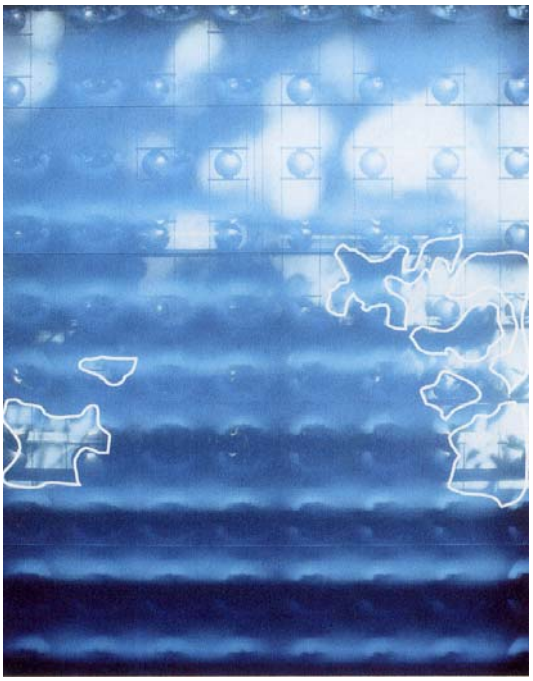
Carpenter's work seems to capture the process of transformation of the phenomena of transparency and reflectivity and the consequent result of the two, refraction. The complex dynamics of refraction establishes reciprocity between the subject and the object. "The idealization of an object by a viewer can embed its perception in a network of resonant memories. This quantity of memory eventually gives way to an imaginary relation, by substituting one apparent sense for another."[2] The role of the observer is always an active one which makes you, the visitor, an integral part of his architecture.

Periscope Window
Minneapolis, Minnesota 1997

The Periscope Window is a part of a private residence which view is obstructed by a fence and a neighboring building beyond. This window is set to create a view by revealing the outside world in the form of shadows cast onto it. By adjusting the operable parts - two layers of glass about a foot apart filled with 14 suspended mirrors and 80 glass lenses adjusted for these specific site conditions, the window is set to

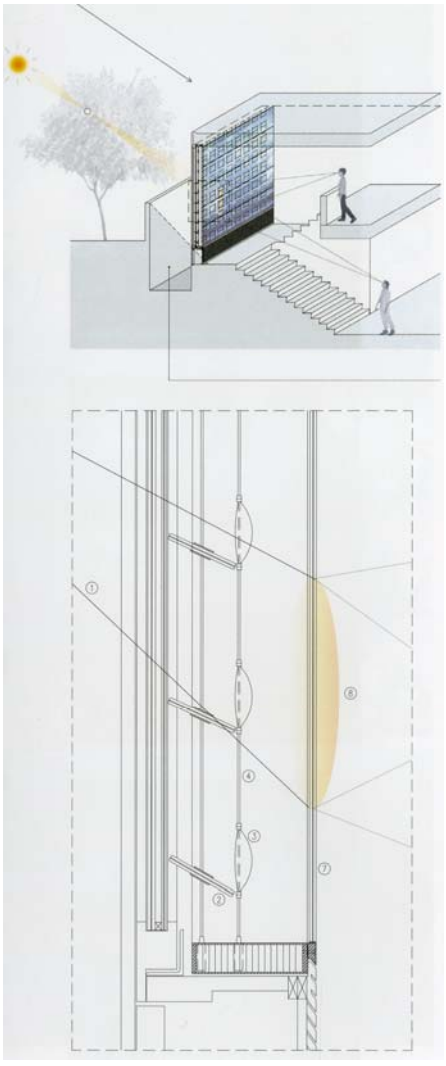
act like a periscope device. The angled mirrors make sure that the image projected onto the window's plane is not that of a fence and a house but the sky above. "Each optical lens focuses an image of the sky and trees onto the inside of the laminated acid-etched glass, creating a grid of slightly different views of the same scene."[2] Similar condition takes place at night with the images of the moon and night sky projected into the house.

