experiential light
experiencing the perceived space

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the road not taken

two roads diverged in a yellow wood,
and sorry i could not travel both
and be one traveler, long i stood
and looked down one as far as i could
to where it bent in the undergrowth;

then took the other, as just as fair,
and having perhaps the better claim,
because it was grassy and wanted wear;
though as for that the passing there
had worn them really about the same,

and both that morning equally lay
in leaves no step had trodden black.
oh, i kept the first for another day!
yet knowing how way leads on to way,
i doubted if i should ever come back.

i shall be telling this with a sigh
somewhere ages and ages hence:
two roads diverged in a wood, and i--
i took the one less traveled by,
and that has made all the difference.

robert frost

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1. thesis writing

1.1 abstract

light is more than just a functional tool we experience everyday. rather light becomes poetic in the nature that it is able to create a language of its own. it guides experience, defines space, has the ability to alter perceptions. in combination with the manifest qualities of light, its aesthetic value includes: color, mood, texture, awareness, and meaning. the patterns of light affect the sensory encounter with architecture as well as the conceptual and symbolic.

this investigation of light will search to reveal the qualities of natural light. natural light is essential to how we view architecture and the world it creates. the rhythms and patterns of light are both consistent and constantly changing. this dialectic relationship coupled with man-made interventions begins to describe how the experience of a particular place is simultaneously controllable and uncontrollable.

this museum will attempt to enhance the characteristics of natural light while generating a poetic experience. light is the subject to be studied and the observer will be able to engage and embrace this subject. the investigation of how light affects our experience of a space will use architecture to create the space and the human can manipulate elemental architecture. through the use of supplemental and temporary exhibits, the user will see how light moves through and around various objects. a museum of experimental light is a building with multiple galleries in which the primary subject, light, communicates mood and meaning.

1.2 thoughts
the language of light

we literally cannot live without it.[1] light is more than just a functional tool we use everyday. rather light becomes poetic. with its wide variety of uses, light begins to create a language of its own.

light changes and renews itself constantly.[2] there is a consistency of contrast between light and dark which begins to formulate meanings of the spaces we encounter. the sun rises everyday but the amount of light that filters into our spaces depends on numerous factors. the ability to control the light received in architectural spaces deals with the moderation between light and dark and the impact it has on our feelings and senses.

through pattern, rhythm, color, texture, and many more sensual qualities--light creates an intriguing aesthetic appeal. integrating these aspects with architecture, light becomes the subject and not just the source. all too often light is viewed only as a source of illumination, but with light as the subject it opens investigation. by studying light and its interaction with materials and forms, a new relationship between space and our senses is evoked. to be able to engage, embrace, and experiment with light generates new questions about how it is used and viewed. light is something to be experienced and not explained.

as light guides experience and defines space, it also has the ability to alter perceptions. we rely on our visual perceptions to inform us of the world around us. and our perceptions must always be changing--for too much uniformity is disorienting. without change we become blind to what we actually "see". our surroundings become monotonous and eventually the individual qualities begin to fade into the background. we only recognize that things appear before us, and do not see the meaning behind it.

it is important that we understand the spaces we live in and how they direct our feelings and senses. creative and interactive architecture, coupled with light, provokes experiential and experimental spaces. natural light should play a vital part in illumination...the visitor must be able to relate to nature momentarily...to actually see at least a small slice of the foliage, sky, sun, water. and the effects of changes in weather, position of the sun, seasons, must penetrate the building and participate in illuminating both art and observer... we are after a psychological effect through which the museum visitor feels that both he and the art he came to see are still part of the real, rotating, changeable world.[3]

1.3 thesis statement

light is an integral part of how we perceive the spaces we encounter, and consequently, how we gain an awareness of how our body is perceived in space. we live in a world of light, and rely greatly on our sense of vision to guide the way we see the world. it is often the first way in which we engage a space; and the way we move through and perceive spaces depends on the type and amount of light present. we experience spaces not only during the day, but also at night. night does not imply complete darkness, for the moon and stars can provide adequate ambient light. recalling a recent visit to michigan central station, at dusk, and thinking about the visions portrayed while exploring the space. while experiencing the main lobby, while observing the light filtering into the space, it is not difficult to discern the difference between the twilight and the overhead street lights. this muted illumination takes a soft, looming space with an amiable presence and transforms it to a stark and dingy clutter of steel and concrete.

though ones eyes were able to adjust to this low level of illumination, it was easy to realize this is not how the train station was meant to be experienced. designers do not build for illumination at night—rather, their main concern is how the space will be lit during the day. the mind imagines how bright the space would appear on a clear day. with a strong, but not direct north light, the train station is filled with light, and shadows permeate the nooks and crannies.

how we experience the built world depends greatly on the implementation of light in architecture. light refers not only to simple illumination, but also the inherent battle of light versus dark. if not for this contrast, variations between spaces and objects would be unperceivable. the changes in light can alter our mood in the places we encounter. what makes the light in one space more desirable than the light in the next? how do we effectively illuminate spaces to evoke specific moods or feelings? we must be able to identify and orient ourselves in a place, not just a space, and one important way we do this is with light.

we can design using natural or artificial light. the use of natural light is often underutilized in architecture. at times natural light is replaced by incandescent lights, and the quality is just not

comparable. artificial light is predictable, creating the same mood in a space day after day. natural light is more unpredictable, making it a more challenging instrument in design. whether it is the sun or the moon, it is constantly changing—no one day is exactly the same as the next. in many circumstances natural light for granted—we know it exists, but we are not always aware of it.

my position is that natural light should be celebrated in architectural design. it encourages an opportunity for a richer experience and a deeper understanding of how we dwell. by gathering natural light, along with materials and the body in space, we gain a better understanding of their fundamental relationships to each other. the utilization of natural light makes us conscious of changes in space and how we view our body. this connection between space and body allows for the evolution of place and stresses the importance of movement.

the works of pallasmaa, bachelard, and bloomer and moore, illuminate dwelling in spaces that utilize natural light, while also showing how it is neglected in many architectural designs. in analyzing the phenomenology of tadao ando's chapel on mount rokko, it will demonstrate how light enhances our bodily awareness, thus creating a place with which we can more fully identify and in which we orient ourselves. finally, looking to further understand heidegger's notion of dwelling, it will help to explain the importance of exploring natural light in architecture and how we experience light with architecture, not architecture with light.

the problem of how we light our spaces can be applied to every place in which we dwell. light is something that cannot be ignored. it is inherently part of our lived world and effects the way we are as beings-in-the-world. this is important to all who are aware of the different moods conveyed by lightness and darkness.

focusing on the interaction of light with architecture, one must discern how it relates to the creation of space. with light, it is not simply about providing illumination, but how it is filtered in and contrasted, revealing significant areas and the change from light and dark. ideally light not only fulfills its function of providing illumination for visual activities, but does so in a way that enriches

our experience.[4] in order to have an experience, the user must be aware of the variations in illumination, and not just walk through a space without noticing the play of light and shadow. the question becomes, how do we purposefully manipulate light to engage the user, primarily through our sense of sight? pallasmaa associates the characteristics of nearness, intimacy, and affection to the sense of touch. this notion can be challenged, because cannot vision reveal these qualities as well? these feelings can be achieved through the play of light and shadows, brightness and darkness, transmitting particular perceptions of the space. these tactile elements have their roots in our vision, as we typically we see a space first. immediately, through vision, a mood and feeling of this space is manifested in our mind.

spaces which employ light creatively and effectively, provoking our moods and feelings, often employ some important characteristics: pattern, rhythm, enhancing the texture of materials, and the source of light in space. our perceptions of a space can be disoriented when trying to understand the complex patterns and rhythms of light entering the space. imagine a room full of windows, and an ornately designed screen appearing in front of the window. now, instead of a simple shadow filtering in, there are a multitude of shadows cast on the floor with a distinctive pattern, but you are lost in its complexity, trying to see the larger pattern in the shadow. this suggests a feeling of confusion and uncertainty. the contrast of light and dark can be overwhelming in a sea of constantly changing light and shadow. the interaction of light and shadow can be dramatic, but too much contrast confuses our vision.

texture is another aspect of our perceptions of a space. a material's texture is experienced, in part, when light is cast on it, creating variations and enhancing its surfaces. texture can be illuminated by light to create a unique sensory experience of the material. the importance of vision becomes apparent here because we see the characteristics of a material before we touch it. light allows us to begin to imagine how the material feels. a smooth surface creates a uniform shadow, while a coarse material casts a shadow that may highlight the crevasses of the surface.

the source of light is essential to the mood and feeling of a room. light allows us to encounter the inside and outside world simultaneously. it focuses on a specific relationship between the person and the space. it can also orient us with space and time. as the day passes light comes from different directions and angles. being aware of the path of the sun can enhance the experience of a space. the perception of a space changes depending on whether light enters from the sky as opposed to the floor, challenging the way we traditionally view light. in architecture we expect light to come from above, or at eye level. when the window is the element connecting us to the outside world, we are instantaneously engaged. if the window is placed at floor level, it requires additional effort to make the connection, and consequently changes our perceptions of the space. pallasmaa argues that we cannot simply cut a hole in the wall and call it a window. care must be taken when deciding what wall the window should be on, how large the window will be, what type of glass or screen should be used, etc. light does not work alone, but rather in relationship to the aforementioned elements: pattern, rhythm, texture, and source.

tadao ando's chapel on mount rokko is an exemplary illustration of the effect natural light has on our perceptions of space, while also utilizing pattern, rhythm, texture, and source. in various ways natural light is filtered from the exterior to the interior to enhance the spiritual mood of the chapel. the direction of the light, where it comes from, and the type of glass used to filter in the light changes how we perceive space, and guides how we experience the space. this experience, which heidegger calls dwelling, emerges through the movement of natural light, along with bodily movement. the gathering of light in this space generates a unique experience.

ando says that to create space in architecture is nothing more than to concentrate and refine light.[5] upon entering the chapel, one is surrounded by cold, milky, glass windows forming a long dismal corridor. one must use one's imagination to envision what is behind this milky glass—except for the isolated clear glass panel straight ahead providing a visible connection between the inside and outside. the milky glass diffuses the daylight and blocks the ability

to connect with the outside. this persuades one to move along quickly. the corridor is not a place to linger. the murky lighting sets up a dramatic contrast with the next space. upon reaching the end of the corridor, one is forced to make a full turn to their right, where one enters the space for prayer. one is flooded by an abundance of light filtering in from the left, through the trees outside the large clear glass window. looking more closely, one becomes intrigued by the wall behind the altar, where slits of light pierce its surfaces. these small but alluring shards of light communicate the greatest meaning across the patterned concrete wall. they are not overpowering, and generate a feeling of calmness and serenity. one slows down, takes time to observe the space, and lets it be as it is. now the space begins to gain significance as one is able to gather his surroundings, both physically and psychologically. one is aware of this place, and allows it to awaken memories of movement and light.

using these characteristics of light—pattern, rhythm, texture, and source—is not merely about shaping the perception of space, but about the cultivation of mood. every space we enter portrays a particular mood and atmosphere. this is influenced by the space itself, yet most often depends on what a person brings into the space. a person never travels alone; they always bring their memories and imagination. before we enter a space physically, we have already entered it with our mind, contributing to the mood of the space, envisioning where walls are located, how it is decorated, and how our other senses may be engaged. vision is not the only sense contributing to the mood of a space; rather, mood is fostered through a culmination of senses. most often our senses begin with our eyes transmitting what we see, stressing the importance of light. with light, we are able to discern what a space means to us. it introduces the memory of light, where entering a new space calls upon the remembrance of a space with similar illumination, or even spaces with vast differences.

imagination and daydreaming are stimulated by light and shadow.[6] in the chapel, the space near the altar provides the most contrast. it appears to be completely in shade, except for the areas highlighted by the small slits in the concrete. as the sun moves throughout the day, so do the areas of brightness, and the cross is

eventually illuminated. being aware of this change can stimulate the imagination. as the cross is lit, it reminds one of other spiritual places they have been in and how different crosses were lit. one becomes lost in a daydream of the various places they have visited before. remembering the spaces in which the lighting never changed, where in all the visits felt the same every time they were entered—it was easy to recall how the space would be lit because it used primarily artificial lights. the mood and atmosphere was constant. but in the chapel on mount rokko, the atmosphere changes as the day passes, the areas of light and shadow move throughout the room and create a more experiential connection to this place. the artificial lighting in other chapels produces a stagnant environment, and the mind responds accordingly. places with clear changes of light and shadow stimulate memory and recall previous experiences where these dynamics have encouraged certain moods and feelings.

bachelard touches on the experience of light when talking about the attic and the cellar. the way we act and move in these two spaces is quite different. dwelling is more complete when we can be aware of opposites, like light and dark, and our daydreams reflect the places which we inhabit. the dramatic change of illumination has a more profound effect on our memory than a mundane and consistent level of lighting. we remember a day when the sun was so bright it hurt our eyes, or when the day so extremely dark it appeared as dusk. in the attic, we are closer to natural light, and our vision is clearer. the space is illuminated for most of the day and here even the areas that do not receive direct light are filled, and the shadows are not as dark. our potential to see and be aware in the attic makes us conscious of our body and imagination. as the light changes throughout the day and so does our understanding of the attic—here our dreams appear rational and informed. we are able to clearly construct and organize our thoughts and memories. the mind may wander as we daydream, but it does so logically because we can anticipate the interaction of body and imagination.

as for the cellar, we are encompassed by the dark and our unconscious runs free. there are no windows and no exposure to illumination. instead, we see only in the variations of the dark shadows

cast throughout the room. here dreams have no limit; we must envision the space around us through imagination, and consequently, the space we perceive constantly changes. our thoughts here become more random as we rethink how the space appears, over and over again. thus our ability to daydream is not as coherent as in the attic because we are preoccupied with trying to wrap our mind around a space we cannot see.

the ability to daydream is manifested by the significance of a place, and how we dwell. a place can use light to enable rich sensorial and psychological experiences—generating perceptions of the space and our body in space. the way light is implemented in architecture can strengthen our personal connotations of a space. as one situates themselves in ando's chapel their senses as well as their psyche are engaged. the smooth concrete walls provide surfaces where light can reflect and illuminate the room even on cloudy days, and you can feel that even the dimmest light will be enough to create a calming and serene atmosphere. the coupling of light and materials stimulates body awareness and perceptions of the chapel. how one feels in the space changes with the amount of light that is filtered in and spread throughout. thus, the chapel is like bachelard's attic. there are moments in the chapel where there is a strong contrast of light and dark, but overall the chapel is illuminated. it encourages a coherent place where we can connect and associate our ability to daydream to our surroundings. one is partially enclosed in this space by the large, heavy, concrete walls—but this is balanced by the opposite wall of glass which connects us to the exterior. one is enclosed in this place physically, but psychologically has the ability to let their mind wander and pass between the interior and exterior.

bloomer and moore elaborate on the notion of dwelling by focusing on how our body interacts with architecture. if we can understand more about how we acquire and modify this psychic image of our own bodies, we may possibly obtain a better grasp of the way we perceive objects and settings around us.[7] the way we perceive well lit spaces versus those which are not is inherently different. likewise, our awareness of our bodies in light and dark places is different. our body image relies on how we feel in a space—

creating unique body boundaries and affecting our experiences.

light also constructs spaces without the necessity of a built structure. we distinguish the difference between well-lit spaces, and those which are dark. where light passes, we often think of a void in the structure, allowing light to enter a space, virtually unobstructed. recalling on ando's chapel, the slits of light that pierce the altar area appear to be coming from the solid concrete wall. but we know this is not possible, and even if we cannot see the slit in the structure, we know it is there because the light must be coming from somewhere. in dark spaces, we notice the absence of light, implying the presence of a structure which blocks the light. the way shadows are cast on the floor implies a separation of space, and the greater the contrast, the greater the division of one space from another. standing in a place which is engulfed by shadow and looking towards a lighted area makes one feel concealed, protected by the darkness. in contrast, when one stands in the light, one feels insecure because they are exposed, and has trouble seeing the figures peering at them from the dark.

light does not only imply spaces, but also anticipates movement. well lit spaces encourage more wandering, and a feeling of confidence. moving from one space to another, both filled with light, allows one to know where they are going and be aware of their surroundings. one feels more inclined to move along streaming beams of light, because it provides a clear direction. where shadows interrupt this path, they can generate another type of movement. their inconsistency provides an irregular series of spaces, and a more random progression from one space to the next.

it is this dialogue between movement and light which makes us aware of our surroundings, and provides a more holistic experience of a place. this is exemplified in the chapel because of ando's great attention to how light filters into the space. he creates a composition of light with the materials and forms employed, and the product is a comprehensive piece of architecture which fosters dwelling. in great architectural spaces, there is a constant, deep breathing of shadow and light; shadow inhales and illumination exhales.[8] these qualities emphasize the importance of understanding the movement and

changes of light along with their relationship to concrete objects. through these changes we begin to perceive and understand spaces, thus transforming them to places. the chapel on mount rokko utilizes materials and forms that create unique moods and feelings of the place as the light changes throughout the day.

to have "place" means that architecture becomes the stage for bodily orientation and identification. the interplay of architecture with body and experiences provides a situation where meaning can be attributed to a place. when natural light is introduced, it provides even richer opportunities to foster dwelling. it provides us with the ability to see, and this ability is not static. instead, because light is constantly changing, so do our perceptions and feelings toward a space that effectively utilizes natural light. as beings, we construct and gather spaces for movement in order to constitute meaning with the body. our body is not defined by its physical presence, but rather the boundary with which we orient and locate ourselves. this orientation and identification constantly changes, reflecting our moods and perceptions of the space we move in. space becomes place when we engage our experiences. it is not just about walking into a space and simply being there; it must suggest and imply meaning. meaning is generated uniquely by each individual, dependent on how we react to our surroundings. light can create dynamic meanings associated with a particular place at a particular time. and the next time you visit this place, the atmosphere will most likely be different because of the ever changing and unpredictable characteristics of natural light.

so why choose natural light over artificial light? is not the purpose of artificial light to recreate natural light? artificial light was developed to reproduce what the sun provided during the day, to brighten the night, and make the day last longer. it is controllable, allowing the mood in a space to be directed, no matter what time of day, or when and where you are. artificial light weakens our perceptions of time. the sky may be dark, with little ambient light from the moon and stars, but in the hustle and bustle of cities, it never appears to be dark outside—lights always shine from posts, billboards, and store fronts. night never seems to occur, because our world is flooded with copious amounts of artificial light.

artificial light is only a single moment in light.… i cannot define a space really as a space unless i have natural light. and that because the moods which are created by the time of day and seasons of the year are constantly helping you in evoking that which a space can be if it has natural light and can't be if it doesn't. … [a]nd the very choice that you make of the element of structure should be also the choice of character of light that you may want…and that i think is truly an architectural demand.[9] artificial light is static, where natural light changes and renews itself continuously. through changes in light we remove uniformity, and in doing so, provide an opportunity for a space to generate a more unique experience—allowing place to emerge.

i have outlined why natural light should be celebrated in architectural design and how, through the dialogue of light and dark, it affects our perceptions. but this analysis will remain superficial if its insights cannot be put into action and experienced. the challenge is to have light with architecture, where it goes beyond the simple provision of illumination to enrich our experience.

we dwell in both light and dark spaces. as beings in the world, we cannot simply ignore one or the other. instead we must learn to understand their differences and uniqueness, and our architecture must respond accordingly. responding does not mean utilizing the same tactics regardless of place; rather, we need to study each case individually. the light we encounter is different everywhere we go, as is our architecture. some places provide strong light throughout the day and even over the course of the year, and others do not—we must be attentive to this, so architecture can be built harmoniously with the light.

so why is this so important? why does it matter where light comes from and how it affects our perceptions as long as it illuminates the room adequately? my claim is that the quality of light is vastly more important than the quantity. overpowering illumination can be disorienting and impair our ability to experience a place, and consequently affect how we daydream, and imagine, and dwell. it stunts our perceptions, and we are lost in this space. too little light strains our vision to make out figures and shapes we cannot see. here

our imagination is forced to compose our own perceptions of the space, and we see through our mind and not our eyes. situations like this tell us that little attention has been paid to how light works in a particular space, and contributes to architecture with light.

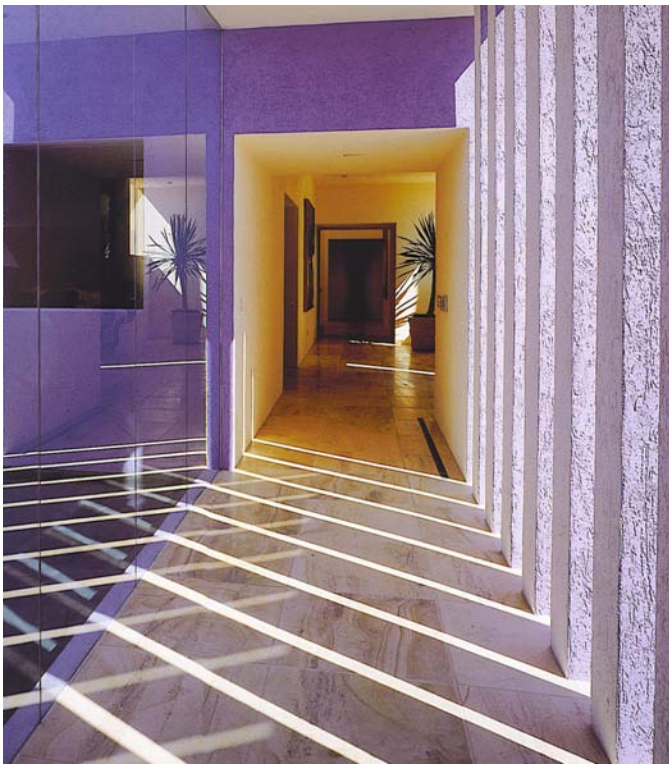
to achieve light with architecture means we must care about the structures we are creating—where architecture becomes a tool to enhance our understanding of light. it is not about how much money a building costs, or having the best design. rather, it is important to show care for how light enters a space, and effects how we experience and dwell in this place. it should engage the person, compel them to stay, or to come back, either physically or psychologically—to be drawn to the place time and time again. to be able to dwell is important, and heidegger defines dwelling as a gathering of our surroundings, and constructing places in which we interact with the world. a building which fosters dwelling must appeal to our senses, create a place where we can orient and identify our bodies in space, while allowing for imagination and daydreaming to emerge. most importantly all of these characteristics must appeal to our consciousness, through which we become aware of our surroundings, and how light is more than just a source of illumination. light is what our world depends on, and should be celebrated in architecture.