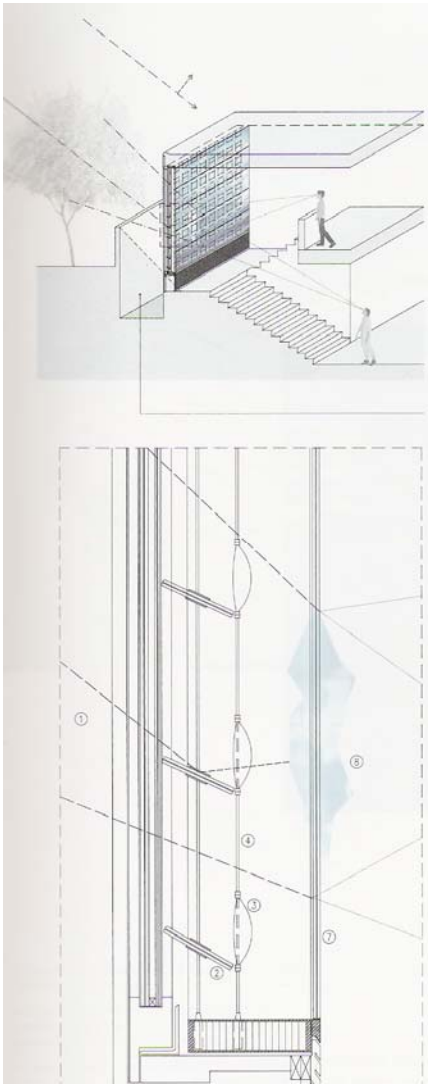
The view in the window is ever-changing and it depends on time of the day, time of the year and the viewer's position within the house. The most layered and interesting images occur on sunny summer mornings with a low yet intense sunlight angle. At that point one can experience the projections of Pinhole Projection, Direct Shadow and Lens Projection.



PINHOLE PROJECTION

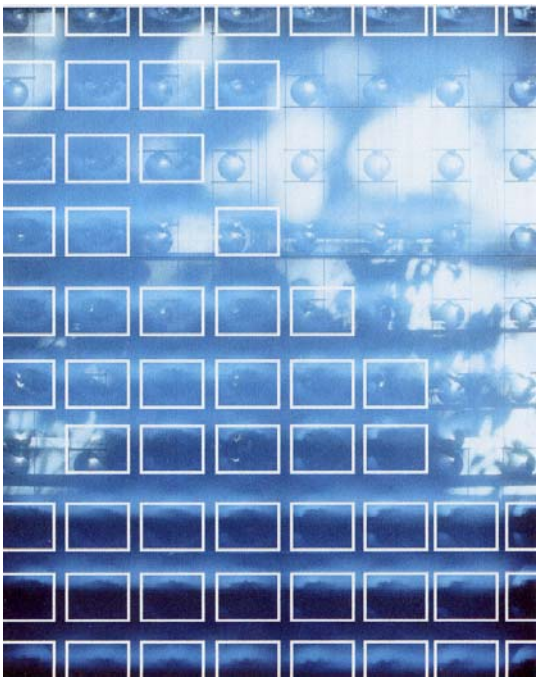
The distance between the pinhole and the screen determines the size of that projection. The pinhole projections of the sun's image move in the opposite direction of the sun and, because of the leaves' movements, flicker on and off. The interruption cast by the structure, mirrors, and lenses add further texture and movement.[2]

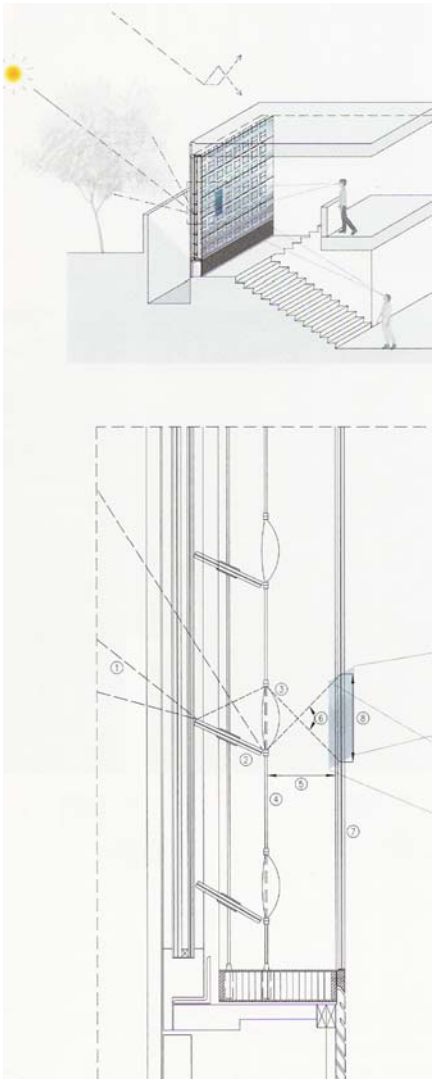




DIRECT SHADOW

The light traveling from the sun is filtered by the tree: some light is completely blocked and some gets through creating a shadow whose outline of branches and leaves is cast onto the acid-etched screen. The lens and mirror projection is less visible, casting some of the sky image onto the shadow and reducing the shadow's contrast. The movement of the leaves adds an active sense of the tree's presence.[2]