2. conceptual studies

2.1 pattern.rhythm

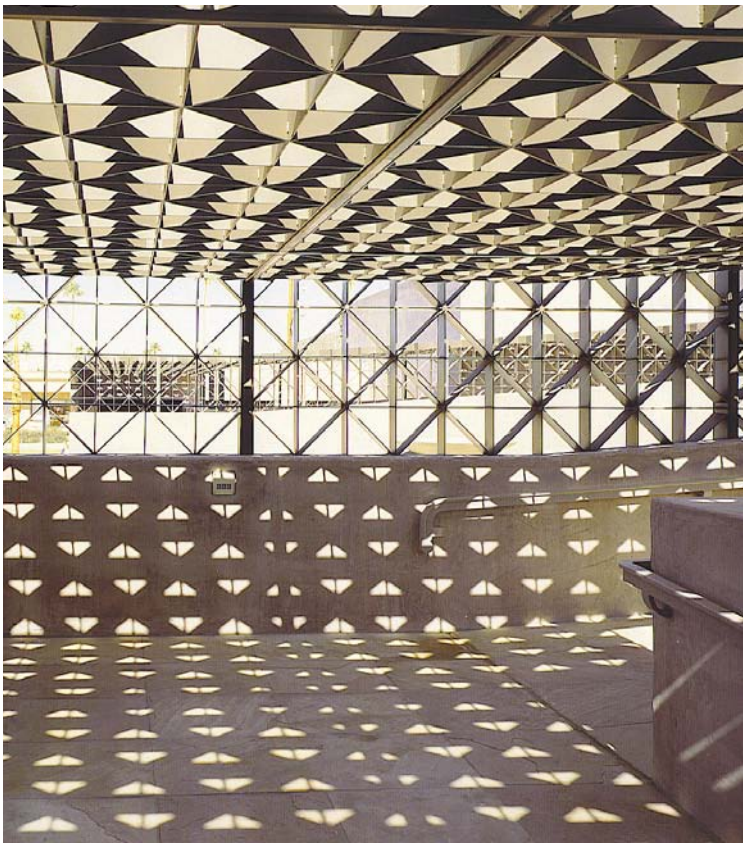
pattern and rhythm do not necessarily mean uniformity. what is more important is how they effect our perceptions by disorientation light that appears in the space. the way light filters into a room or over a particular surface creates a unique effect. here light is the source, but becomes the subject when we notice the separation between light and shade and open these patterns up for interaction.

here the pattern of light that filters through the rock wall changes and moves as the sun passes throughout the day. unlike artificial lighting the patterns here will never be exactly the same as a previous one

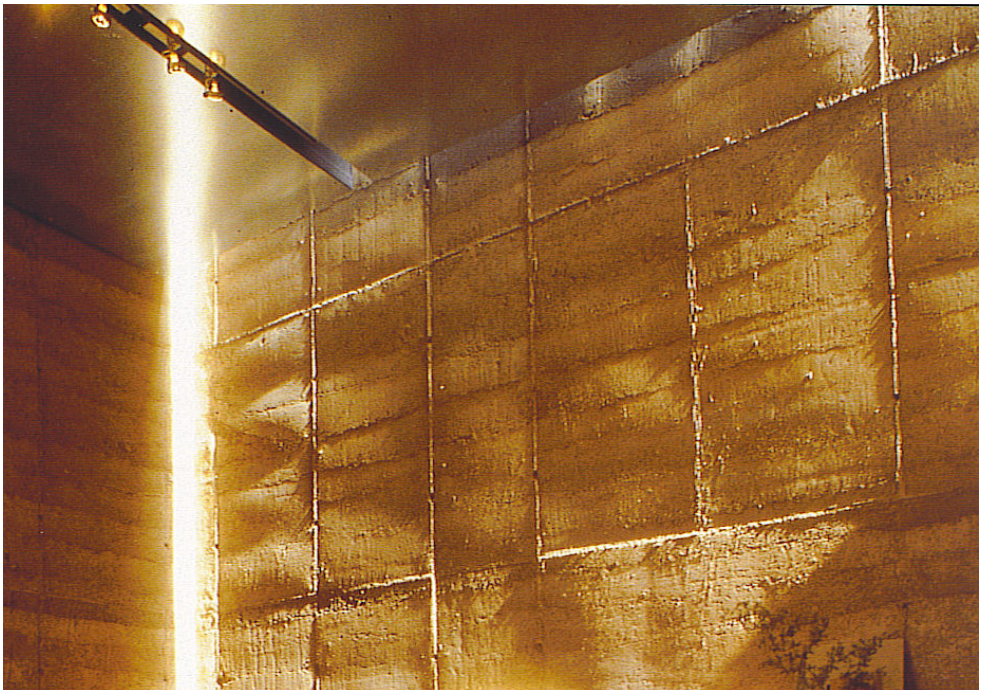


the rhythm of the lighting and the rhythm of the forms are one.[10]

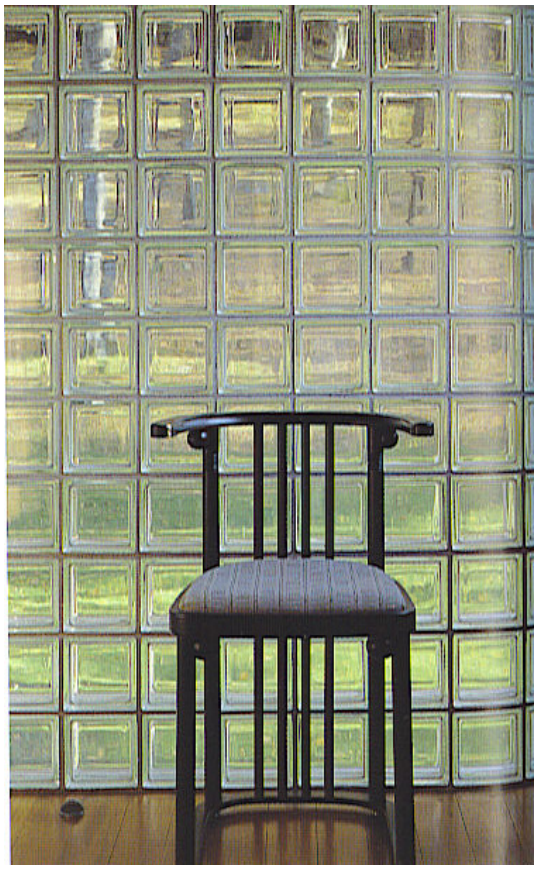
some patterns can be too repetitious and disorienting, beginning to lose what is up and what is down. care must be taken in order to create spaces where our consciousness can grasp what our eyes and mind perceive.



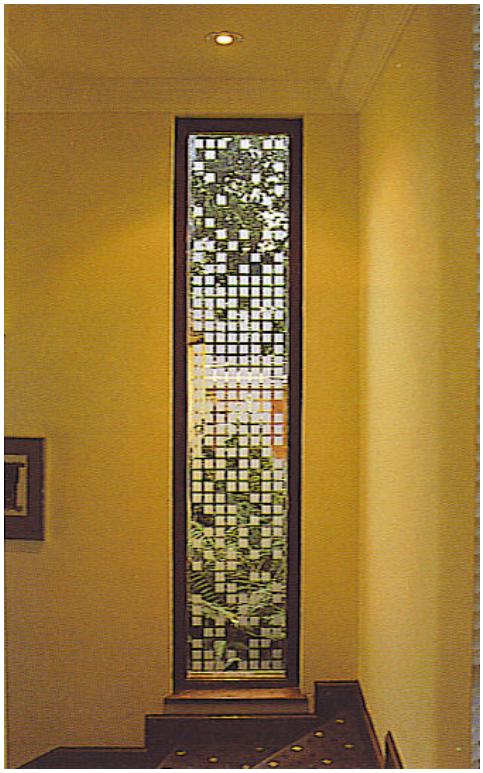
2.2 texture



we see by contrast, we live by contrast, and we are aware of qualities only through their opposites.[11] a material's texture can only be seen by the contrast of light and dark and the shadow cast. it creates variations and enhances the diversity of shadows. texture is not just the material itself but also how it transmits and reflects light to create a unique sensory experience of a space.



texture is key in the filtering and diffusing of light. ambient light offers a softening effect and creates a more thoughtful interaction in the space.



here the material is transparent but the texture distorts a clear image of what is on the other side. there is still a connection of the interior to the exterior but it is blurred

2.3 location

the location of light is important to the mood and feeling of a room. it enables us to experience the inside and outside at the same time. not only does it have the ability to connect interior and exterior, but it can also disconnect by filtering light into the room through untraditional techniques. by focusing on a specific relationship between the person and understanding where the light is coming from, we begin to notice our position in space and time.

location of light interacts with our perceptions both with what is going on outside as well as what occurs inside. to be able to experiment with where the light filters generates different experiences and feelings within one space. space can stay the same physically, but with varying light conditions it changes how we perceive the space.

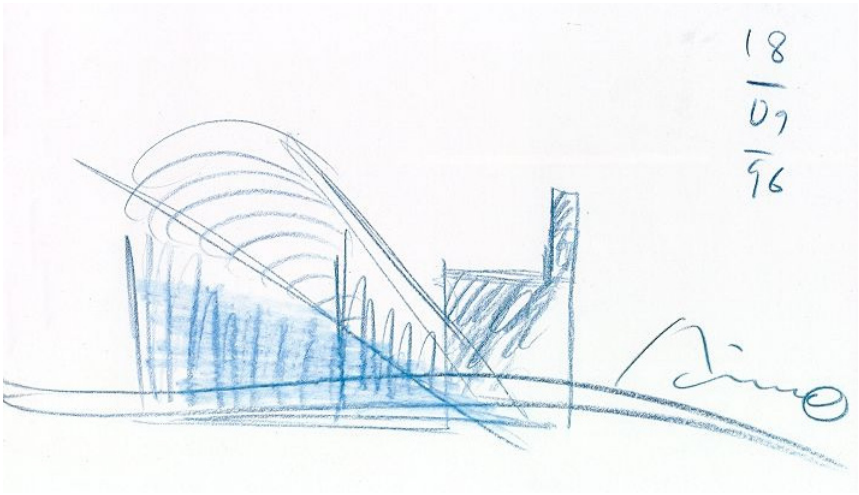
the location of these windows help to create unique shadows on the objects inside. also by extending the floor and walls past the edge where the window meets helps to blur the line of inside and outside.

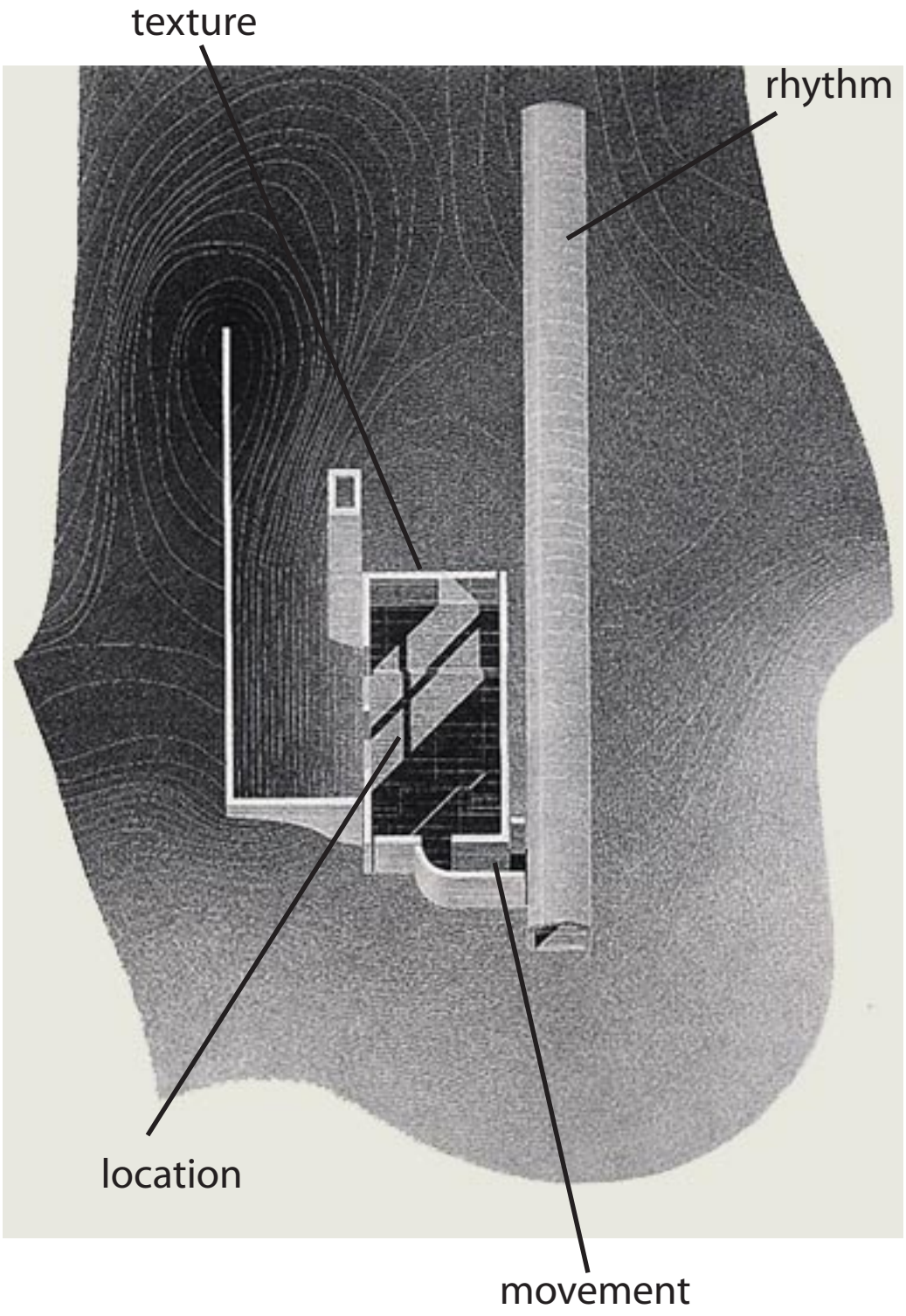
3. precedent studies

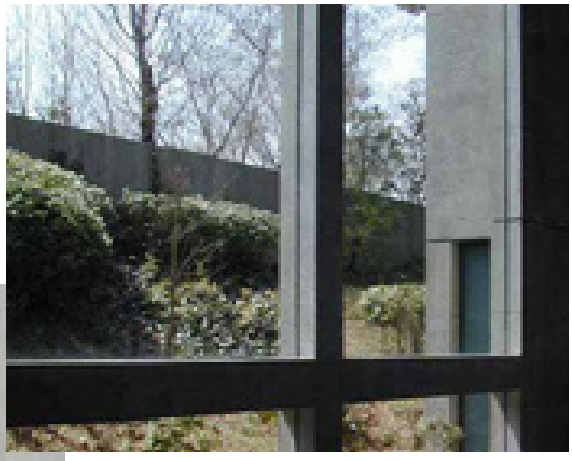
3.1 chapel on mount rokko

kobe-shi, japan
tadao ando

ando implores all natural light in this spiritual setting. the simplistic materials of concrete, glass, and light create a powerful place with the contrast of light and dark, while employing direct and indirect natural light.




texture
rhythm
location
movement



location

texture

rhythm

to entrance to this small wedding chapel is discretely tucked behind a small local hotel where are one first encounters a long corridor with walls of milky glass and a view of the exterior at the end. this changes the character of light and gives a more private experience before you enter. once there, the visitor is forced to turn to the right in order to enter the chapel. there one is greeted by a dark vestibule with a curved concrete wall bringing you in. light spills from a long vertical slits to carefully illuminate the space.

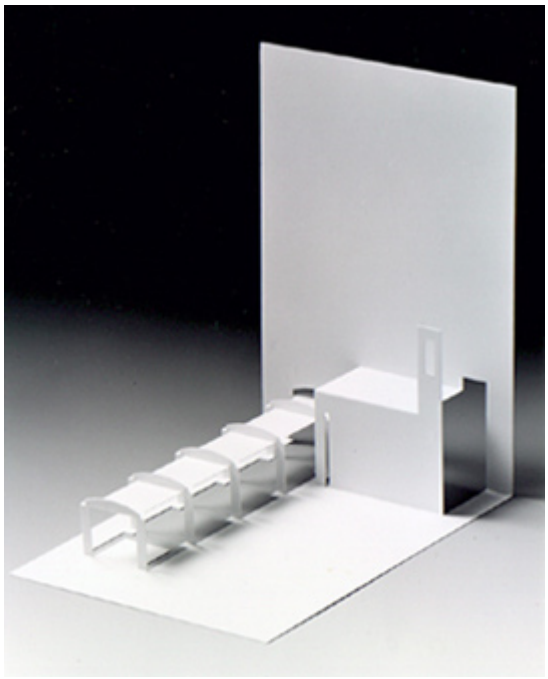
ando contrasts materials with the use of light and the materials begin to speak for themselves. as the light moves over the concrete walls they appear to change and constantly alter the spatial feeling of the room. the play of hard direct light and soft ambient light generates a place affects not only our spiritual understandings, but impacts our over all mood and sense of the space.

the poetic dialogue ando achieves is a rich organization of experiences. the chapel embraces the visitor and takes them through a serene procession of light while being in touch with their surroundings. because to when we manipulate light, we manipulate our perception of architectural space.[12] this structure takes on a different character as one moves around the exterior as the long linear corridor contrasts with the cube-like volume of the chapel, as well as the tall and skinny bell tower. not only does one notice the changing perceptions of the concrete structure, but also how light filters through the various materials and surroundings.

view of the stairs from behind the hotel leading to the chapel entrance

view from the back of the chapel towards the altar

exterior view where the corridor meets the chapel

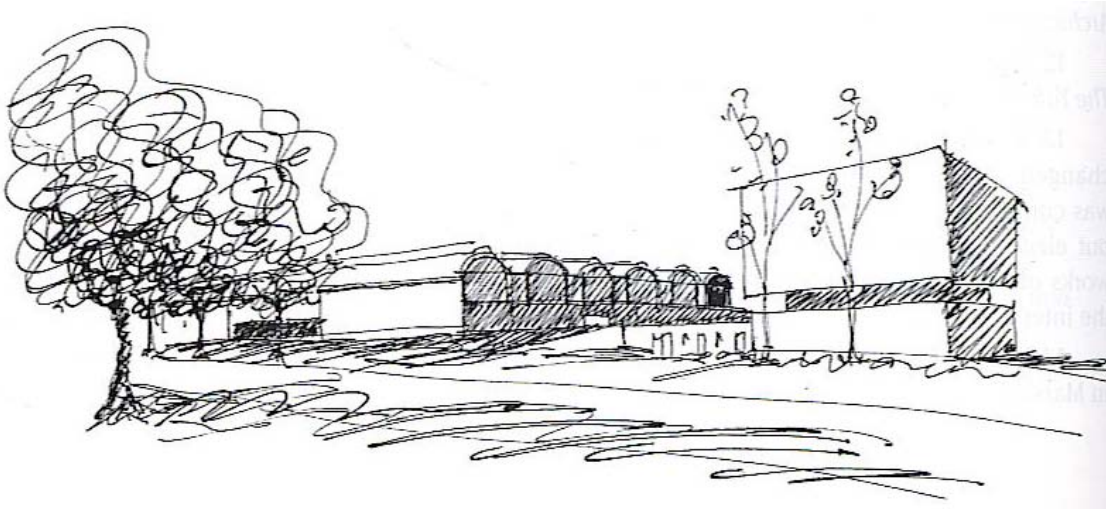


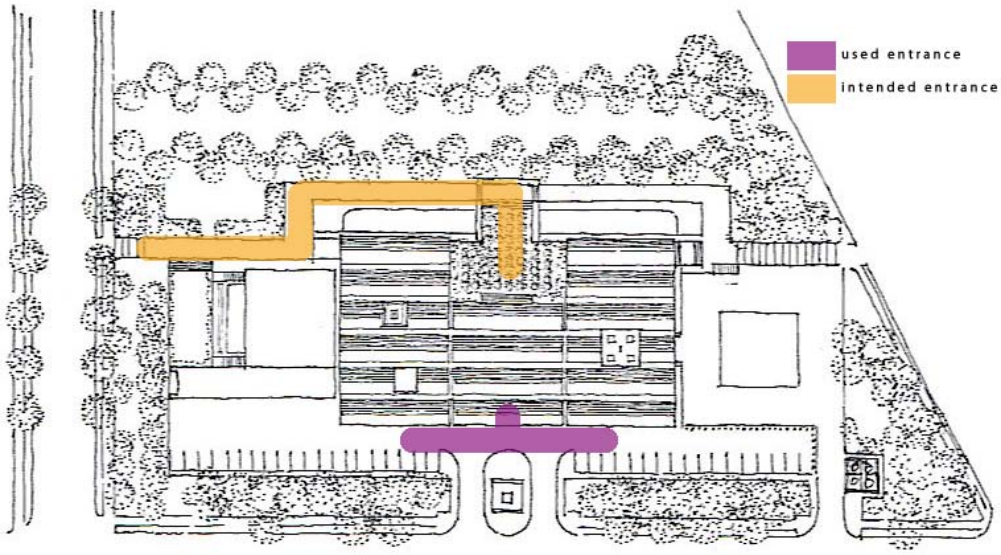
detailed sketch model articulating how the spaces come together

3.2 kimbell art museum

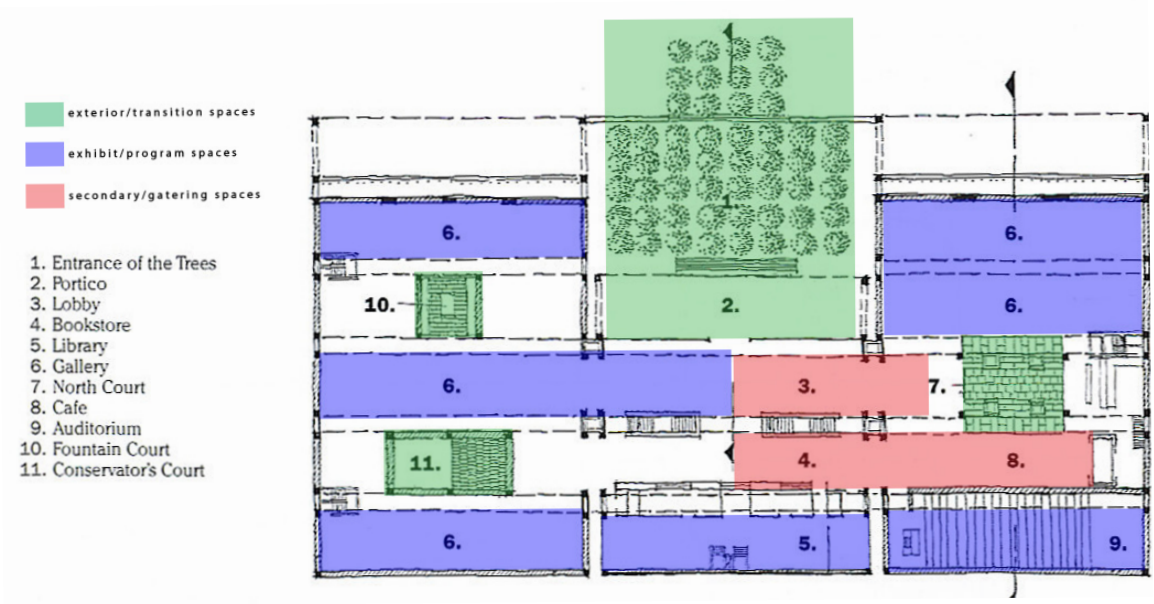
fort worth, texas
louis kahn

kahn's museum encompasses both the spiritual and realistic realms that we live in. he carefully examined and designed a space where the light and the structure are one.



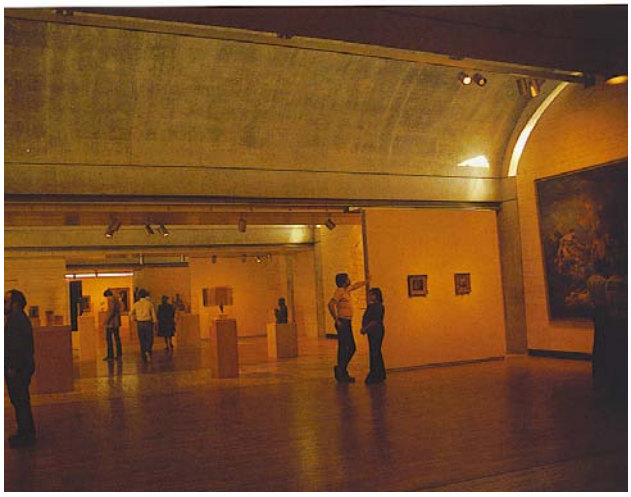


overall plan highlighting possibilities of how one can enter the museum. also showing how what the architect intends can be changed by the user's own ideas and convenience



the exhibition spaces are spread throughout the museum, connected by transitional and circulation spaces that have features which integrate them with the museum as to not break movement through the space

gallery space

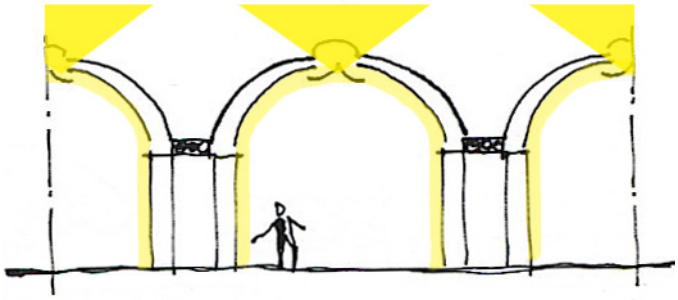


beginning with the exterior kahn designed the "entrance of the trees" which leads one from the hot texas sun to the dappled light under the trees, and then into the coolness of the museum. but here lies a flaw in kahn's design, this intended entrance has been under minded by the location of the parking lot on the opposite side of the museum where it is easier to walk directly to the first door they see instead of walking around the building.

upon entering the museum one is greeted by the immense open space sheltered by a structural vaulting system. the vault appears seemless, and the slits of light come from glass that continues from the concrete. these poetic considerations of light, materials, and location greatly affect the quality of light that filters into the spaces.

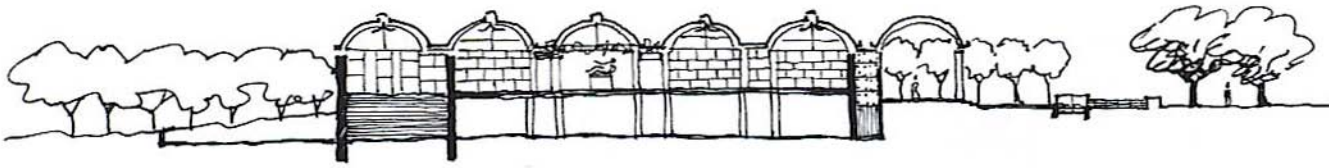
this design generates a soft, luminous light--revealing such characteristics shows that natural light creates different moods as the sun passes throughout the day, as well as, the multiplicity of affects that come from coupling light with various materials and surfaces. moving throughout the gallery and secondary spaces there is uniform lighting achieved from this simplistic system of window and reflectors. the lighting system has been carefully integrated into the structural system to create a cohesive building, where the visitors are not distracted by how light is filtered into the spaces, but at the same time can appreciate the use of bright natural light instead of the often harsh artificial light.

entrance of the trees



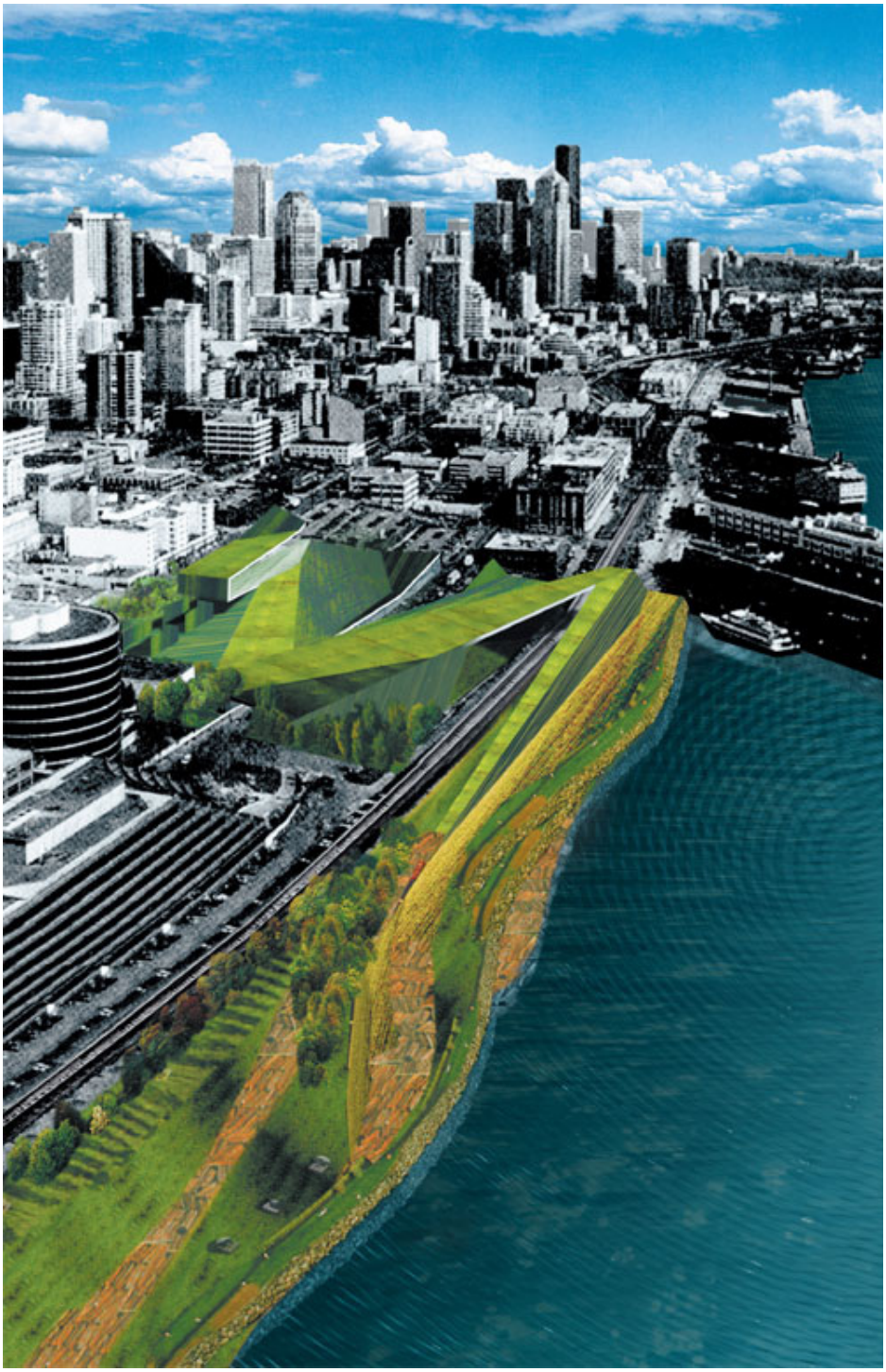
light enters the slits at the crest of the vault, then it bounces of the reflectors and is able to fill the space with bright ambient light

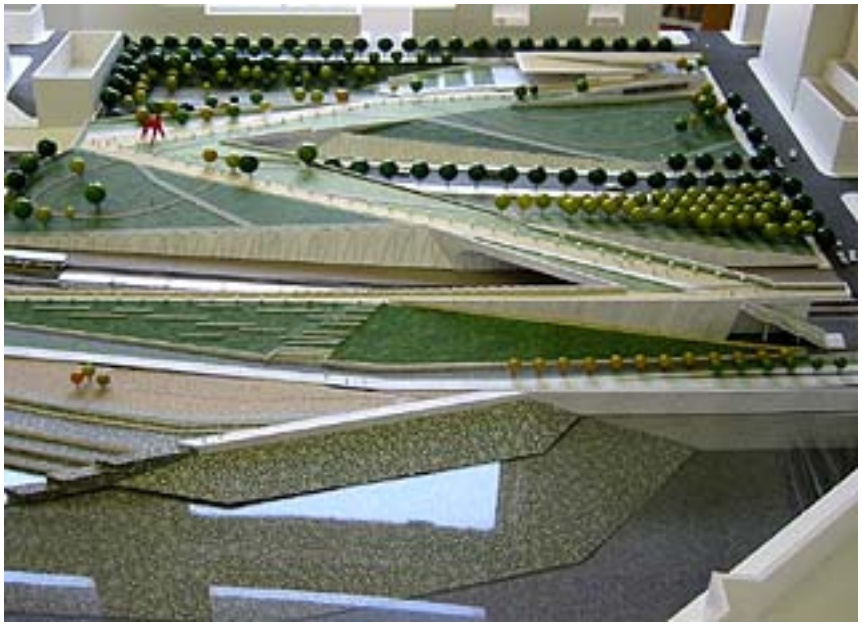
if i were to build a gallery now, i would really be more concerned about building spaces which are not used freely by the director as he wants. rather i would give him spaces that were there and had certain inherent characteristics. the visitor, because of the nature of the space, would perceive a certain object in quite a different way. the director would be fitted out with such a variety of ways of getting light, from above, from below, from little slits, or from whatever he wanted, so that he felt that here was really a realm of spaces where one could show things in various aspects.[13]



3.3 olympic sculpture park

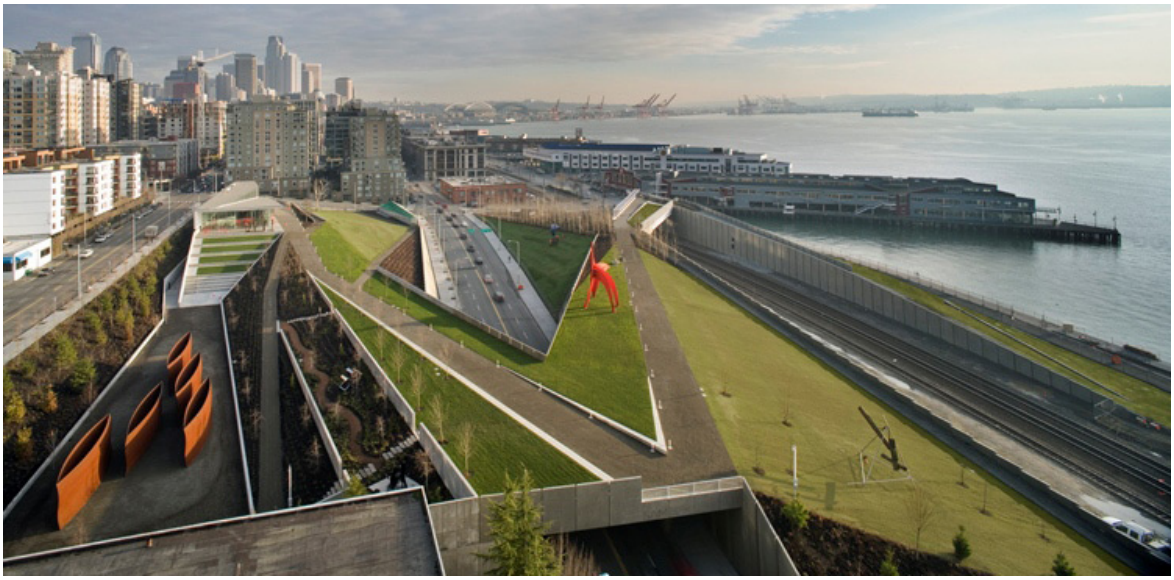
seattle, washington
weiss.manfredi

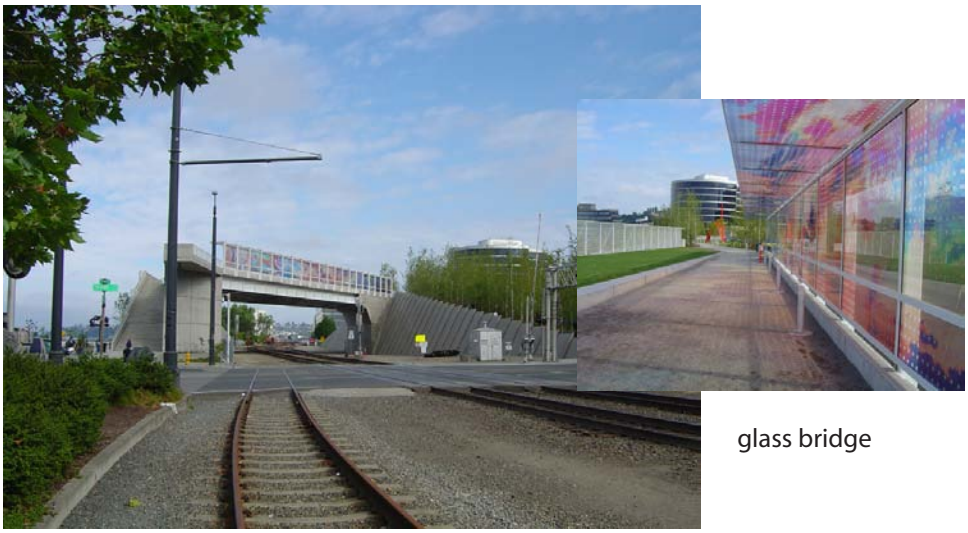




weiss.manfredi have poetically integrated landscape, art, and architecture, in seattle's urban environment. the park's main aspect is a large "z" shapes that connects all ends of this large 9 acre sculpture park. the new topography of the site works to utilize and incorporate the history of the site, from existing infrastructure and highways to rail lines and then the coastal shoreline. this park brings together all aspects of the city through an interesting weaving of sculpture and landscape.

the sculpture park has become a design of many layers, carefully pieced together in order to achieve a multi-faceted space, constantly changing and responding to the natural elements. the "z" shaped pathway carries you across the whole space winding you past the various sculptures and exhibits--giving you different points of perspective ranging from the serene shoreline to the dense urban area all with this vast green area between.





glass bridge

these infrastructure projects have been incorporated with the landscape creating this walk through the park more interesting than what one would typically think. they provide a sense of continuity to the park and begin to outline how we perceive space while directing movement among the sharp angles of the path.

oversized gutter to turn rain run-off into a water feature

one sculpture framing the next

other works in the park are considered anchor works which are major points of interest drawing attention to the various precincts of the park, while others are temporary installations and exhibitions that are spread throughout the park.

the park provides people a rich opportunity to experience modern sculpture in this dynamic space, where as the park itself evolves over time so will the art work--ultimately blurring the line where art begins and ends.

the design's vibrant terrain is intended to emphasize and interplay with the things unique to seattle – rain, mist, reflection – in a series of interconnected precincts.[14]

3.4 the layer house

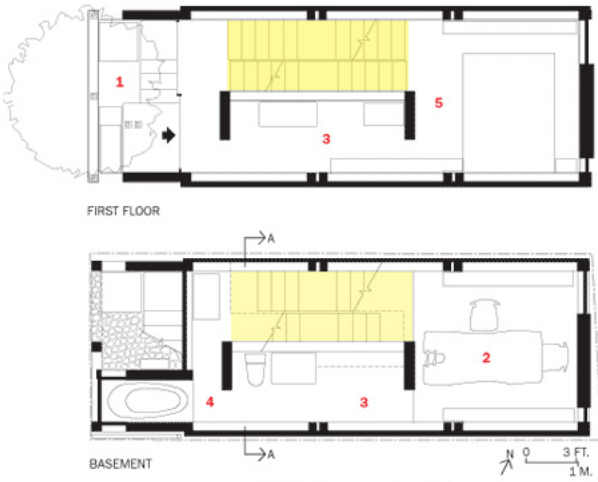
kobe, japan
hiroaki ohtani

ohtani's house is a shadowy dwelling where beams of concrete comprise the walls. he also carries the slots to the skylight on the top floor creating a mesmerizing pattern of conflicting lines on the wall.

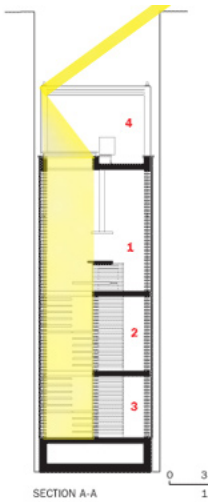
these heavy walls contrast with the front facade made of large plate glass. this draws a line of public and private spaces. lines continue throughout the space with the play of solids and voids--light and dark.

because of the tight location of the layer house, there is limited places where light can filter in. but even with these limitations ohtani achieves a unique and interesting pattern with light and architecture. as the light changes throughout the day so does the shadows created on the walls, therefore changing our perceptions of the spaces.

light is primarily filtered through the stairwell. even in this very small space with limited areas where light can come it, the ambient light is able to fill the functional spaces of the house.



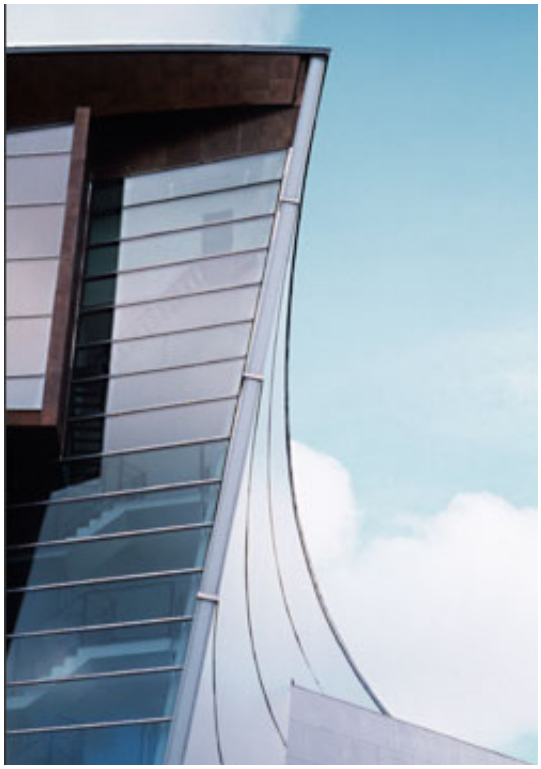
1. *Garden*
2. *Study*
3. *Closet*
4. *Toilet*
5. *Bedroom*



1. *Kitchen*
2. *Closet*
3. *Toilet*
4. *Roof deck*

3.5 museum of contemporary art

helsinki, finland
steven holl architects



the design of this museum is unique to its location in the northern hemisphere. particular to helsinki is the horizontal natural light, from which different galleries have been designed to have different natural lighting conditions. these effects are achieved by slight variations in the room shape and size, along with curving certain walls to direct light as well as movement.

the gallery spaces are not systematically set up, but rather unfold to create a continuous series of movement with changing perspectives and perceptions of the spaces. circulation throughout the museum is composed of various curving ramps and stairs, integrated with the viewing areas. this allows the visitor to move through the space as they please, providing opportunities to observe, discover, and reflect.

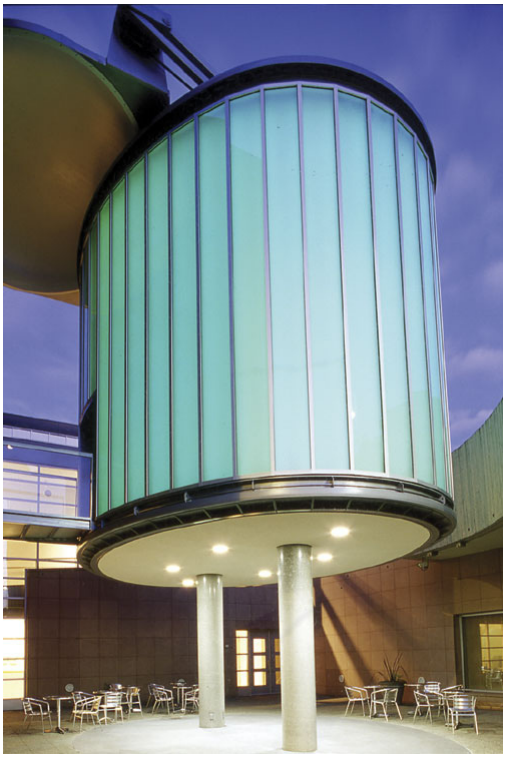
the care taken when designing how light enters the space allows the entire museum to receive natural light in different ways--through the curved roof which provides skylights to the glass walls, all which allow light to diffract and reflect, illuminating the galleries.

3.6 light reign

henry art gallery at the university of washington
seattle, washington
james turrell

combining architecture, sculpture, and atmosphere this freestanding, enclosed chamber fits about fifteen people. this "skyspace" is designed to heighten one's sense of sight and perception. furnished with only a continuous bench along the interior, which tilts up slightly, the user is encouraged to look up to the opening in the roof.

here through a simple opening, turrell is able to play with our perceptions, effect light, and thus create a unique space. the importance of this piece is to help the user understand the effects of the sky over time. experience varies at different times of day and different days of the year. users are encouraged to frequent this space on more than one occasion to truly experience the power of turrell's work.



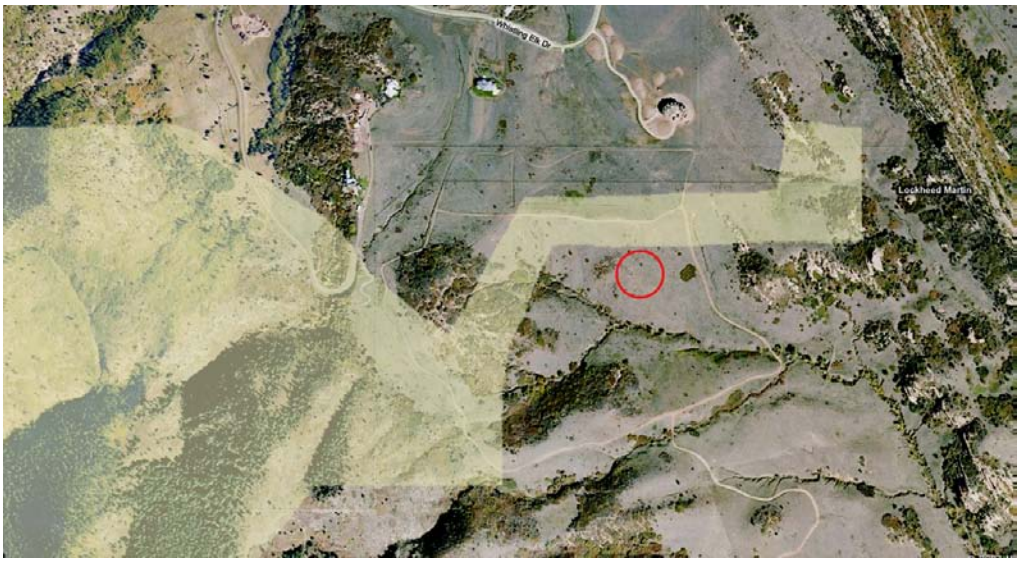
the exterior is covered with glass panels illuminated with soft led lights that slowly change their color

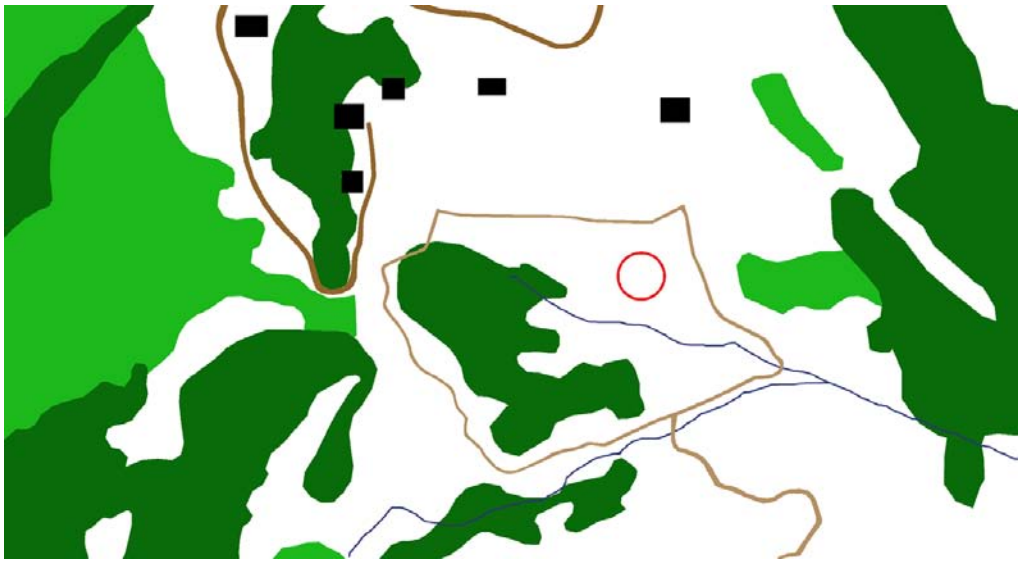
light is a powerful substance. we have a primal connection to it. but, for something so powerful, situations for its felt presence are fragile. i form it is much as the material allows. i like to work with it so that you feel it physically, so you feel the presence of light inhabiting a space. i like the quality of feeling that is felt not only with the eyes.[15]

4. site analysis

site analysis

indian hill
jefferson county, colorado
elevation: 6200 feet
latitude: 39 N
longitude: 105 W



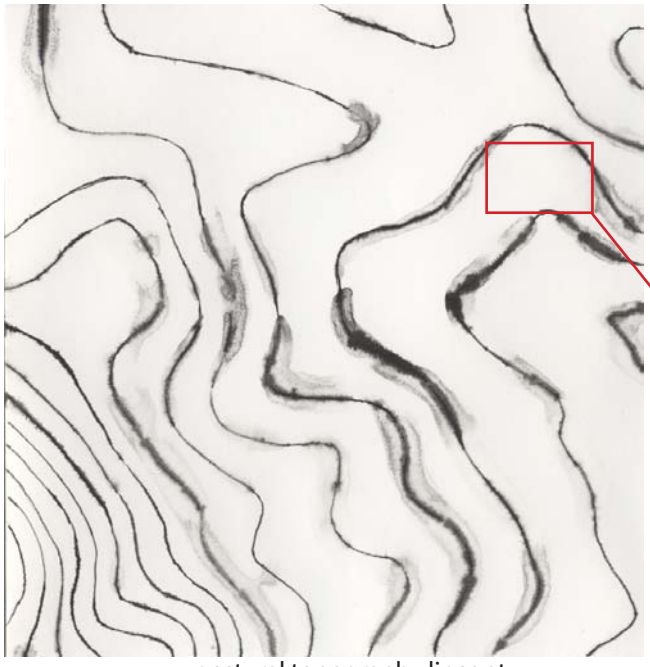


this site provides many aspects that will support the program function of being able to experiment and interact with light. the site sits atop a hill, but also part of the mountainous range. this quasi-secluded location allows the visitor to step away from the environment they are used to and embrace the new surroundings while focusing on the experiences and perceptions of light. typically clear skies add to the benefit of the museum by eliminating the number of filters the light must pass through before it reaches the structure. then the architecture itself becomes the filter in to which light is able to penetrate and fill the interior spaces.

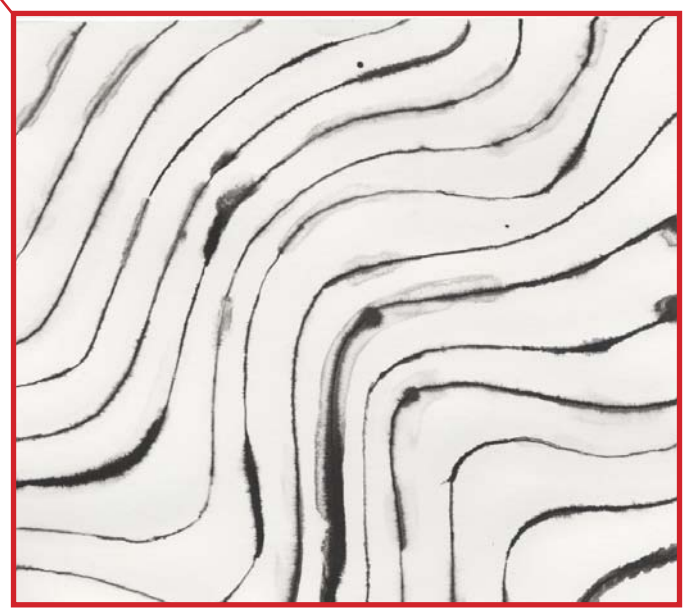
deer creek canyon

deer creek canyon is located just to the west of the site. the park offers trials for hikers and encompasses diverse natural environments. the terrain is more diverse, but the open environment allows for good natural light. this location allows the museum to enhance its surroundings. the remoteness of this site allows for a more private and intimate experience of the museum, but without being too far from the busy city.

photo illustrating the rolling hills and rocky landscape



gestural topography lines at every 80 feet



gestural topography lines at every 40 feet

the rolling hills of the rocky mountains creates a poetic landscape where one can dwell--it is always changing and thus the atmosphere of this place is never quite the same on repeat visits. this site provides an interesting backdrop for the museum of light.

its diverse, rocky landscape provides a site rich with natural sculptures. placing a museum on this site will enhance this beauty and provide contrast of man-made sculpture with nature. it also has its own palette of materials that will produce different lighting characteristics than those of the built structure.

integrating structure and site will create a poetic illustration of how both elements become one. the care taken here coupled with the delicate but empowering use of light make this calming experience where one is invited to take their time to explore the site as well as the multiple elements of light.