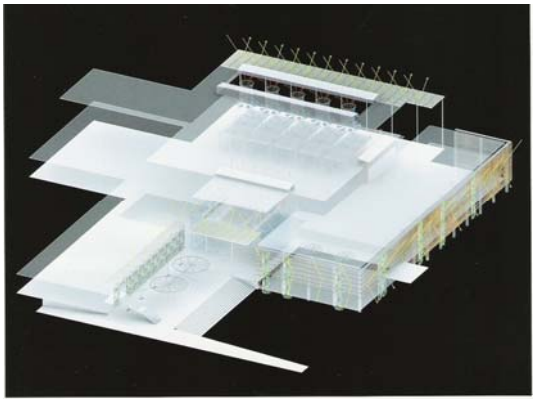




LENS PROJECTION

The lenses project the mirrors' reflected images of sky and tree onto the window. The filtered light coming through the tree shades parts of the acid-etched glass, enabling it to capture the imagery projected by the lenses. The reversed images and representations of movement of the mirrors are inverted and reversed by the lenses, creating a correctly oriented but reversed moving image on the projection screen.[2]

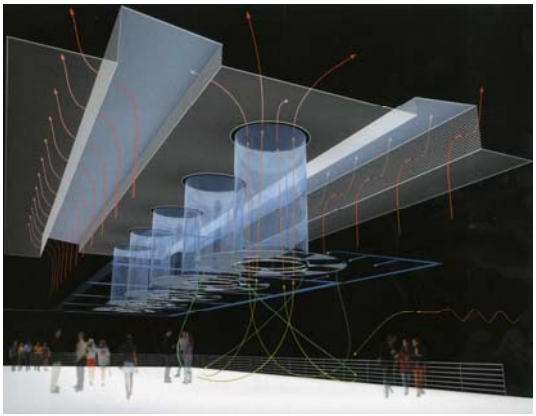
Tulane University Center
New Orleans, Louisiana 2006



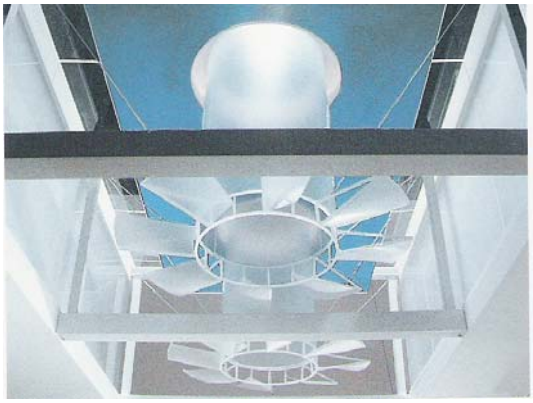
In 1999, James Carpenter was approached to help in redesigning of the Tulane University Student Center, which has over years become a sealed box, completely dependent air-conditioning. From the beginning Carpenter envisioned the center to be a more environmentally sensitive building, taking advantage of the weather and high pedestrian activity. The new design was set to create more shade and increase air movement in the built environment.

One of the most important aspects of the building is the louver shading concept wrapping around western and southern facades. It is composed of vertical wood and aluminum slats that are operable but with varying densities appropriated for the spaces beyond. In addition to protecting the building from direct sun rays, the louvers also provide for a dynamic building skin.

Experiencing the building from within also exposes one to variety of spaces and views.



Another innovative idea were the ventilation vents that were also used as the light shafts. Natural light, along with the cold air would make its way down the shafts into the open floor. Once the cool air absorbs the heat it

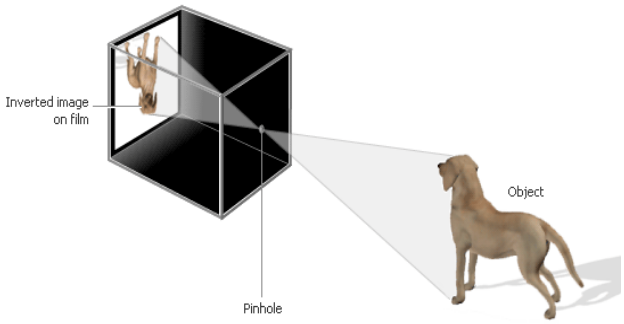


raises back up the cylinders end exits through the sun-heated tops. This was a perfect solution for bringing the light deep into the interior of the building that otherwise could never get natural light or ventilation. The cylinders are made out of semi-translucent glass which increases their reflectivity and turns them into prominent aesthetic elements during the night.

At this point, Carpenter's work is hard to classify. His office represents more of a well organized, advance thinking research laboratory than a typical architectural office. "This condition finds confirmation in Carpenter's meticulous habit of directly crediting virtually every significant member of the design team assembled for each project, so that the attribution more closely resembles the credit line at the end of a feature film than that which is normally provided by our anachronistic mythical misconceptions about individual creativity, even though leadership and inventive ingenuity are obviously always present throughout the process."[2]

Carpenter's work shows sculptural qualities, yet with its performative characteristics it gravitates more towards architecture. Audience always seems to be an important and active part of the spaces he creates. He emphasizes the relationship between the user and the environment much like Turrell does, but asks you to actively engage or even change

the perceived relationship (Turrell is more about succumbing to the created atmosphere). Carpenter uses light as the catalyst to activate the already existing force in the environment around us and he uses architecture to trace its effects. He encapsulates the notion of light as architecture.



Pinhole camera system[7]

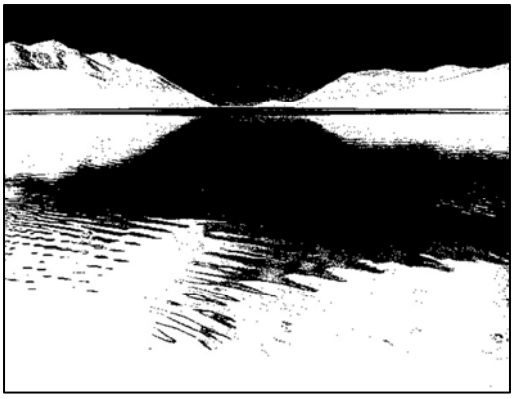
The starting point for the design approach was photography. This came from the initial studies of sun movement where the sun's daily path was tracked using a pinhole camera. The inside of the camera was covered with a blueprint paper which had to be developed in a similar fashion to that of the photo paper used in photography. The act of exposure had revealed the importance of the light within this field and with that my interest into photography was born.

It did not take long before I had decided to focus my studies solely on the black and white photography. It appeared to me that black and white photographs did more to evoke an emotion and create a mood than its colored counterpart. Lack of color allowed for greater emphasis on the forms within the photograph but it also introduced an element of ambiguity which permitted the viewer to

Ansel Adams photograph[7]

engage with its content on a more personal basis. It was this idea of reading into something rather than just viewing it that seemed worth further exploration.

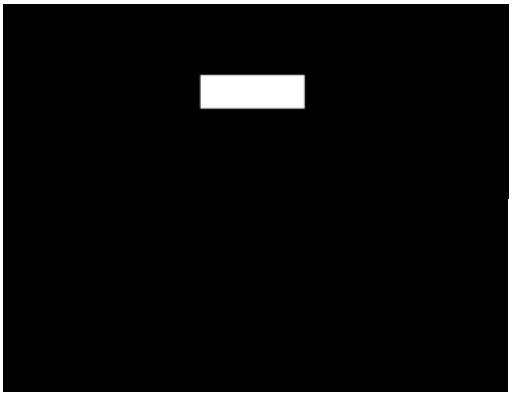
The first necessary step was to dig deeper into the core of black and white photography and see what could be taken from it and applied in architecture. This exploration was approached in three interrelated and continuous studies; 2D analysis, 2D exploded analysis and 3D analysis.