5. program

5.1 project program summary

this project is an exploration of light and how its characteristics change as a result of built space and objects in which it encounters. this place is to be highly experiential, generating unique atmospheres and moods, drawing the user to come back more than once. we experience the integration of light with architecture everyday, everywhere we go. but often light becomes a secondary aspect and we forget the importance light has on both our physical and psychological beings. changes in light, and consequently shadow affects our perceptions and attitudes toward certain spaces. it should appeal to our consciousness--make us be able to recall and remember this space. this is a place where light is employed creatively and effectively for experiences to occur.

by calling this place a museum, it will challenge and transform the typology of a museum. as a museum of light this will be a place to study, observe, and experiment with light. light is typically used as a source of illumination, and not as much the object of study. but light has so many characteristics to be exemplified under the right circumstances. if utilized correctly it can enhance materials, spaces, and objects. this poetic integration of light contributes profoundly to the spirit of a place. the place then becomes unlike any other, where light defines the experience of a building and the area around it.

this museum is composed of several buildings which serve as gallery spaces in which artists come in and create temporary installations that react and respond to the specific lighting conditions/openings in the structure of the particular space. each exhibit is unique to the space as well as how long it will be part of the museum. for works that will be there short periods of time, they only have to respond to immediate sun patterns and seasonal conditions. for long term exhibits, they must understand how light will change throughout the year.

each gallery space has a specific orientation to the sun in which the contrast of light and shadow contributes to the understanding of the experience within the space. as light enters from different directions--where some galleries have light from above, and others from the sides--and reflects off of both curved and straight surfaces, a ranger of different experiences is generated.

overall there is a battle of light and dark within the spaces. this consistency of contrast formulates certain meanings and perceptions of the space you are in. these meanings are then transformed by the artist's installation and light becomes and integral part of the art and not just light on the art.

the museum is not just limited to interior spaces, but continues outside to

integrate movement and circulation on the site and with the built structures--thus the user is always a part of the program. the exterior space becomes a sort of sculpture park. will serve as transitions spaces, allowing movement from one structure to another. it will also serve to contrast our perceptions of how we view light through interior verses exterior spaces. exhibitions here will be exposed to the elements and enhance a different characteristic of light where it is completely subject to natural without man's intervention.

the organization of the buildings on the site is drawn from the paths of the sun, and the lines created. picking specific and strategic lines, and keeping the each building's already determined orientation to the sun, generated a relationship among the buildings which kept the site open and park like. there is a main axis which draws one from the entrance and lead them up the sloping landscape. no other paths are clearly defined, as to allow the user to move about the site as they please. this park atmosphere also allows for artists to create work in the landscape and other pieces which may serve as apatures to the buildings.

this museum is a constantly evolving work. as new artists come in and create new pieces the user is invited to come back and experience the different spaces created. but more importantly the user is encouraged to stay throughout the day and experience the space frequently over the year to understand how light changes, affects the art, and ultimately changes our perceptions of space.

5.2 quantitative program

visitor's center	
reception area	300 sq.ft.
office #1	80 sq.ft.
office #2	90 sq.ft.
visitor's dining area	
cafe	980 sq.ft.
men's bathroom	150 sq.ft.
women's bathroom	150 sq.ft.
corner light gallery	1170 sq.ft.
south light gallery	2135 sq.ft.
split light gallery	1440 sq.ft.
end light gallery	1125 sq.ft.
north light gallery	1160 sq.ft.
top light gallery	960 sq.ft.
exterior park/sculpture spaces	16240 sq.ft.
	25960 sq.ft.

5.3 space detail summaries

qualitative summary

visitor's center

purpose...

here the visitor can come find information about current and upcoming exhibits. a revealing ribbon window, the user catches a glimpse of what the museum contains.

activities...

the administrative arm of the museum. simple business activities will take place here, as well as providing the user with a place to find information.

spatial relationships...

opens to the main path of the exterior museum space. located near the parking lot, and visitor's dining area so it can be easily found to serve its functional need.

quantities required...

unit capacity: 10
number of units: 3
equipment/furnishings: desks, chairs, bulletin boards, information brochures, benches

visitor's dining area

purpose...

to provide the users with a place to stop and take a break from the museum's exhibitions. a large window opens to the central part of the museum/park to keep the user engaged.

activities...

the cafe allows the user can grab something to eat while spending the day at the museum.

spatial relationships...

opens to the main path of the exterior museum space. located near the parking lot, and visitor's information center. allows the user to see majority of the park from inside.

quantities required...

unit capacity: 25
number of units: 3
equipment/furnishings: tables and chairs, serving bar

corner light gallery

purpose...

to provide the user with an opportunity to interact with light that comes from only the corners of the building. the two lit corners contrast greatly with the two unlit corners. while these corners can also be controlled by moveable panels to allow different amounts of light in.

activities...

observation/interaction is determined by the artist and the way in which they choose to engage the user.

spatial relationships...

located on the main path. opens to early morning and early afternoon sun to create diverse experiences throughout the day.

quantities required...

unit capacity: 25
number of units: 1
equipment/furnishings: determined by the artist

south light gallery

purpose...

to provide the user with an opportunity to experience light that is more direct and from the south. inside along the long glass wall is a moveable panel that allows light to penetrate in certain areas and not in others.

activities...

observation/interaction is determined by the artist and the way in which they choose to engage the user.

spatial relationships...

set in the northern part of the site, a curved glass wall opens to the south and the rest of the museum/park.

quantities required...

unit capacity: 20
number of units: 1
equipment/furnishings: determined by the artist

split light gallery

purpose...

to provide the user with an experience of light that comes from all sides. with a ribbon running through the middle of the building, light reflects and refracts off all surfaces.

activities...

observation/interaction is determined by the artist and the way in which they choose to engage the user.

spatial relationships...

located at the end of the main path, through a procession up the slope of the site. opens downhill to the visitor's center and uphill to the mountains.

quantities required...

unit capacity: 20
number of units: 1
equipment/furnishings: determined by the artist

end light gallery

purpose...

to provide the user with an opportunity to experience light that is mostly indirect. light comes through openings to the west and east, and light gentle cascades along the curved walls for a softer affect.

activities...

observation/interaction is determined by the artist and the way in which they choose to engage the user.

spatial relationships...

set in the southern part of the museum/park and the user is visually separated from the museum once inside. openings allow for only minimal view of the exterior.

quantities required...

unit capacity: 20
number of units: 1
equipment/furnishings: determined by the artist

north light gallery

purpose...

to provide the user with an experience of light that is completely indirect. opening to the north, this gallery receives no direct light and the experience here relies on light that is caught between the buildings on the site.

activities...

observation/interaction is determined by the artist and the way in which they choose to engage the user.

spatial relationships...

located perpendicular to the main path. opens to view the path and other galleries to the north.

quantities required...

unit capacity: 20
number of units: 1
equipment/furnishings: determined by the artist

top light gallery

purpose...

to provide the user with an opportunity to experience light that comes strictly from above, as most people assume that is where light comes from. at most times light will fully illuminate the gallery.

activities...

observation/interaction is determined by the artist and the way in which they choose to engage the user.

spatial relationships...

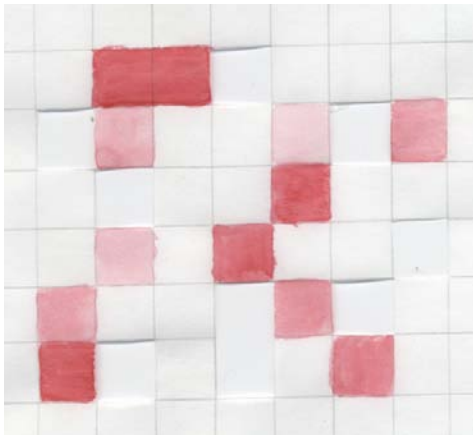
located just to the east of the north light gallery. no visual relationship to the museum from inside the gallery.

quantities required...

unit capacity: 20
number of units: 1
equipment/furnishings: determined by the artist

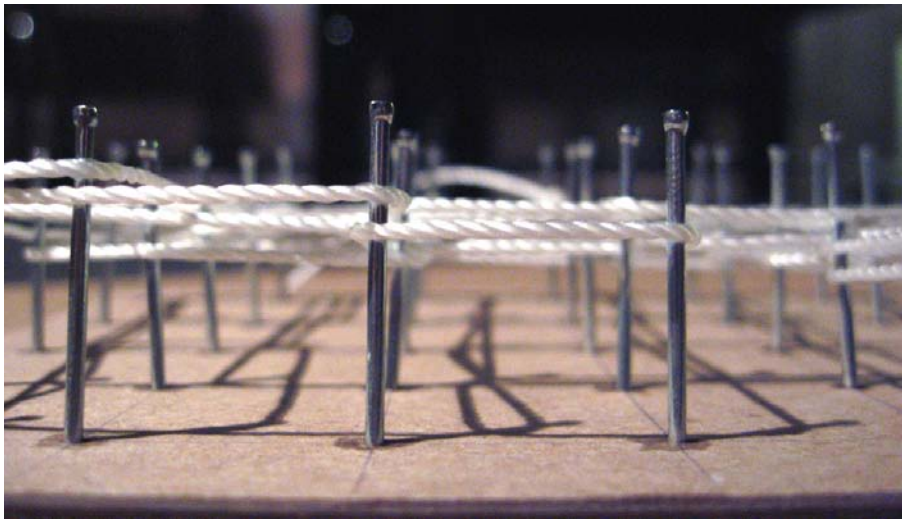
6. design process

6.1 springboard

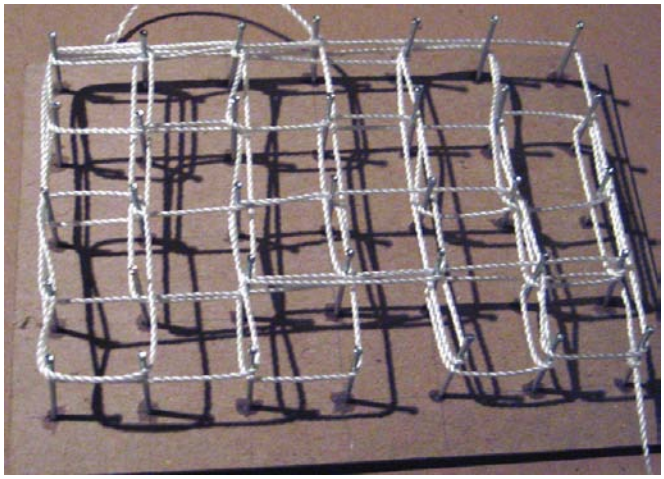


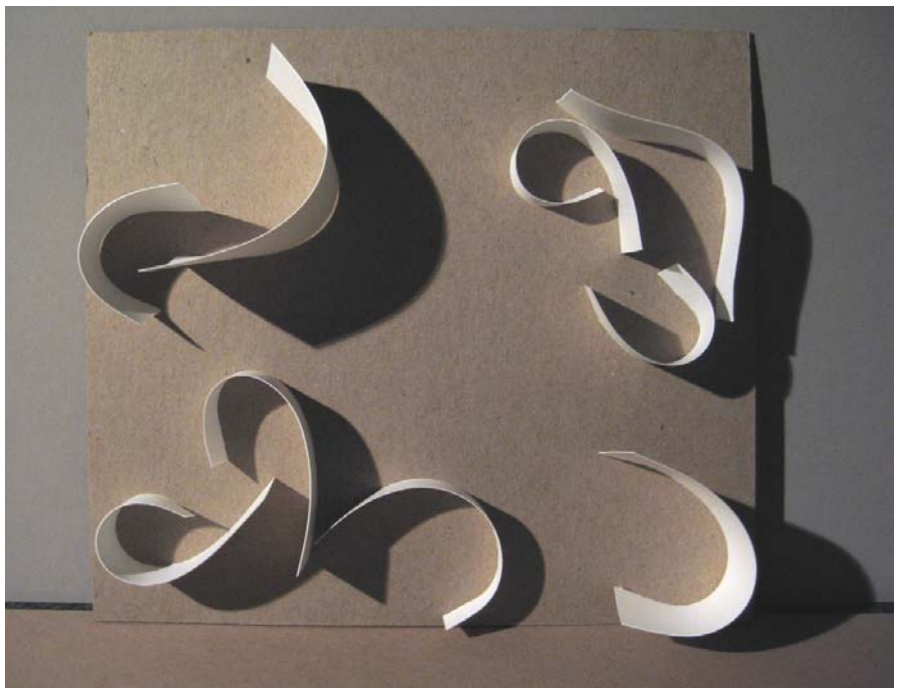
watercolor on velum looking at how materials with different opacities can filter in light

preliminary exploration on how light starts to pass through materials arranged in a way to create various patterns that generate a certain atmosphere

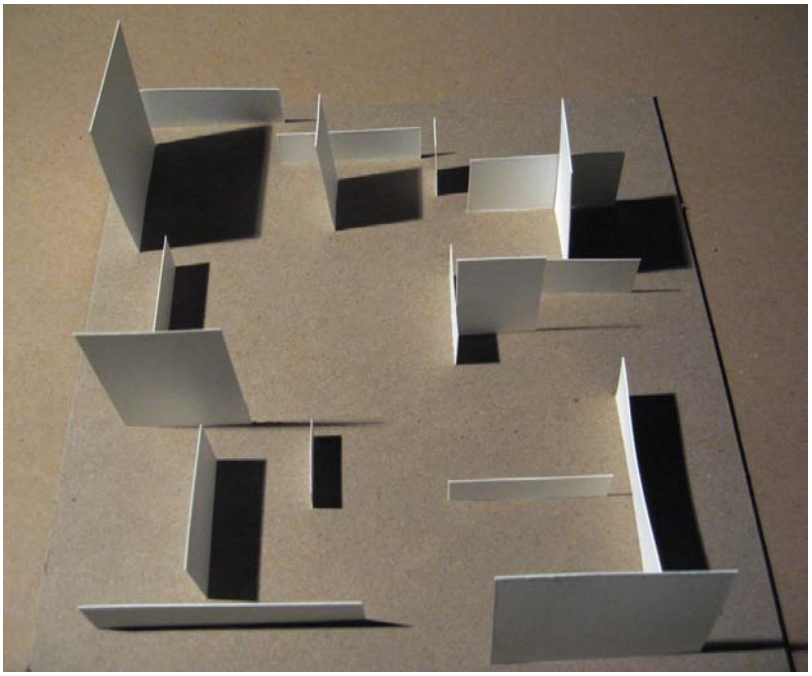


model with string and nails beginning to understand how pieces can be layered and connected on a wall

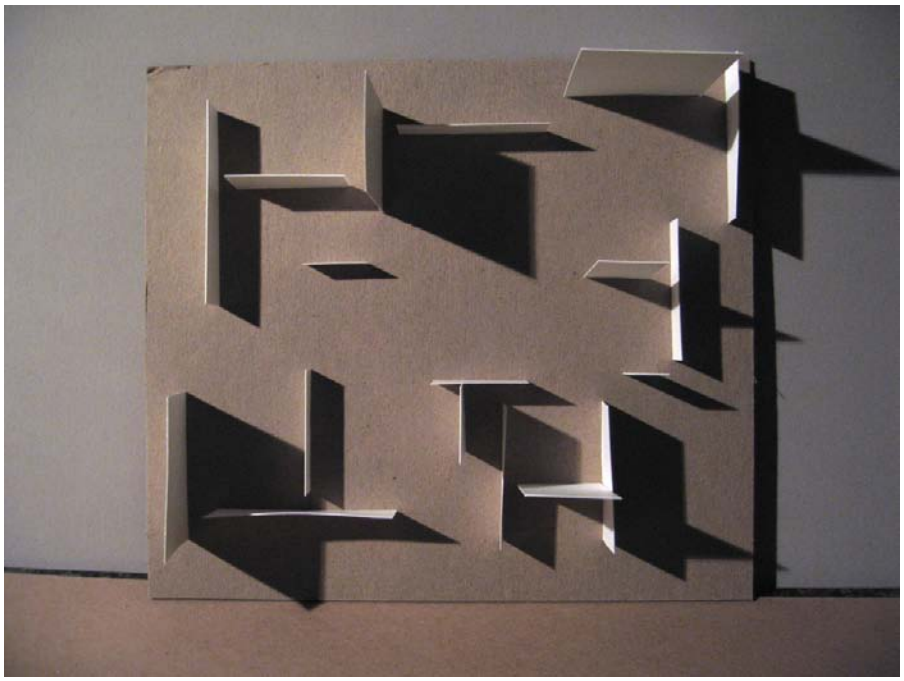


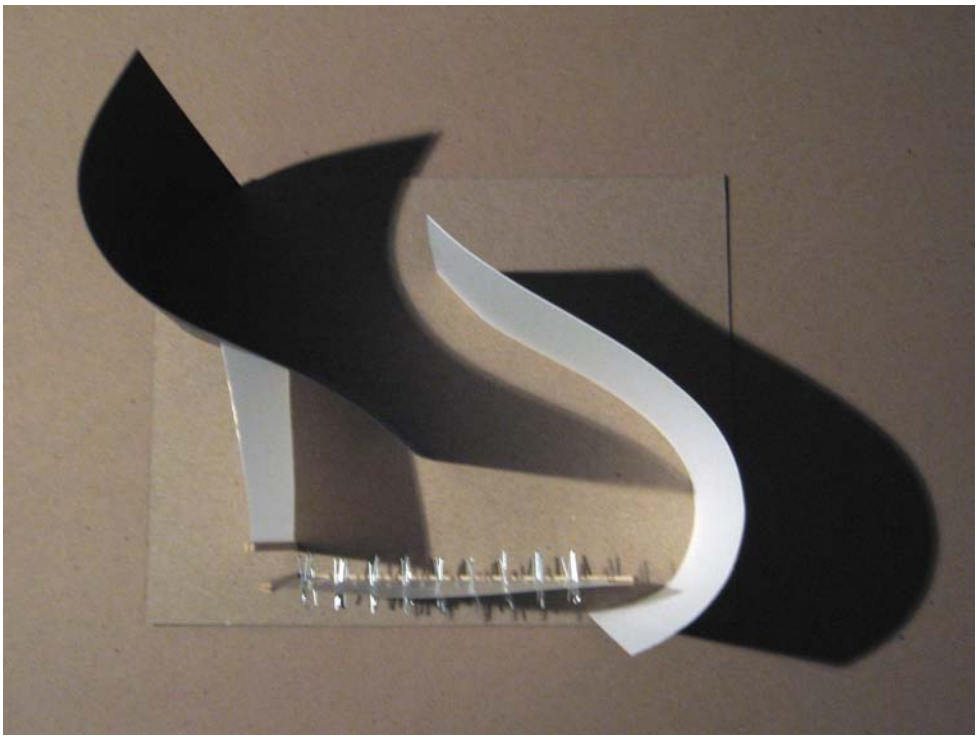


suggestions of building form that do not just act as places where the museum is housed, but also start to imply circulation to and from, in and out of spaces

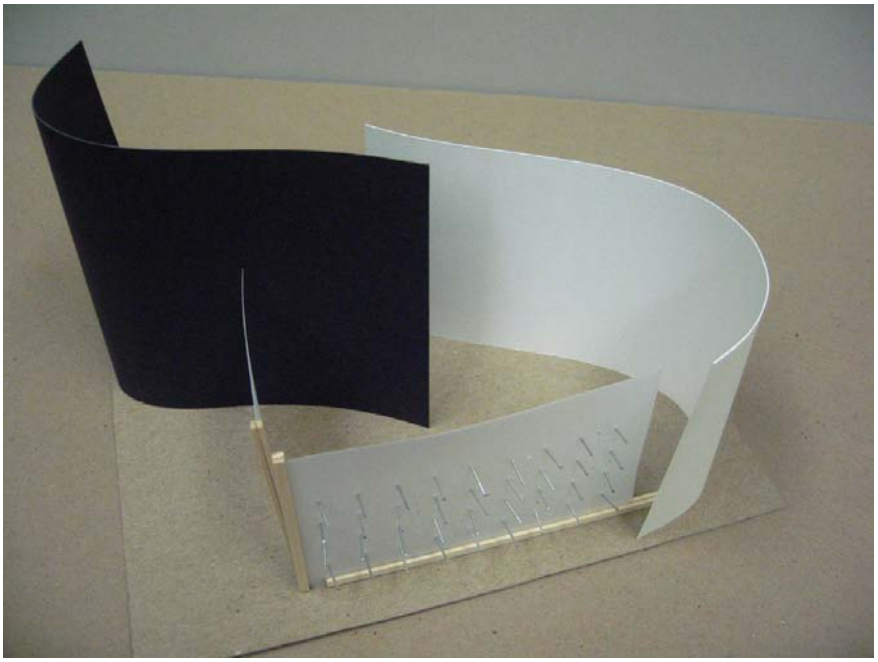


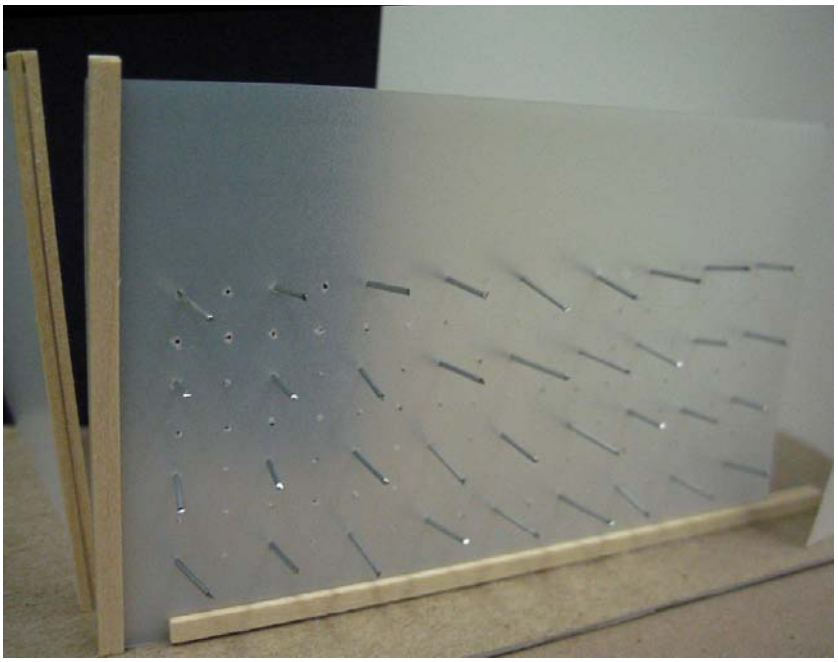
experimenting with a more linear layout resulting in a rigid circulation pattern, but the feeling that these forms could potentially move and slide pass one another





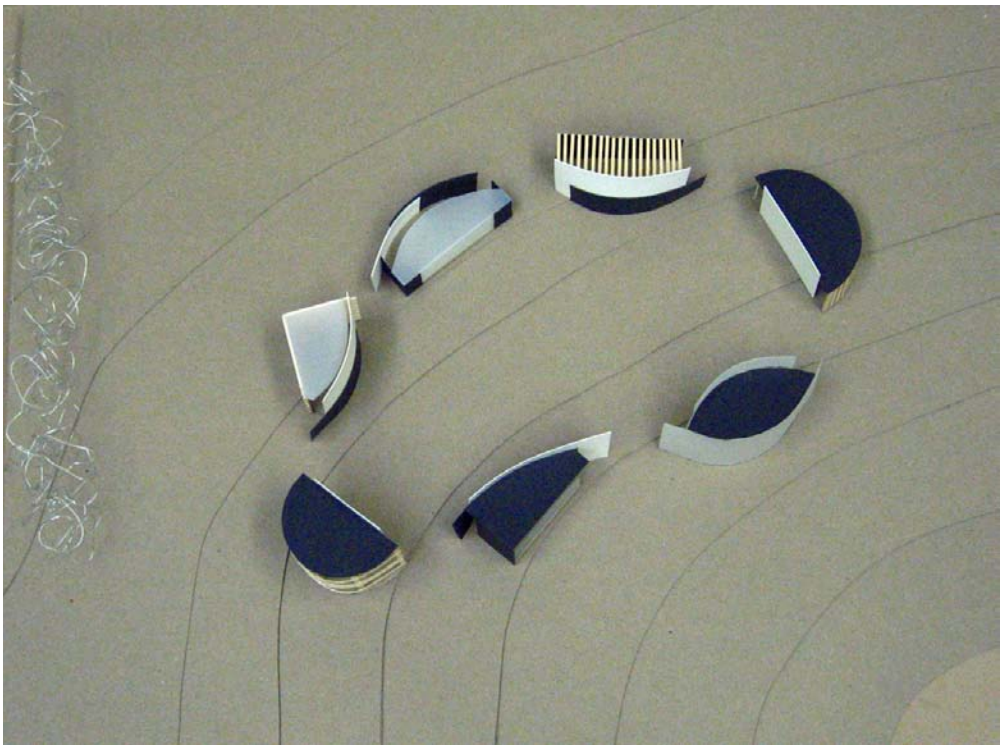
beginning to combine both the curved and linear elements to create spaces, still facilitating movement



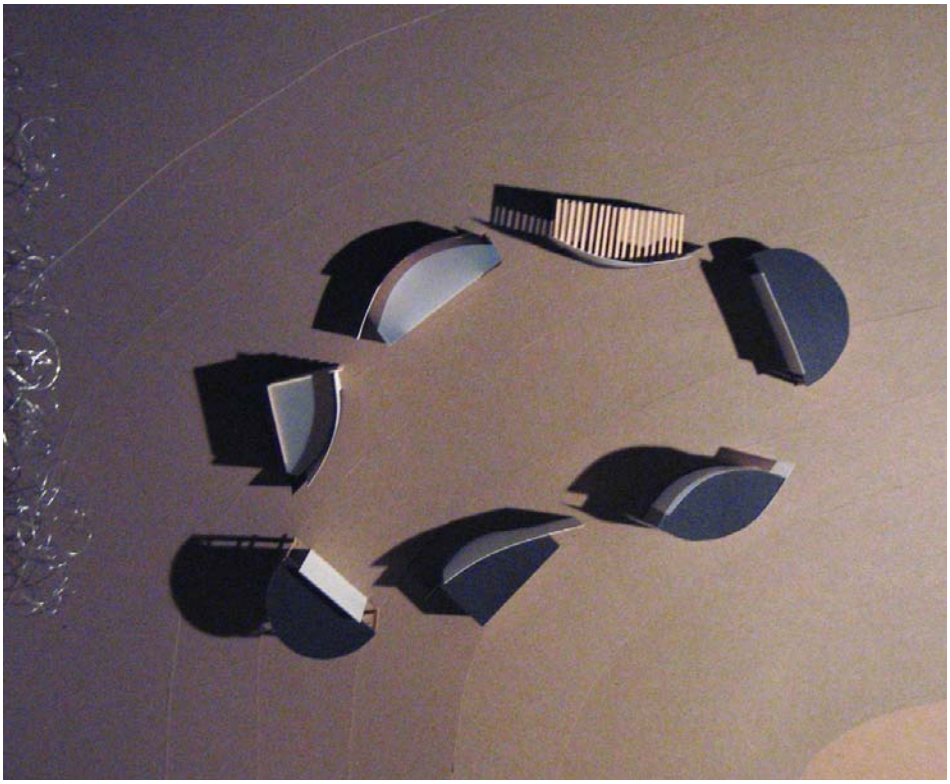


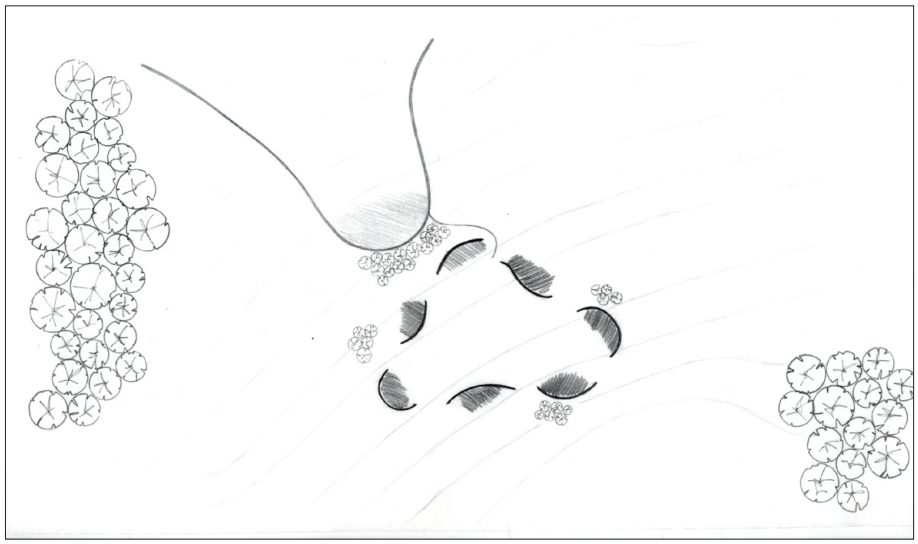
with inspiration from the string and nail concept model-exploring a wall with numerous pegs on which tiles can be place and removed to create and change the amount and pattern of light that is filtered into the space

6.2 schematic design



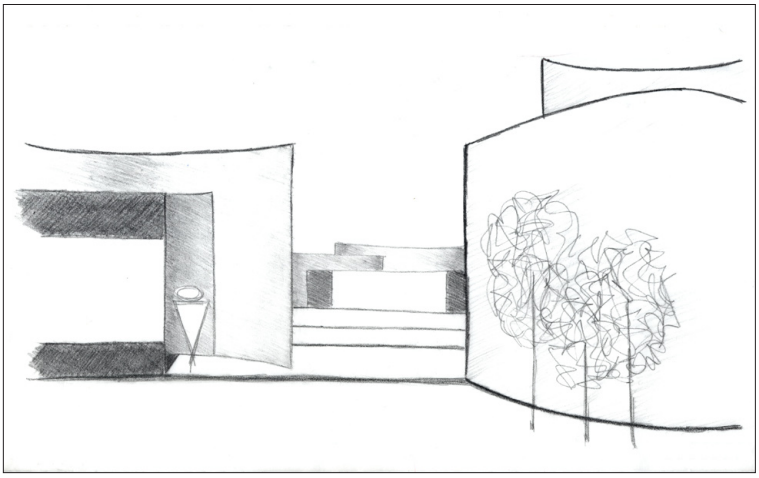
site model

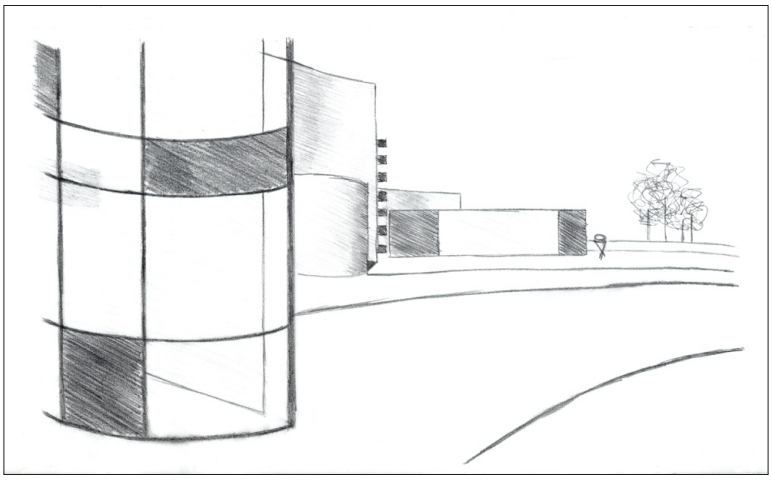




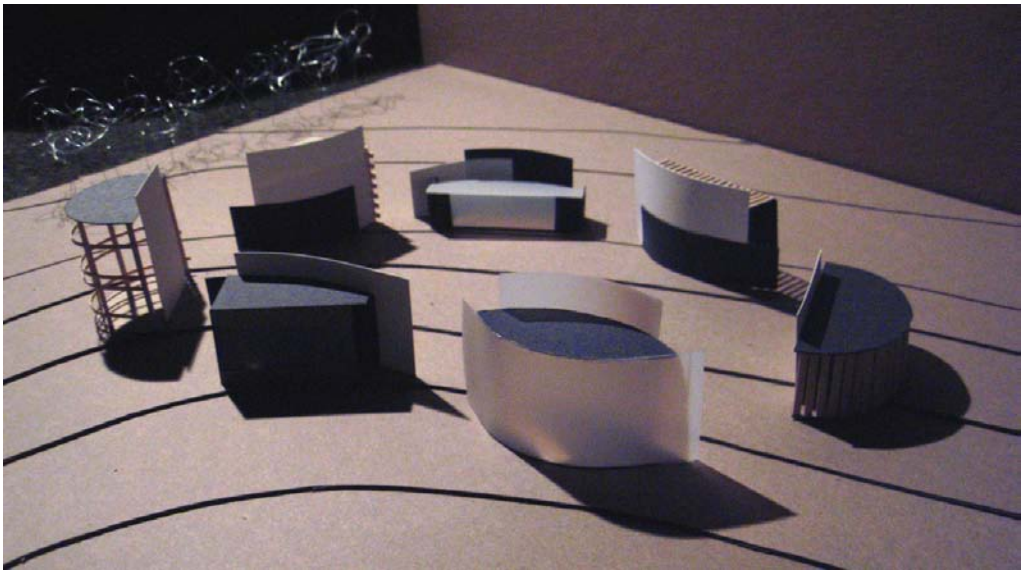
site plan

continuing to experiment with both curved and linear elements and how individual spaces begin to create and overall museum space-focusing on the fact that light filters everywhere an object is not, the forms generate a play between light and shadow with various patterns, textures, and locations

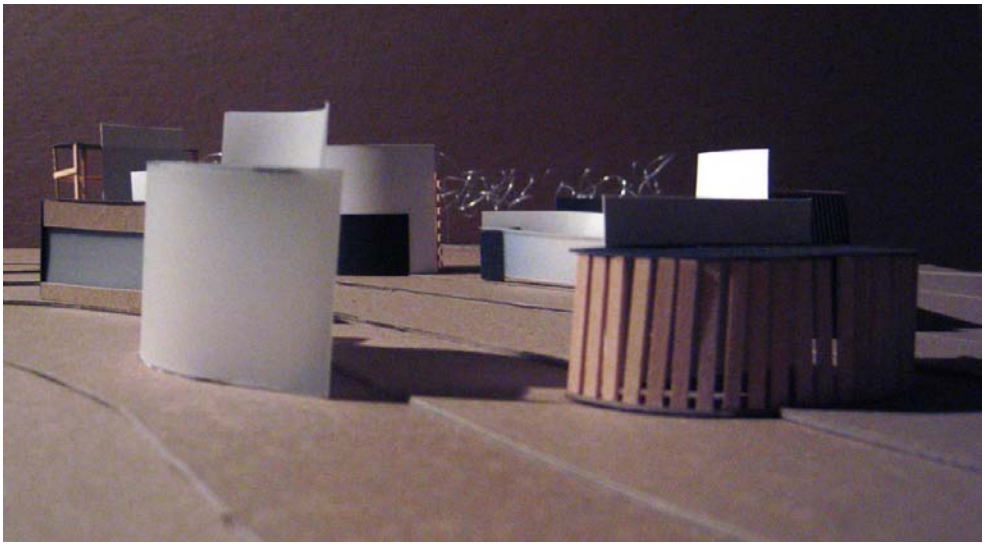




perspectives

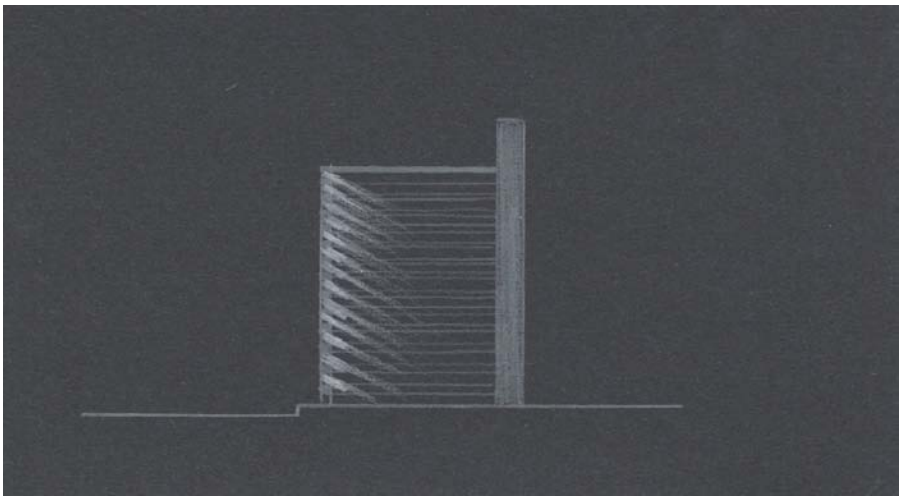


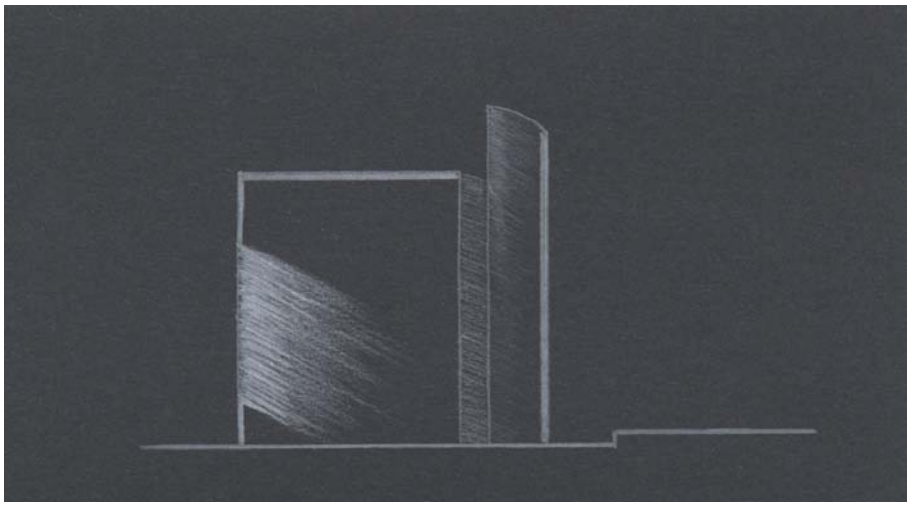
site model perspectives

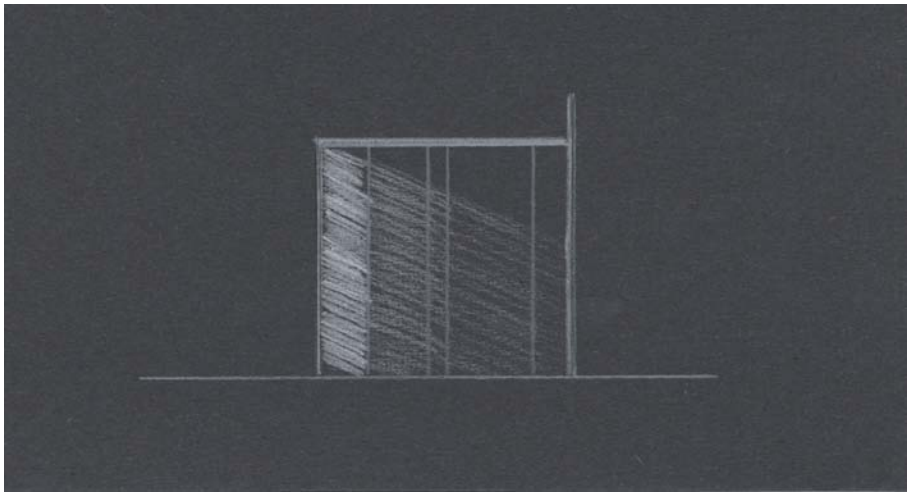


exploring how light enters different spaces by varying from opaque to translucent to open surfaces are placed-where each space produces a different experience

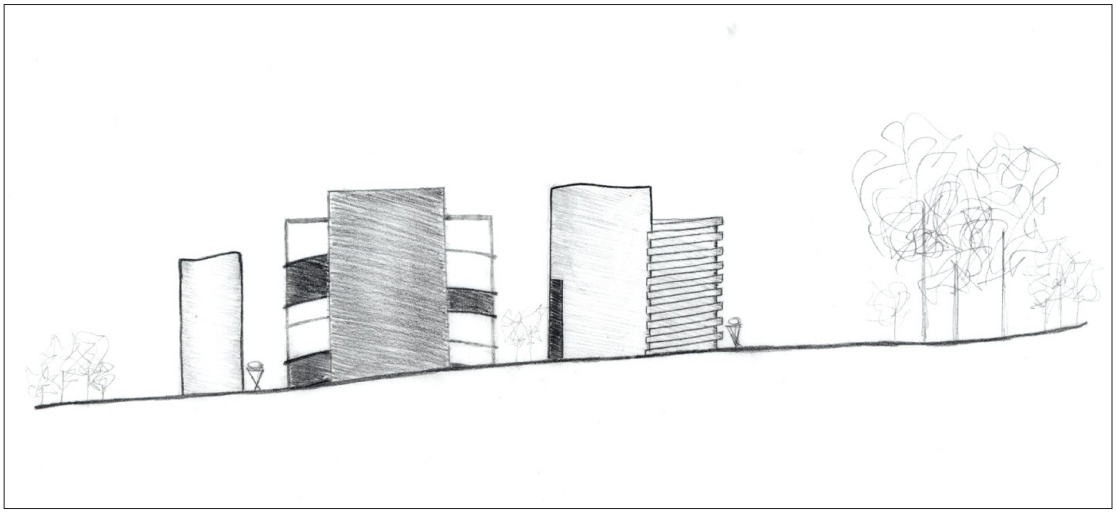
changes in lighting effects not only vary from one space to another but also change as the sun moves throughout the day



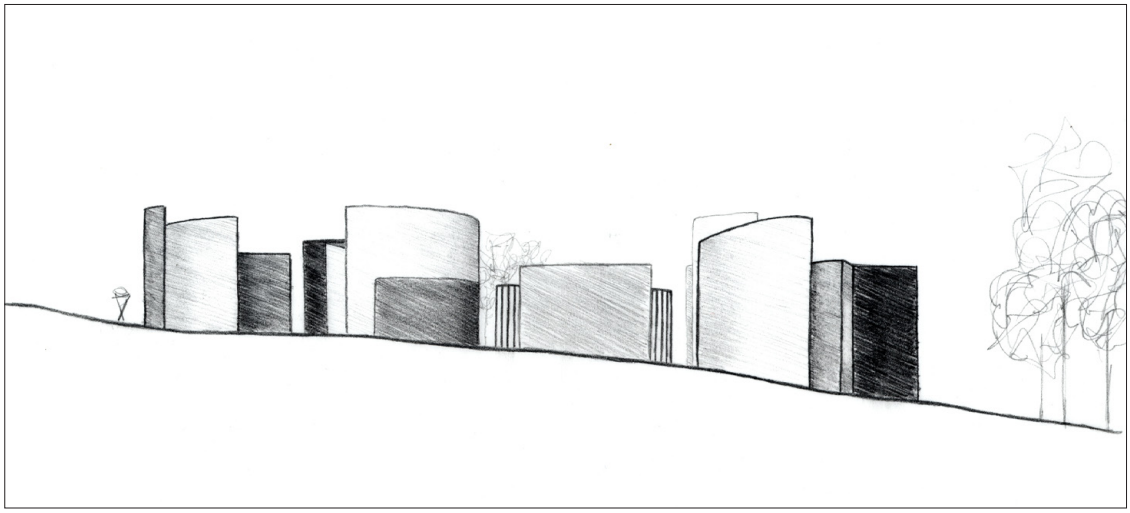




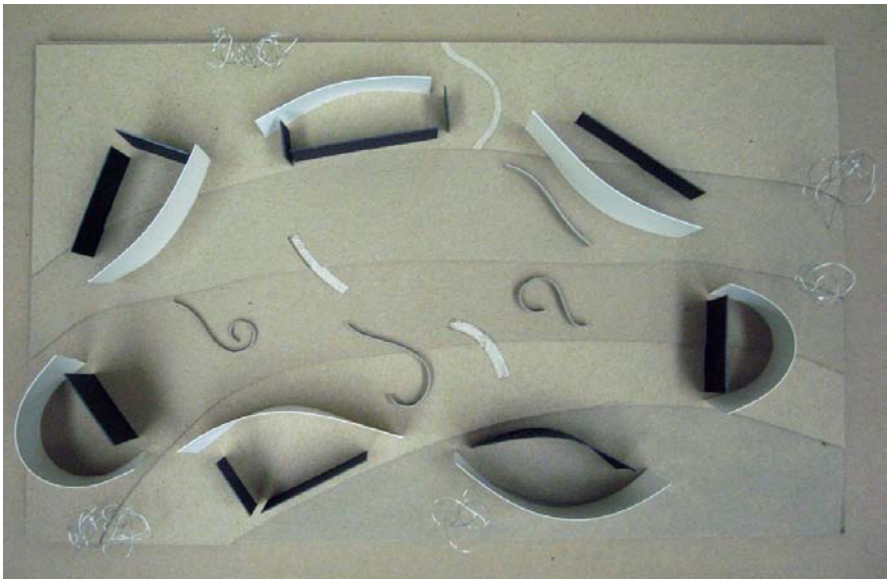
sections studying how light is filtered into the space



site sections

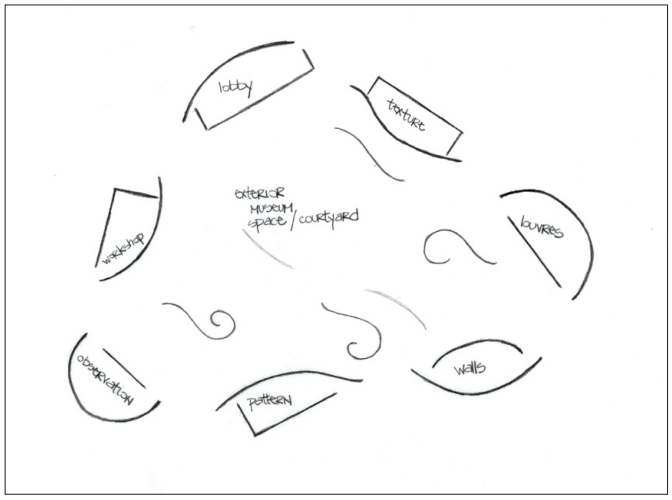


site plan

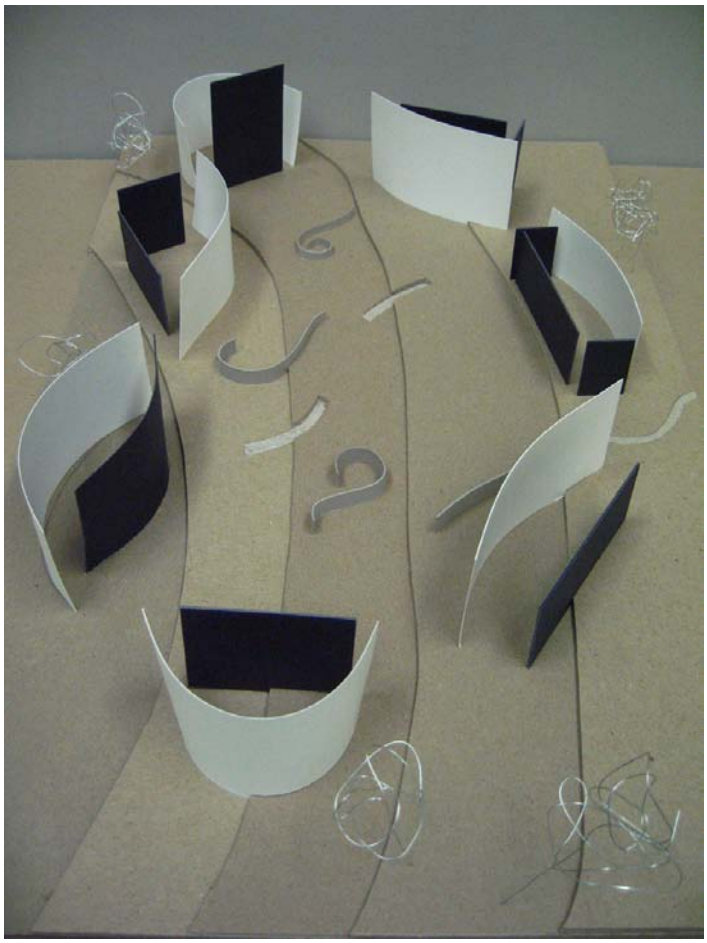


zoomed in site model with more developed exterior museum space

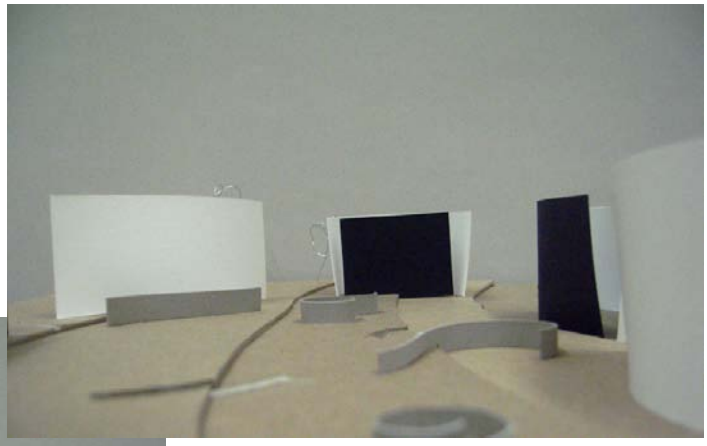
taking a closer look at circulation and movement on the site-the museum is not just limited to the indoors but continues outside



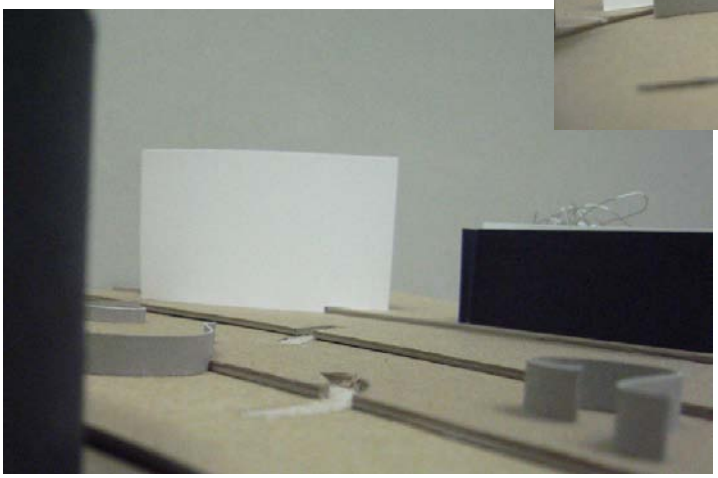
floor plan



here other exhibits create unique contrasts of light and shadow while also serving some functional purposes