2D ANALYSIS

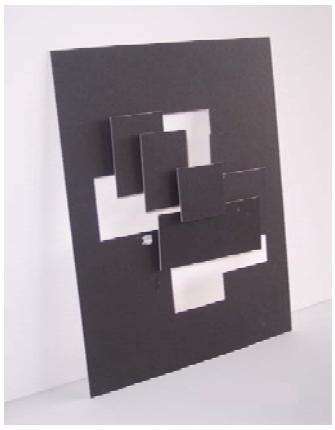
This approach could be subdivided into two different types. The first one focused on the figure/ground relations within the photographs, while the second one took it a step further and attempted to distill the photographs to their simplest possible format.

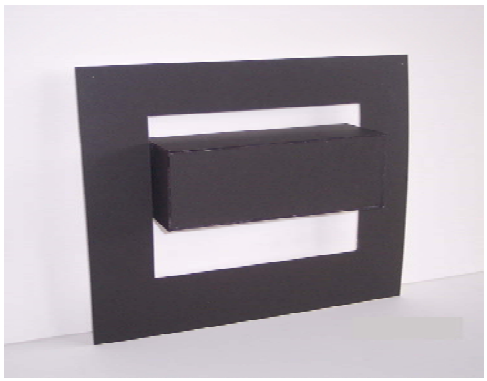
The figure/ground study was useful in determining what was in the foreground and what belonged to the background. The importance of this was in that that it revealed the focus of the photograph as well as the means of enhancing it. Every photograph seemed to contain a particular member around which everything else was revolving. Locating this center piece meant pinpointing that piercing element within the photograph that originally grabbed your attention. It meant further simplification of the image.

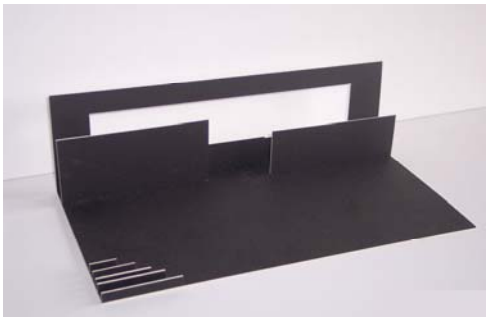


The second part of this study, the distillation, was set to isolate the center piece and study it on its own. If the power of the image rested in this one component, than perhaps that same component was able to yield some clues in understanding the significance of the light composition within the representation. The center piece was further simplified by being assigned a more standard shape as a step closer to the three-dimensional entity.

2D EXPLODED ANALYSIS



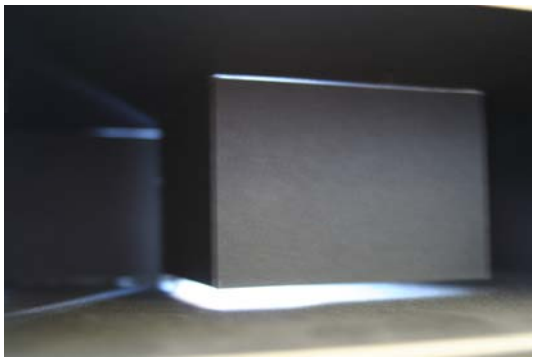


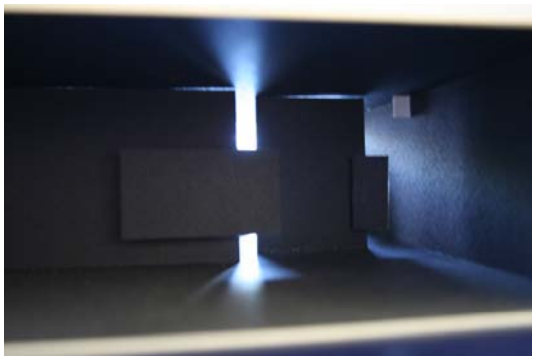


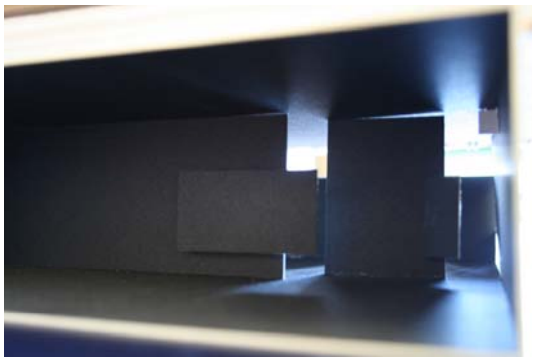
This method encompassed extruding the images off the paper and creating a layering effect, which for the first time provided the opportunity for the manipulation of light passing through it. In this case the forms exposed to the light took on a three-dimensional quality and they added a new dimension of shadows. The perception of the image now depended on the angle it was viewed under as well as its positioning in relation to the light source.