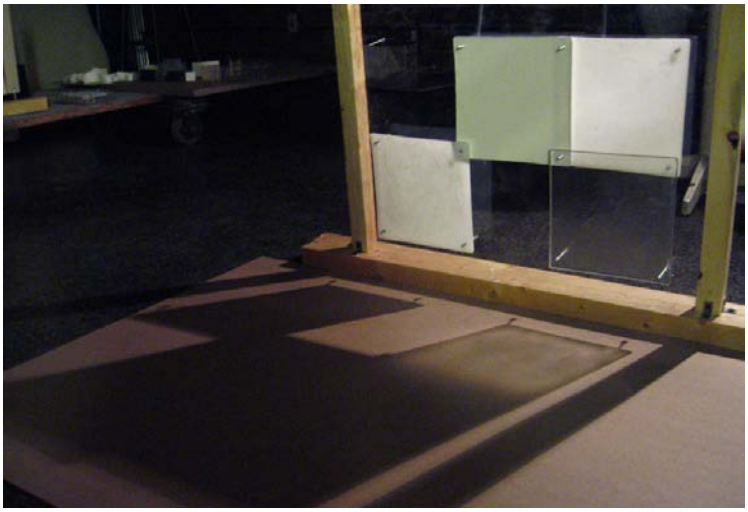
site model perspectives

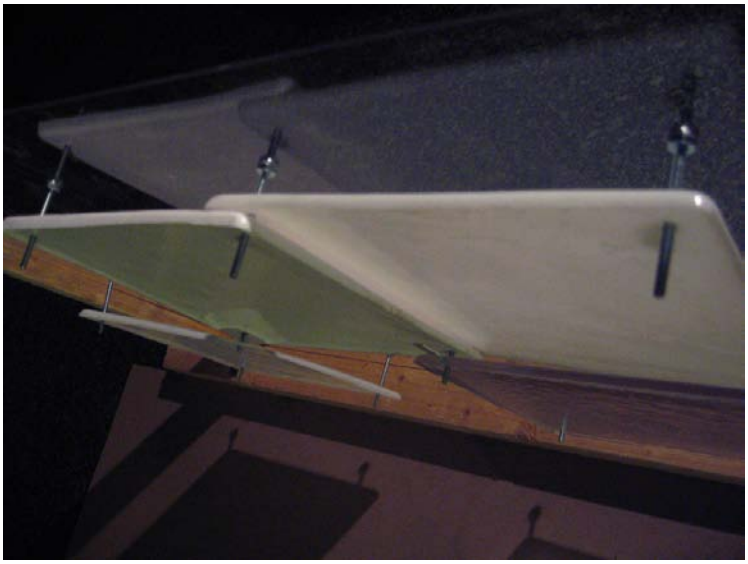


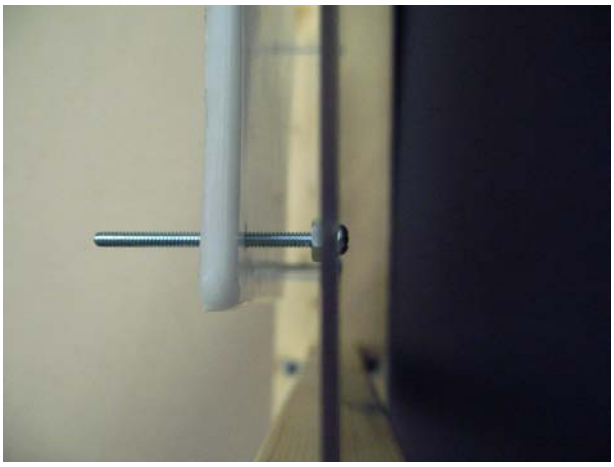
wall section models

developing from the previous string and nail concept model-a wall with pegs where tiles with varying opacities can be moved and layered

engages the user to create and change the pattern of light that filters into the space

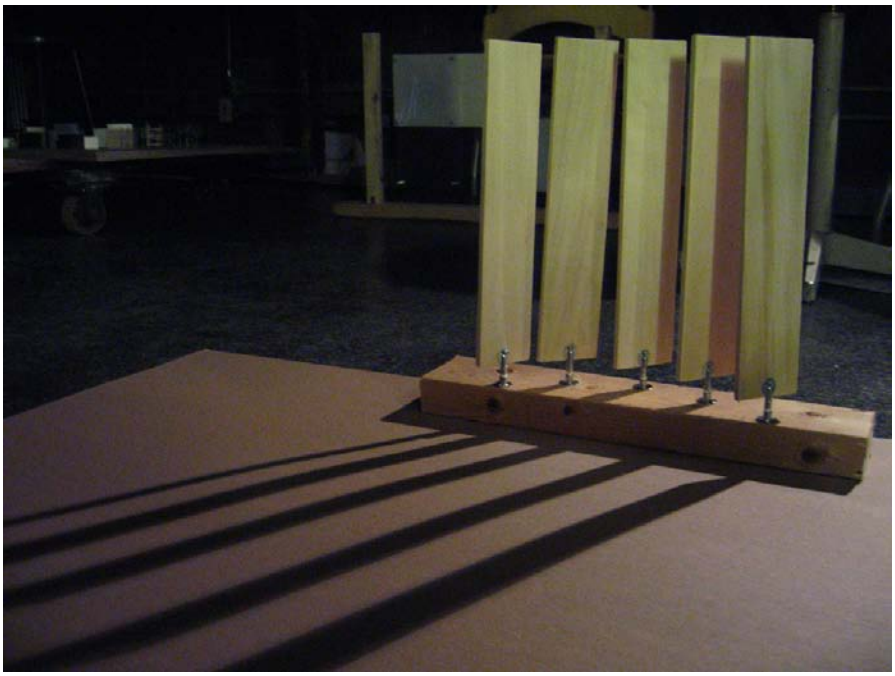




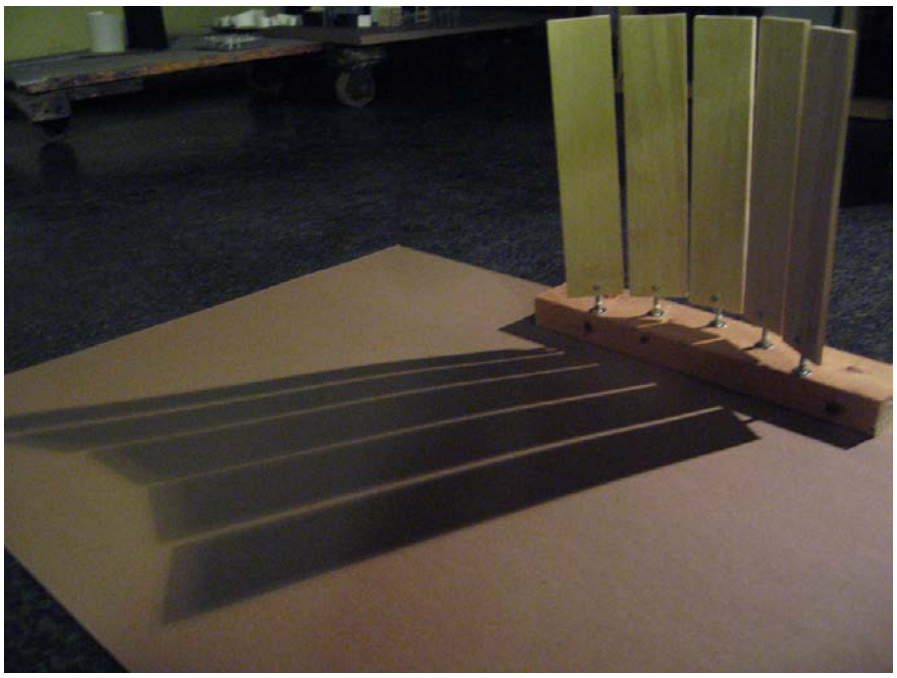


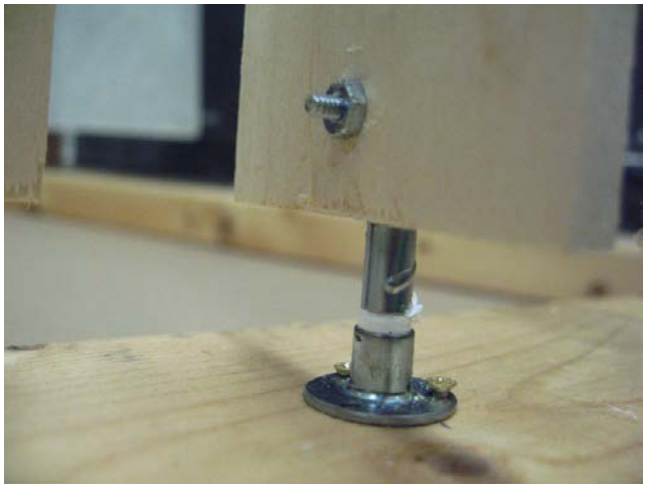
model details

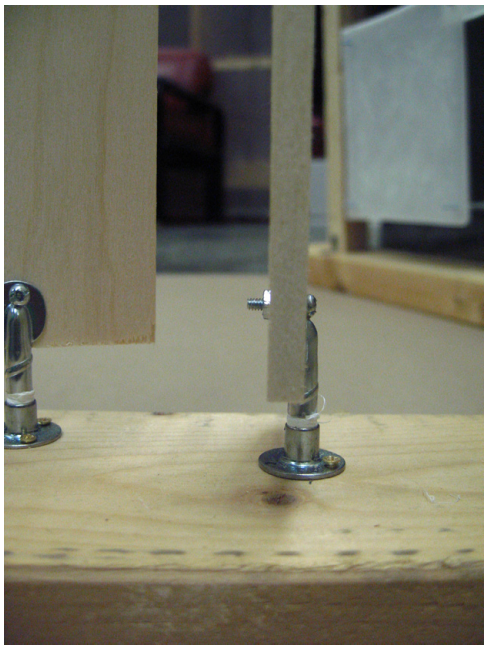
wall section models



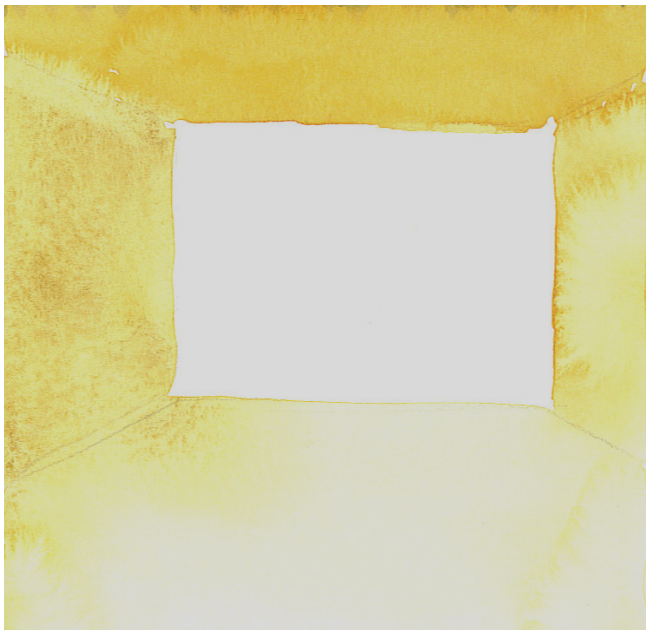
hinged louvres that allow the user to control the amount of light that enters the space-the exhibition space will allow the artist to enhance his work by focusing the light in the most desired position



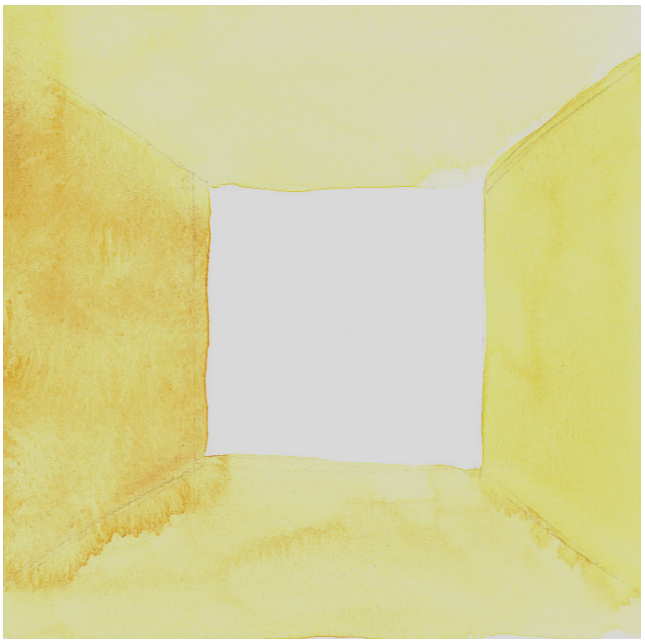


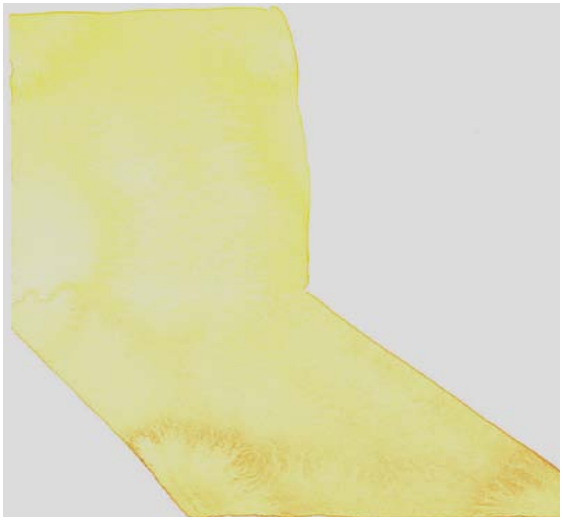


model details

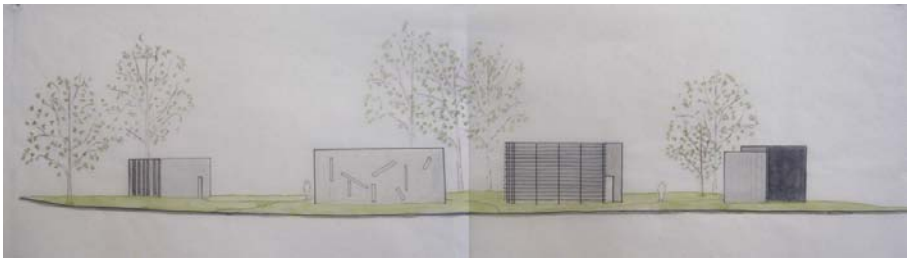


watercolor studies of the variations of light that can occur in one space. this study helped in understanding no surface treats light exactly like the next. thus the experience of space is determined by what the user decides to focus on.



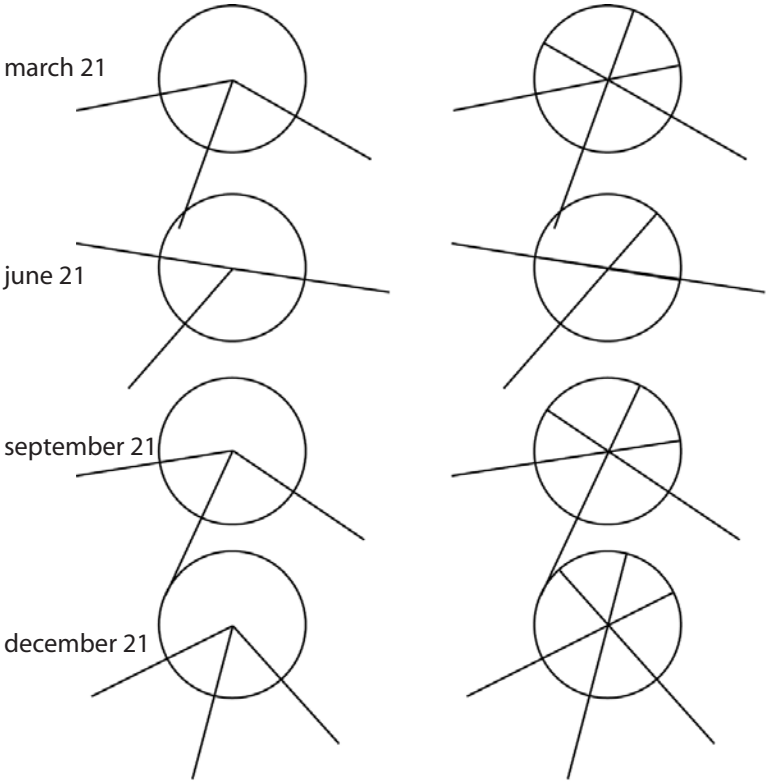


continuation of building forms and site layout

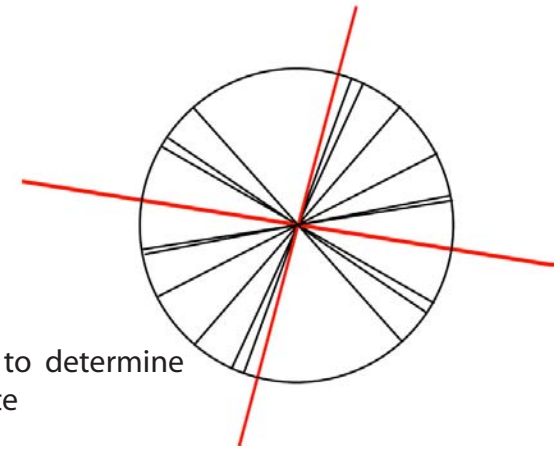


site organization

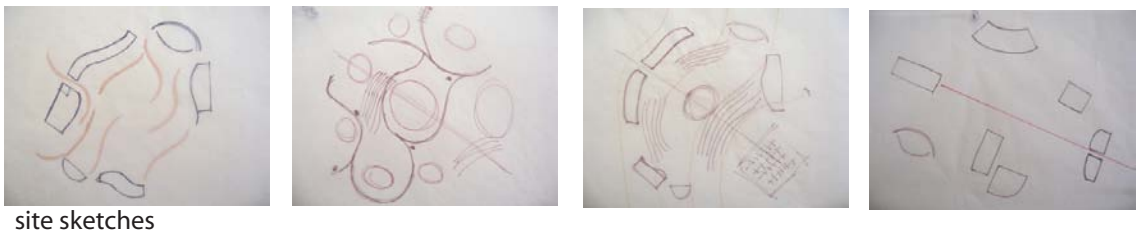
conceptual ink study of how space is created between objects



diagrams of sun paths throughout the day and months. used as an organizing principle to help layout specific building locations.

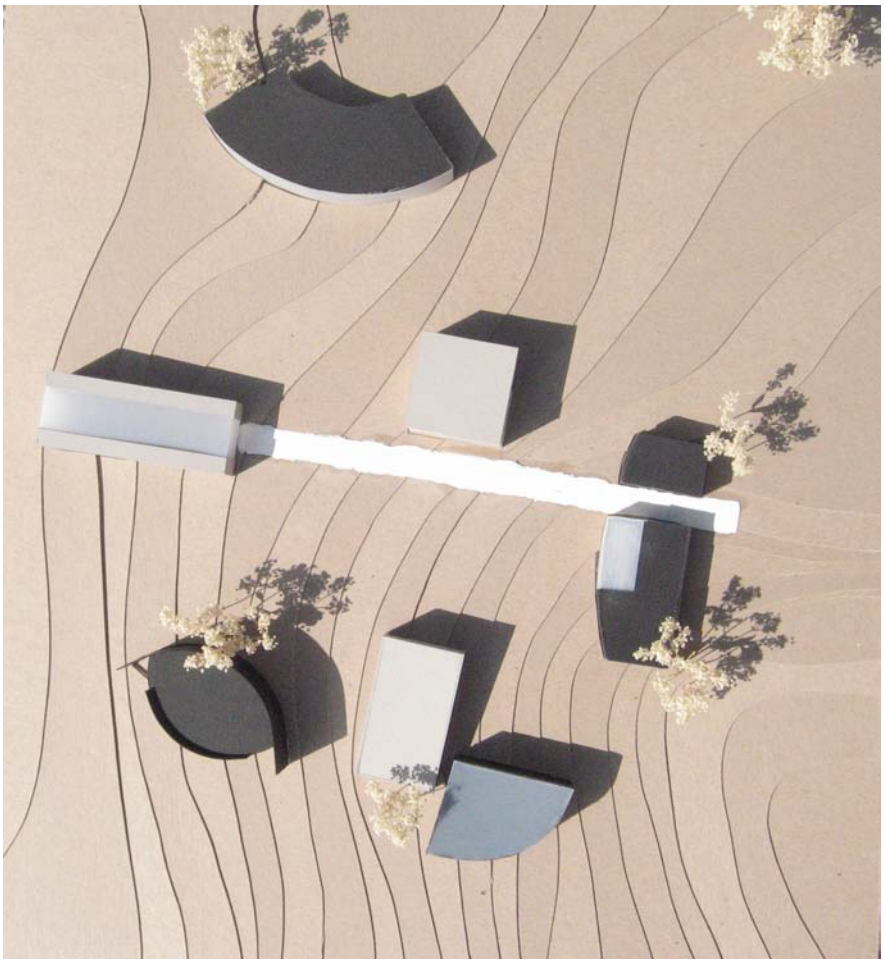


overlay of sun paths to determine the main axis of the site

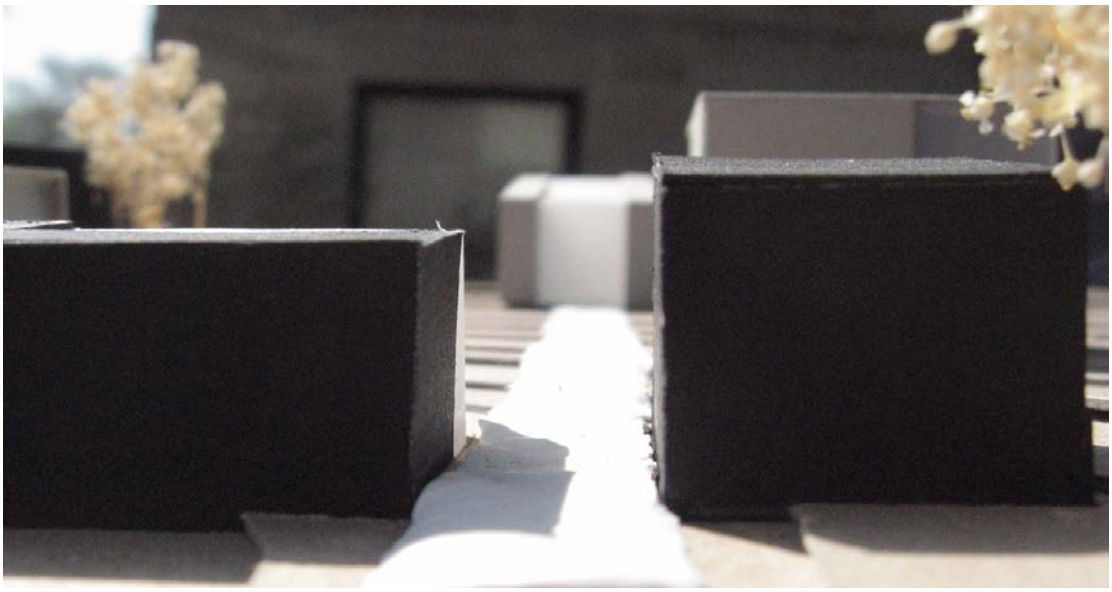


site sketches

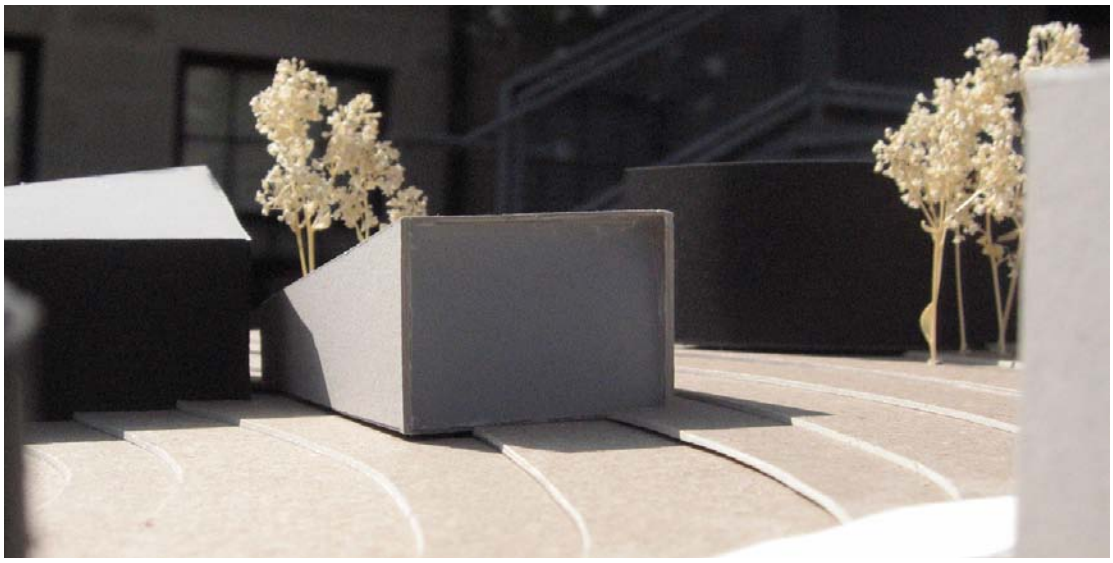
6.3 final design

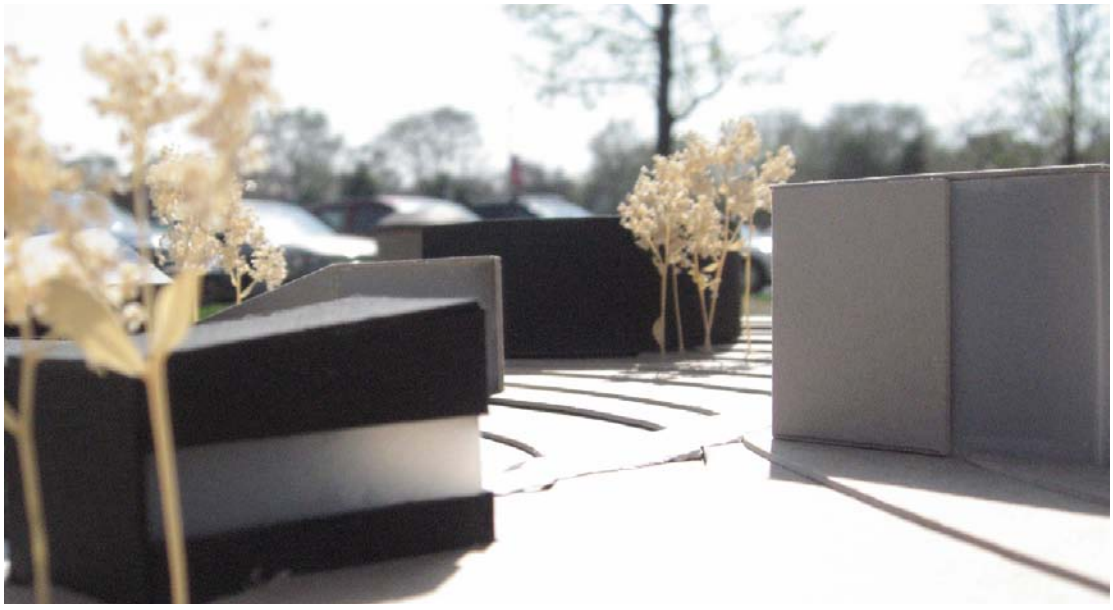


final site model



perspective viewing the path's ascension up the hill

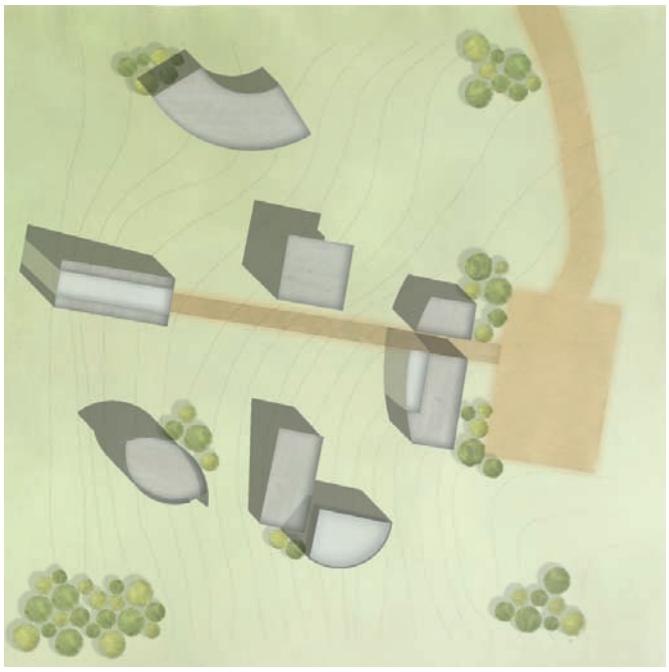




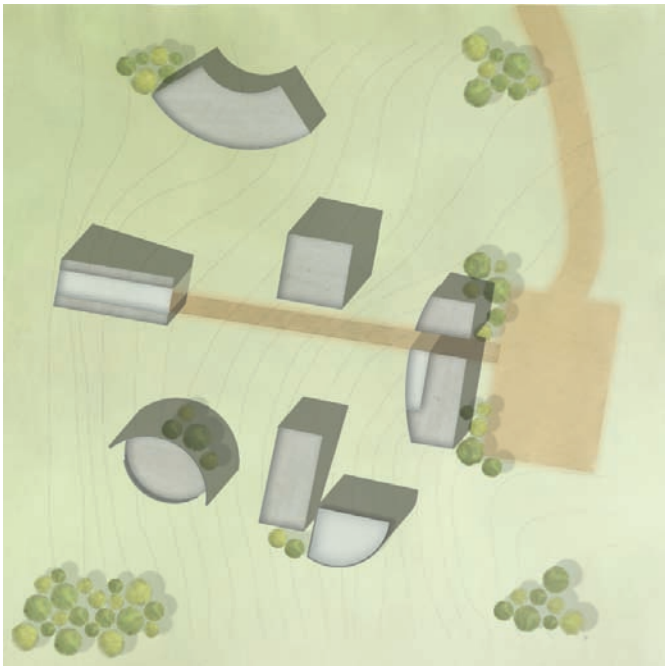
photos of the model-montages with site context

site plans

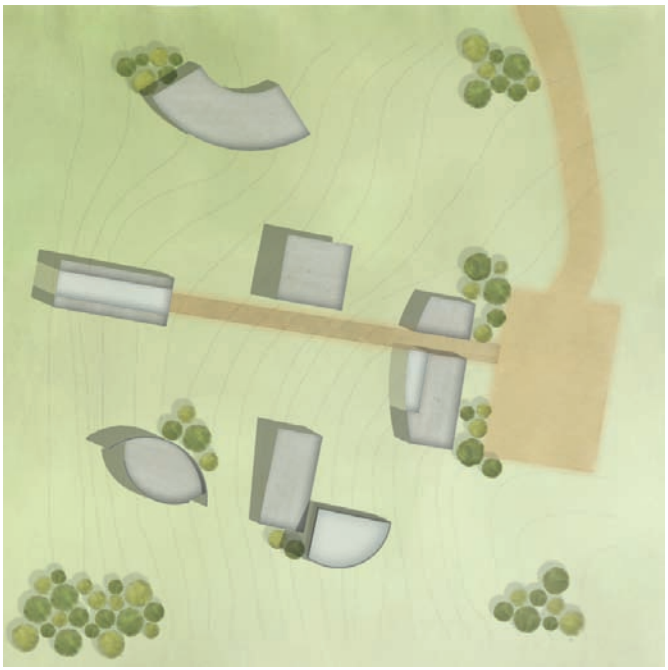
showing the changing shadows over days and months



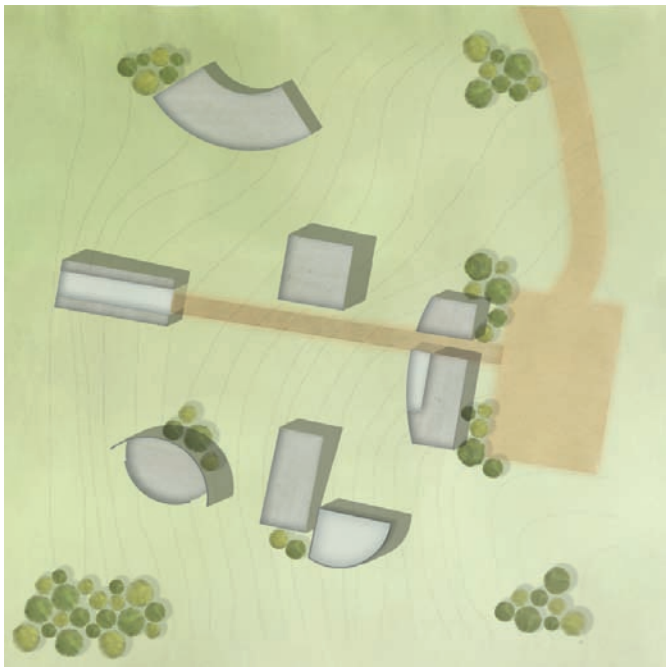
march 21-10am



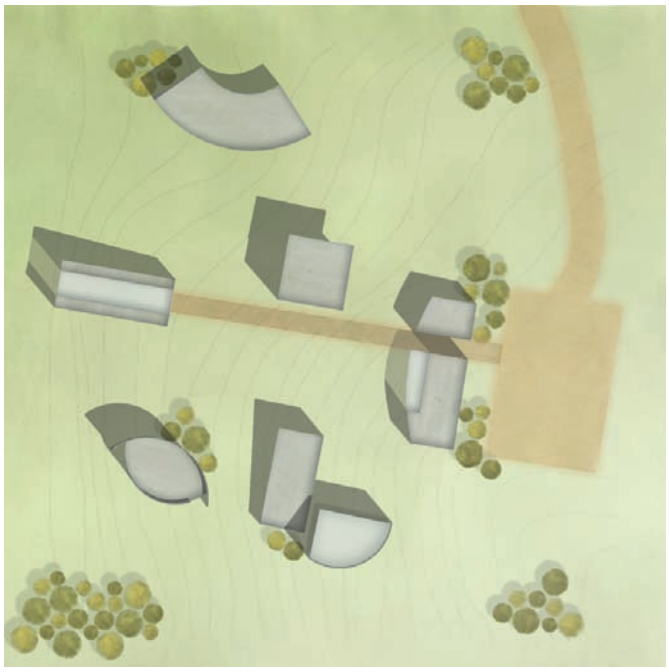
march 21-3pm



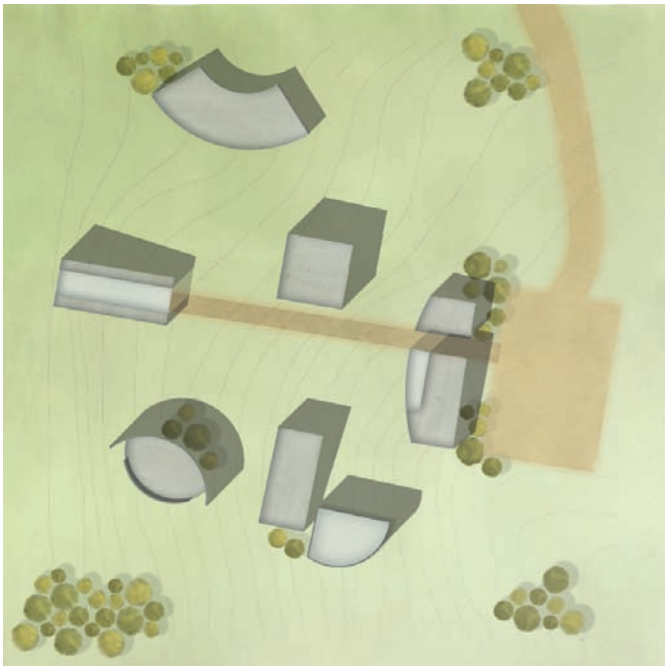
june 21-10am



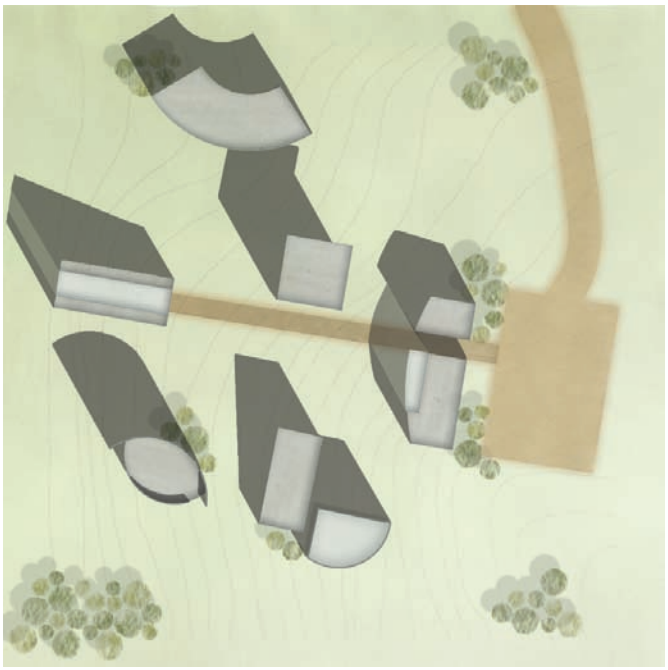
june 21-3pm



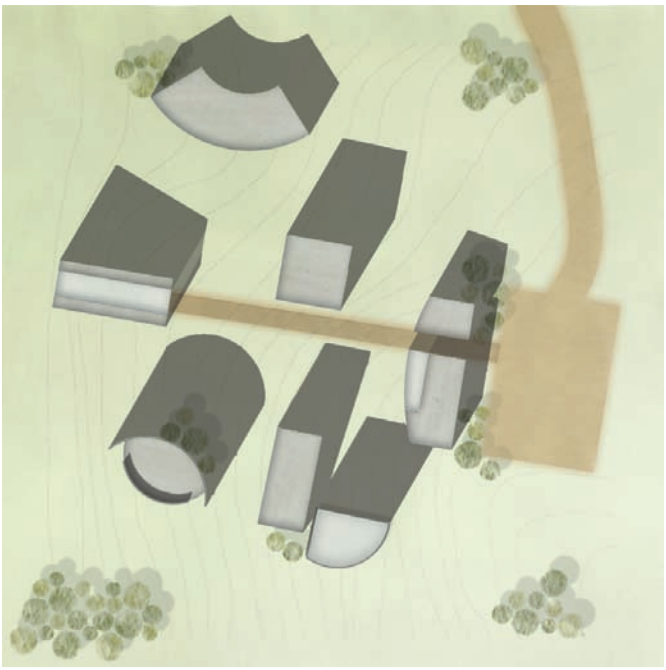
september 21-10am



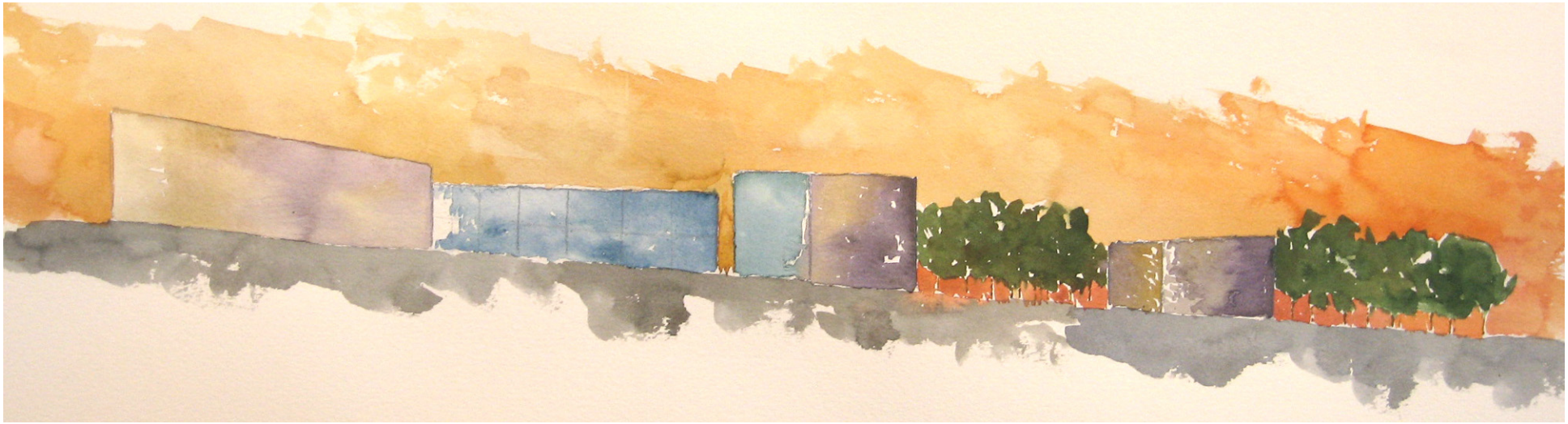
september 21-3pm

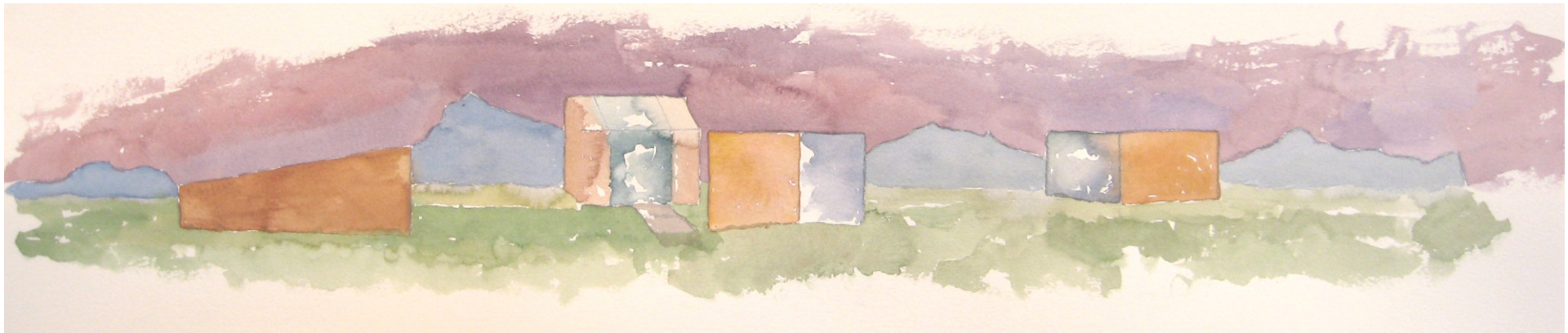


december 21-10am



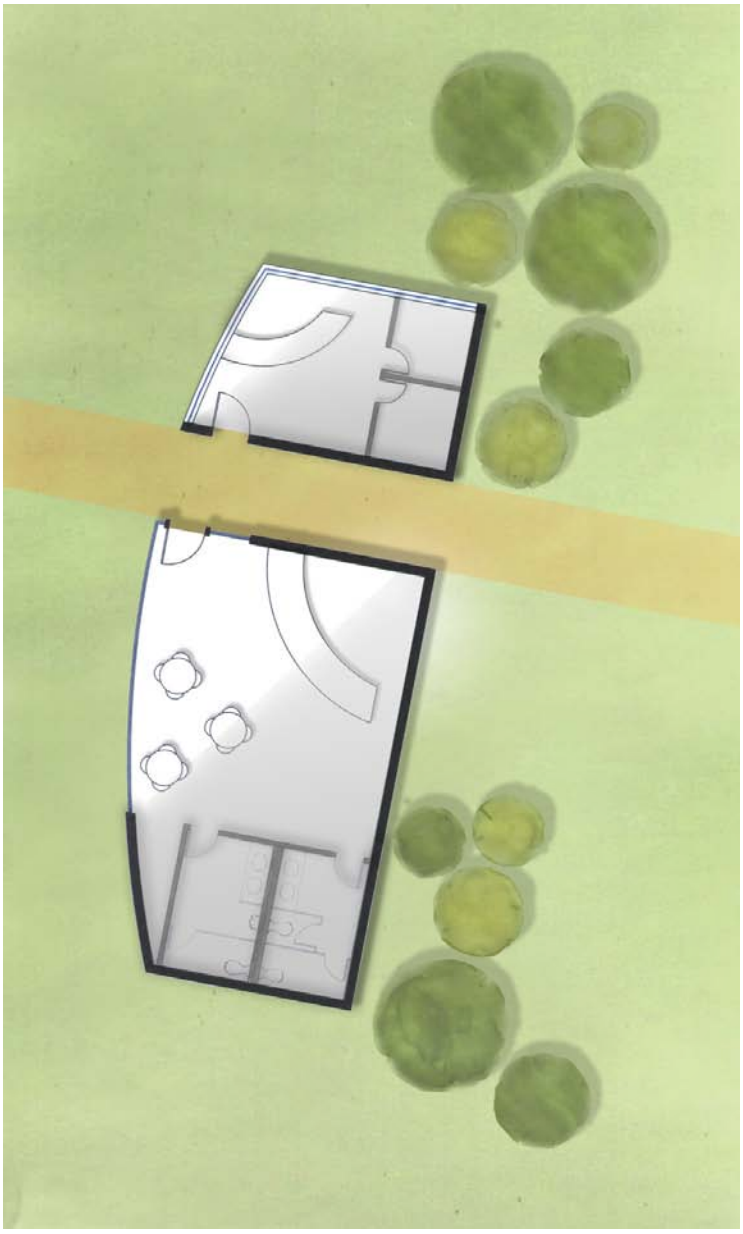
december 21-3pm



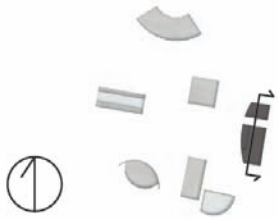


watercolored site sections

visitor's center



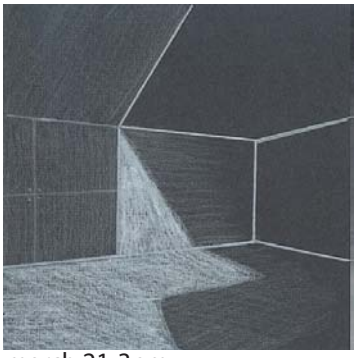
floor plan



section

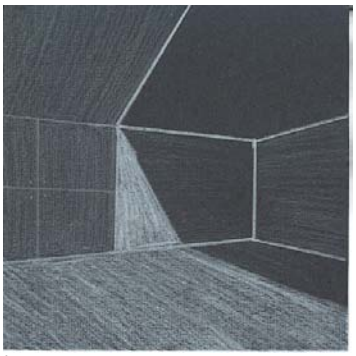
interior shadow renderings

march 21-10am

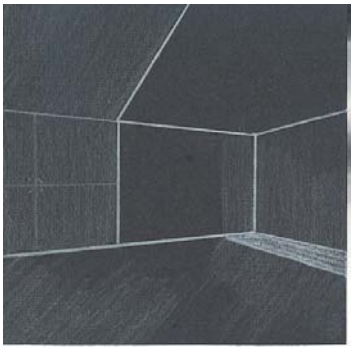


march 21-3pm

june 21-10am



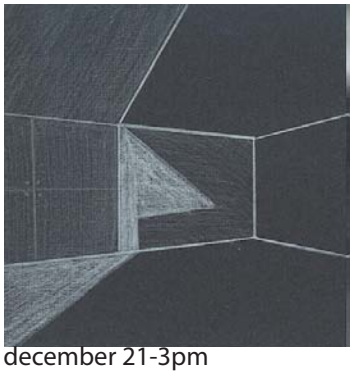
june 21-3pm



september 21-10am

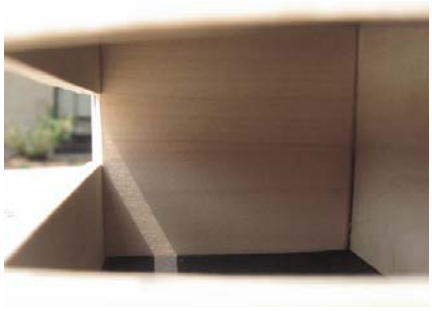
september 21-3pm

december 21-10am

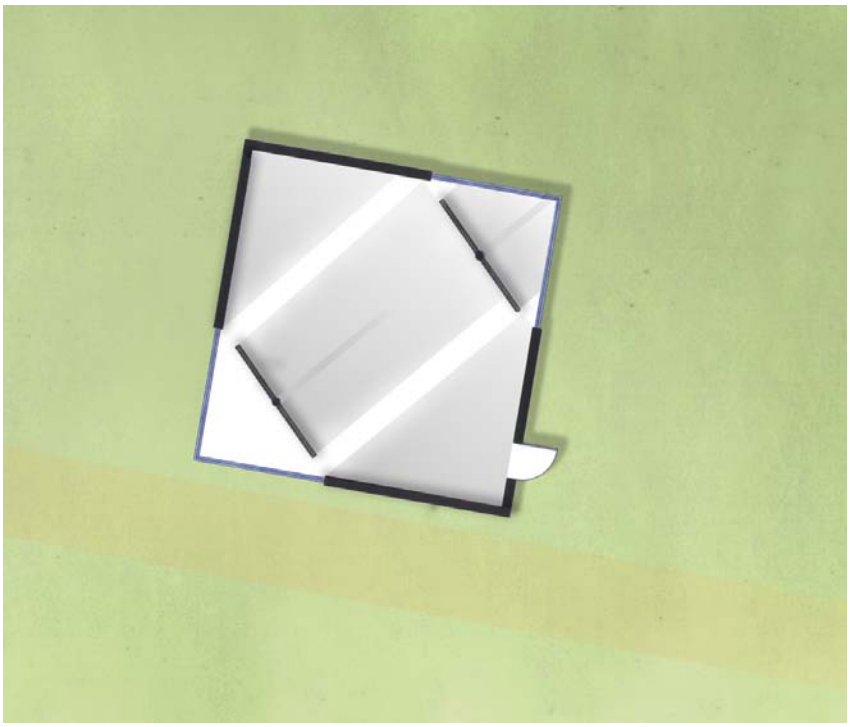


december 21-3pm

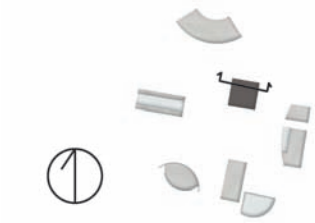
photographs of shadows

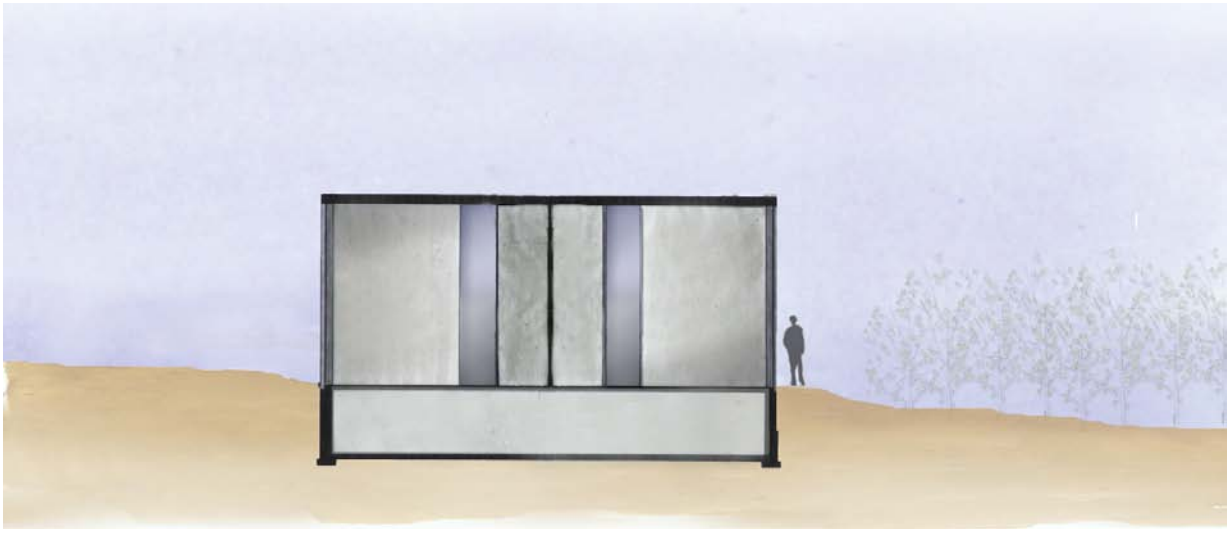


corner light gallery



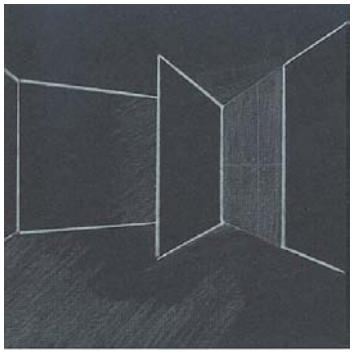
floor plan



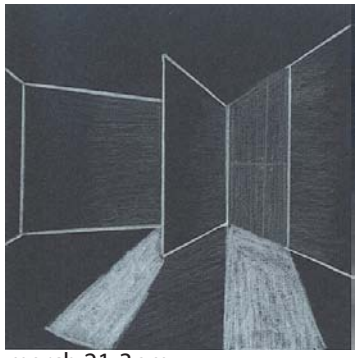


section

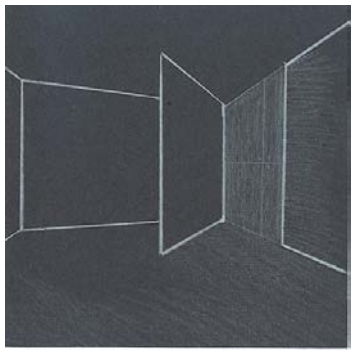
interior shadow renderings



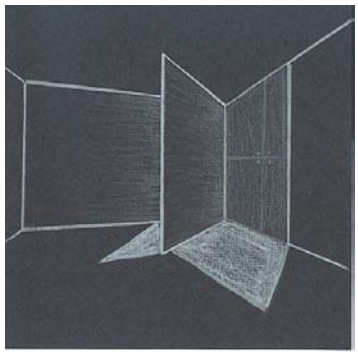
march 21-10am



march 21-3pm



june 21-10am



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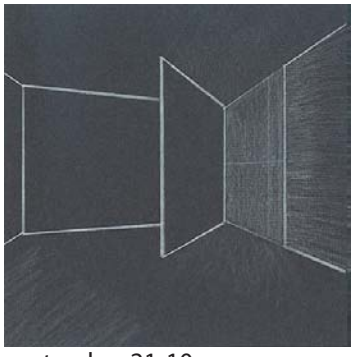
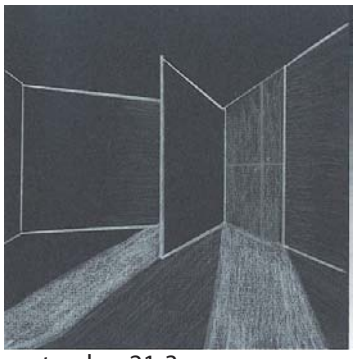
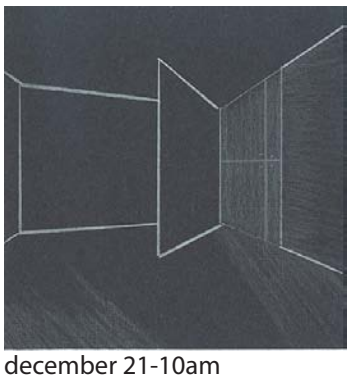