Even though the product of this approach was a result of simplification of the photographs, it seemed that somewhere along the way it developed a new level of complexity. This discovery appeared promising and worth further investigation.

3D ANALYSIS







The three-dimensional study came as the final stage of the photographs' analysis and it was set to bring the whole process closer to the world of architecture. The process began with construction of enclosed environments which were based on the previously established results. The idea was to provide these spaces with a sense of scale and possibility of being inhabited. The produced spaces also contained an aperture in the background with a light source highlighting the spatial characteristics of the rooms and creating a realistic ambiance.

The results exhibited a plethora of light qualities and its ability to define enclosed spaces. It seemed that results depended on the size of the aperture, its location within the respective plane and the type of obstacles the light encountered on its way through the opening. The given variables are now set to provide a strong base and

guidance in combining the program with the site conditions. It is the overlap of these factors that should clearly mark the path for the final design decisions.

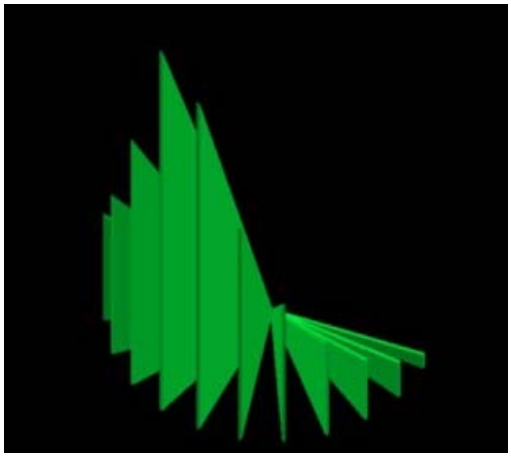
APPROACHING THE SITE

Site – city block[11]

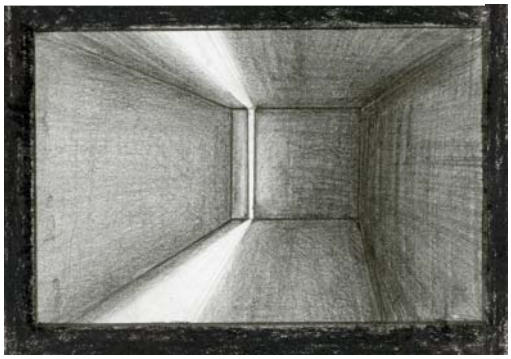
The museum is set to be located in downtown Cincinnati. The site is a city block held together by 6th and 7th streets to the south and north and by Walnut and Vine streets to the east and west. The site itself is composed of two alleyways dissecting the city block into four quadrants and it is this intersection that will serve as the starting point for this thesis design.

Typical alleyway

The narrow corridors provide a dark origin for the museum to spring from and like a tree in a forest spread itself in search of natural light. This approach follows the initial idea of starting with complete darkness and sparingly adding light where deemed necessary. The urban environment will also impose certain limitations in terms of orientation and space which will further restrict or even guide the development of the design.



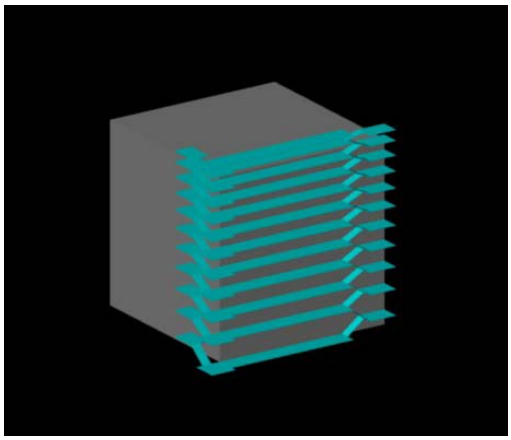
Sun angles on June 21st, 6am-8pm



Example of dark/specialty spaces

Through the analysis of the sun angles at the site, it become obvious that due to the existing buildings, the east and the south edges of the site were the only areas receiving direct sunlight. This had become one of the main forces behind the design approach causing the majority of the program to migrate to the south-east corner of the block. Within this setup, east and south facing portions of the building will be exposed to direct sunlight only at certain times of the day providing an opportunity to celebrate the sunlight in a very distinguished way. The spaces located there will be based on the enclosures constructed during the 3D analysis of the black and white photographs previously illustrated. These areas will also serve as the entry points to the site.

The museum's ceiling heights will vary from floor to floor and they will follow the sequence of f-stops as found in typical



Ceiling heights in the corridor part of museum

South entrance to the site

East entrance to the site

photography cameras. F-stop is a ratio between the diameter of the aperture in the lens and the focal length of the lens.

The sequence is as follows: 2.0 2.8 4 5.6 8 11 and 22. The cameras operate in metric system, so in this case the numbers are viewed as meters and then converted into feet (2.0 m would approximately give you 6.5ft ceiling height). These numbers will also help determine the size and the number of the openings in the façade which will provide for a wide variety of spaces and their lighting conditions.

In contrast to the corridor portions of the museum, which will mostly remain dark, certain components of the program will occupy the tops of the existing buildings which will provide an opportunity for more light immersed spaces. The two respective pieces will provide for two distinctive forms of circulation and exhibition areas. These

parts will be linked through the backbone of the building also serving as the vertical circulation. This tower is set to be a glass box completely flooded by light during the day and conservatively lighting the site during the night. The idea is to turn the site into a night time exhibition area that is never closed off to public.

CONCLUSION

From the very beginning this thesis was set to explore the way natural light forms and defines architectural spaces. Such studies have been done many times before but it seems to me that they were mostly concerned about light blended with other components (material, temperature, sustainability, etc.) and for this reason it was rarely studied and viewed as a separate entity. What happens when the light is viewed as an autonomous material?

To isolate the light from the environment seems impossible for we visually sense the light only through its interaction with other elements. Black and white photography allowed this study to come close by simplifying the spaces and making the sunlight the foreground of the composition. In this situation the light is still playing off of the physical mechanism of the environment but now the traditional roles are reversed. The light here takes on a leading role and everything else becomes a background. It is very much about perception, but in a visual realm it is all that matters.

Previously I have referred to this process as writing with light. The term came from the word photography whose origin can be traced to Greek words *phos* meaning light and *graphe* meaning drawing or writing. I found this applicable to the manner in which I was approaching architecture in this case. The idea is embodied in the museum of black and white photography with two distinct objectives for the sunlight. The first one was to allow for the comfortable viewing of the exhibited photographs and the second one was to create experiential spaces with dramatic lighting conditions. The sunlight in the

second case takes on a role of showing itself and not much of its surroundings which is rather eccentric. Its objective here is to take precedent over everything else and offer the viewers a distinct but equally important exhibit. This exhibit carries certain amount of ambiguity which allows the space to be read into and interpreted on individual bases.

Such results can be directly connected to the way in which James Turrell views light with exception that he is more concerned about inner personal discoveries rather than spatial ones. In his works, Turrell always presents a clear objective to its visitors. Whether it is the spiritual connection to the sky above, vest powers of the desert or simply meditation, the visitor's experience is narrowly predefined. James Carpenter approaches his projects the same way, only he introduces more variables which consequently allow for more possible outcomes (all of which are accounted for). This thesis seemed to take in account these principles and work backwards taking away components such as color and material until the sunlight is virtually left on its own. The process is very similar to the analysis of the black and white photographs (previously explained) where by simplification possible interpretations were broadened. The dilemma now is whether we should stop here or possibly start adding the taken elements back in, one by one. The benefit would be that now with greater understanding of sunlight itself the new marriages could produce more desired results. The down side is that it seems that it could go on indefinitely. At what point can we say that the exploration is finished?

The hope here was to enrich viewers' perception of the space by heightening their senses and stimulating their intellects. The process of creating such experiences was highly

educational and rewording and one can only hope that some of that will be passed on to the visitors of the final piece. I am not sure if its success can be evaluated at this point or if it can be judged at all. Can such experience truly encounter failure? Its open-endedness makes this question hard to answer but at the same time easy to accept as part of the ongoing thesis development.

This study has successfully illustrated that sunlight can be used in an artistic fashion to enhance and even create architecture. Light was able to alter the perception of the spaces it inhabited and with this it offered viewers' an experience that is seldom found in today's architecture. The darkness was virtually used as a material that received and shaped the sunlight which gave it a recognition of an equal partner. Between the intensity of these two the shades of gray were nearly eliminated and the final product, once again, was reduced to black and white.

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