september 21-10am



september 21-3pm

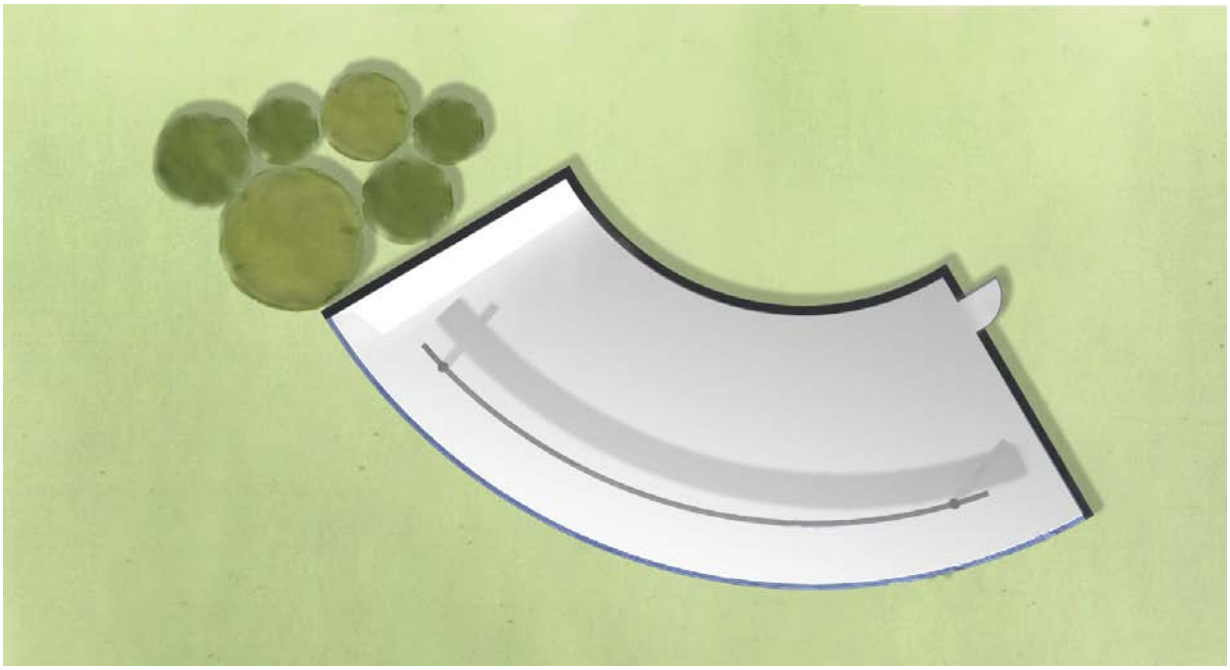


december 21-10am

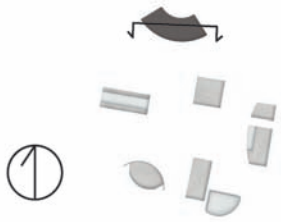
december 21-3pm

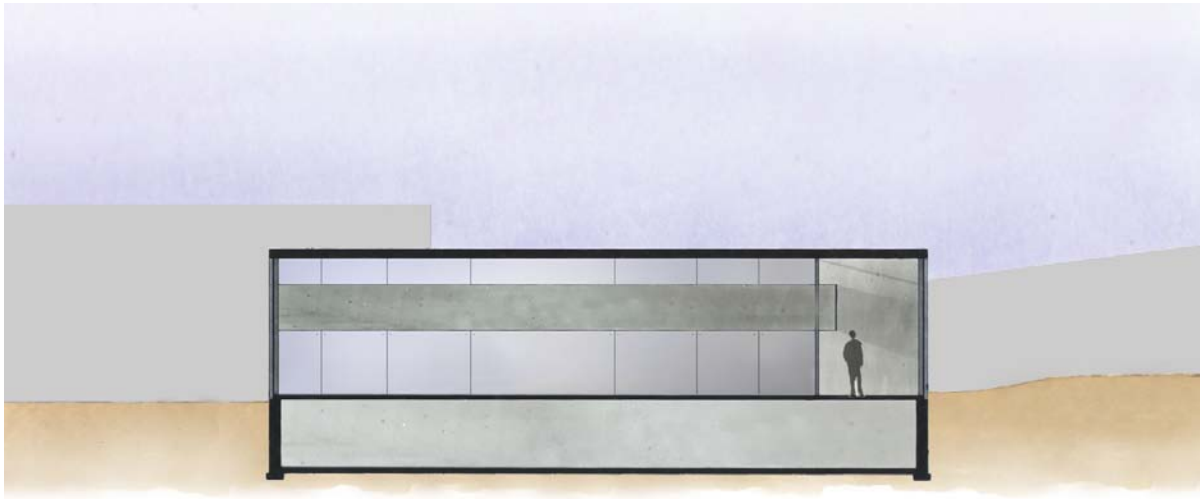
photographs of shadows

south light gallery



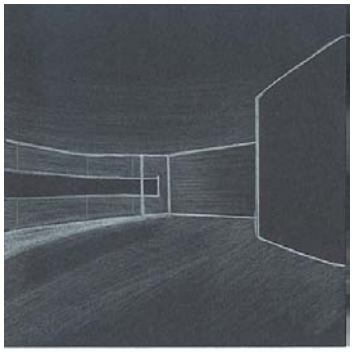
floor plan

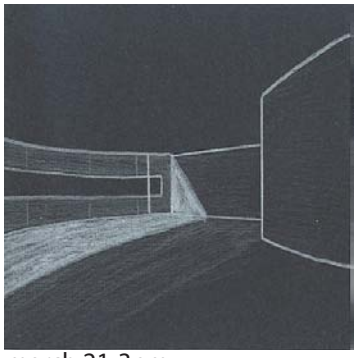




section

interior shadow renderings


march 21-10am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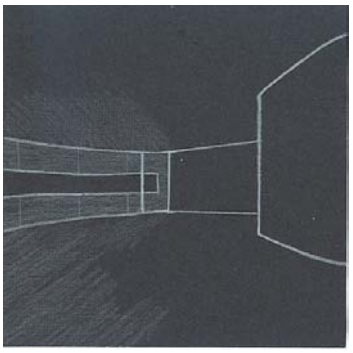
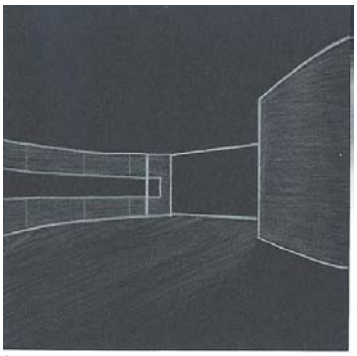

june 21-10am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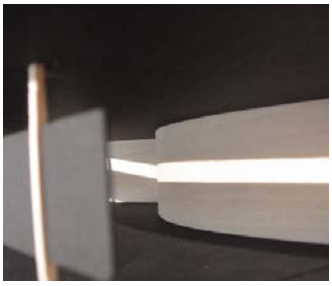
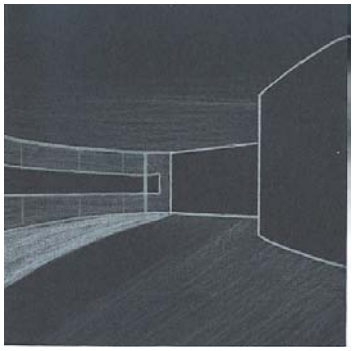
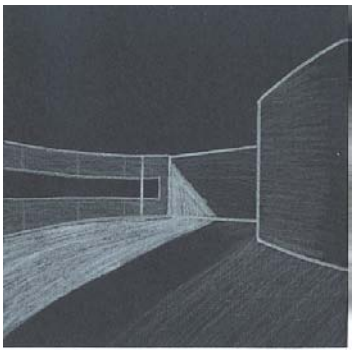



september 21-10am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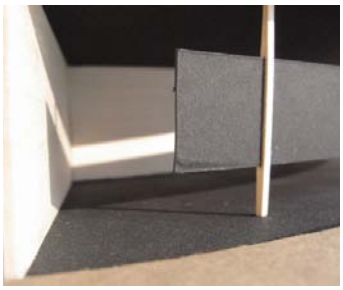
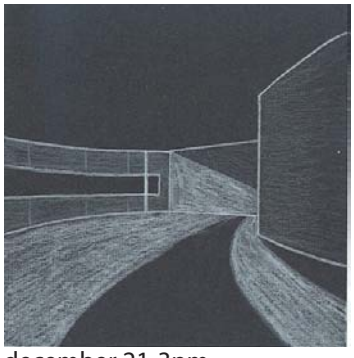
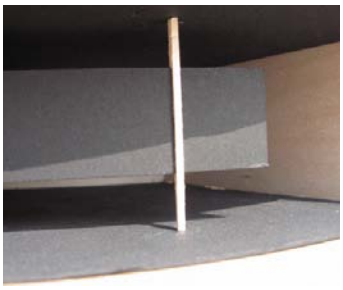
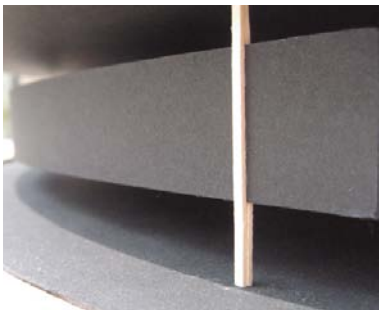


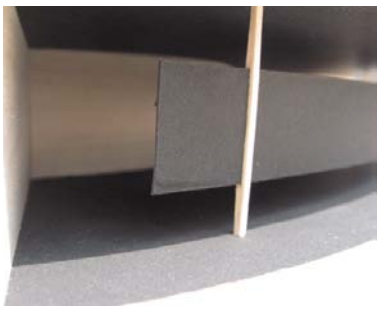
december 21-10am


december 21-3pm

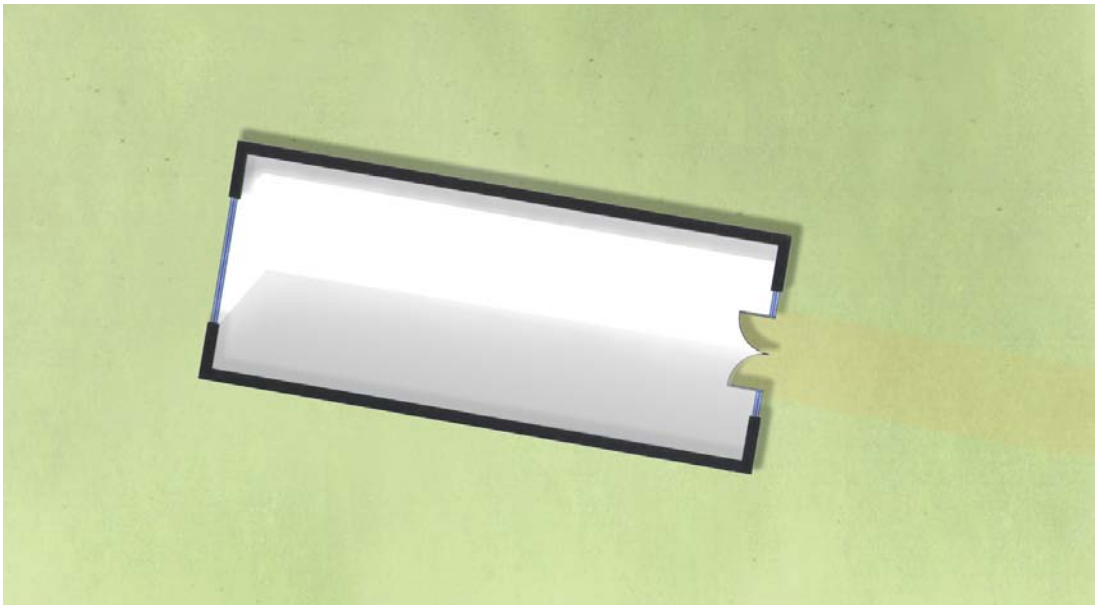


photographs of shadows

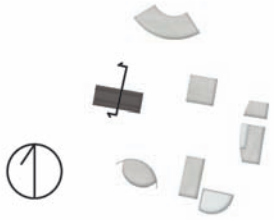




split light gallery

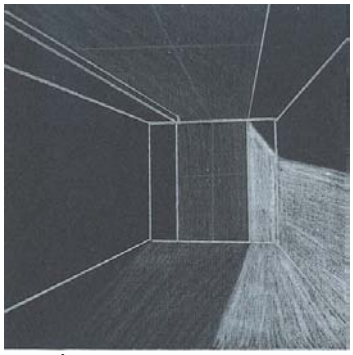


floor plan

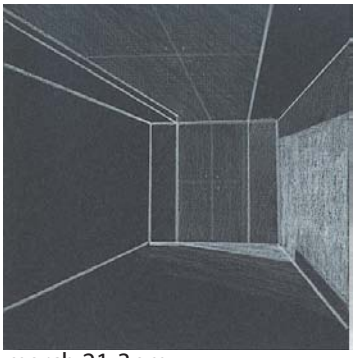


section

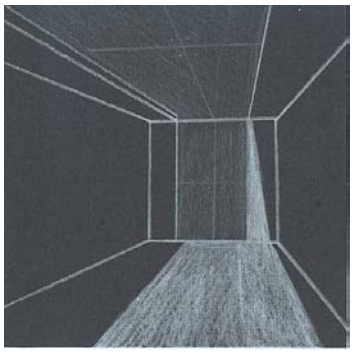
interior shadow renderings



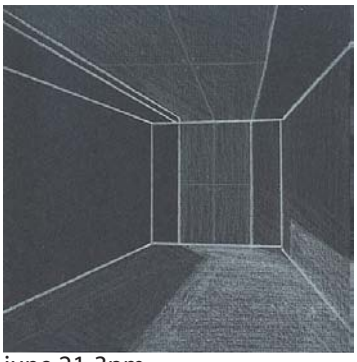
march 21-10am



march 21-3pm



june 21-10am



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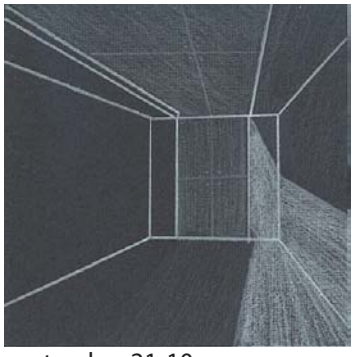
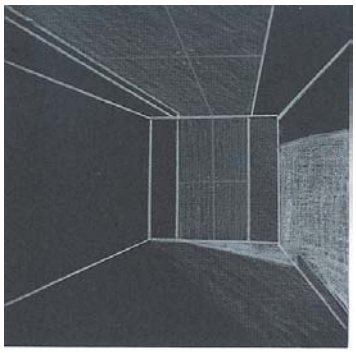


september 21-10am



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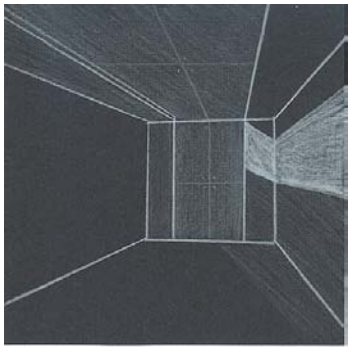
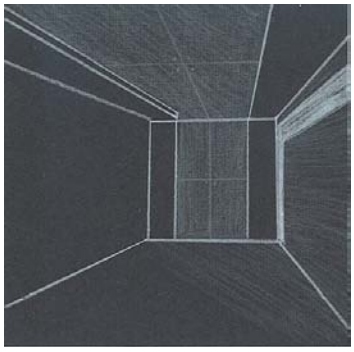


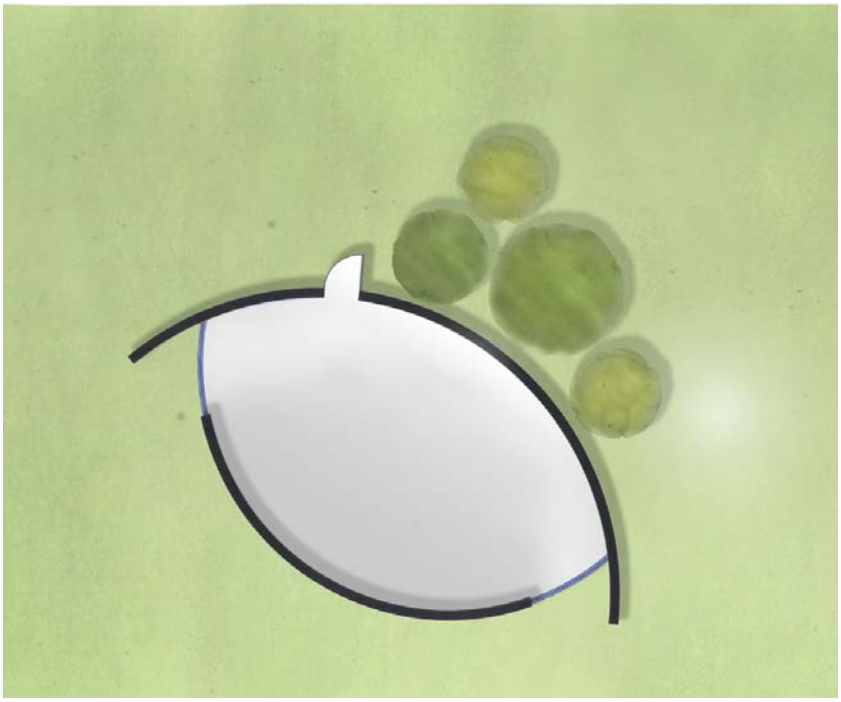
december 21-10am



december 21-3pm

photographs of shadows

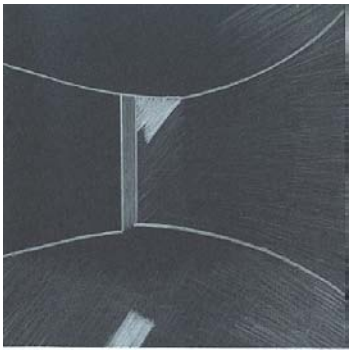
end light gallery



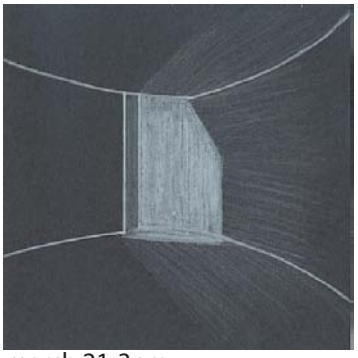
floor plan

section

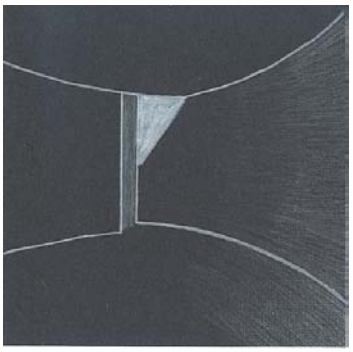
interior shadow renderings



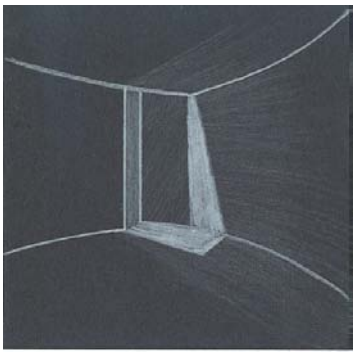
march 21-10am



march 21-3pm

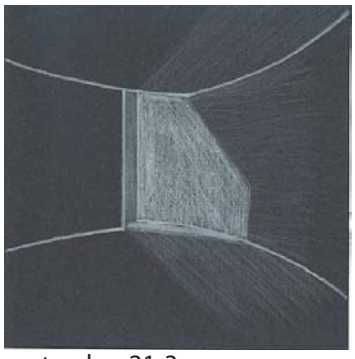


june 21-10am



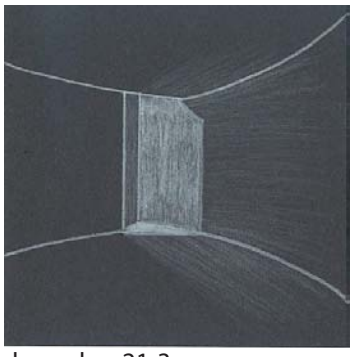
june 21-3pm

september 21-10am



september 21-3pm

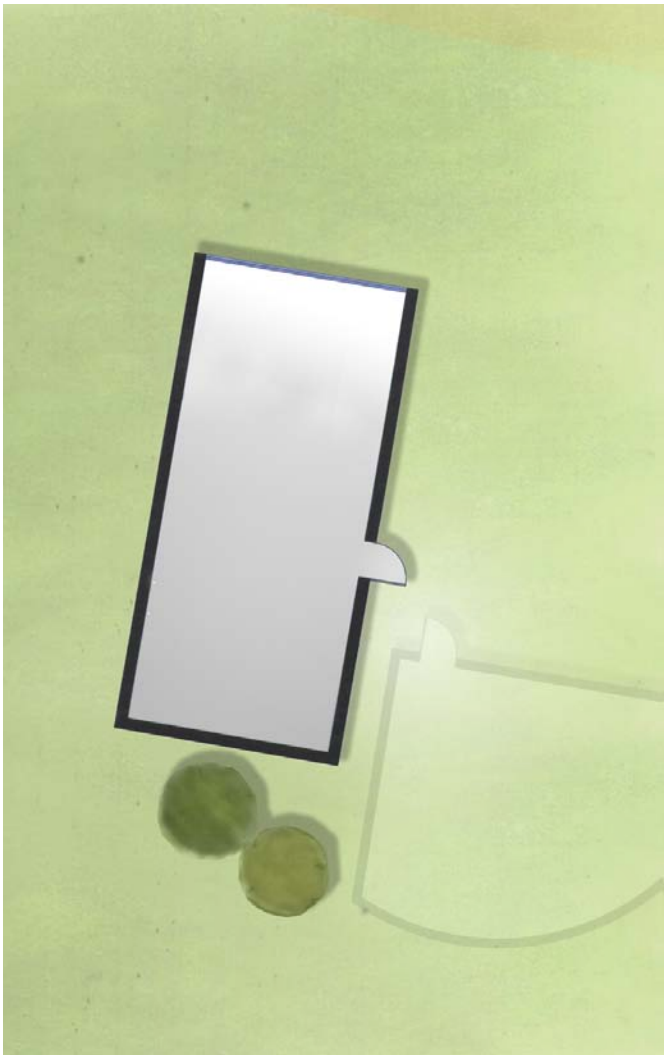
december 21-10am



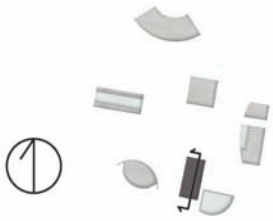
december 21-3pm

photographs of shadows

north light gallery

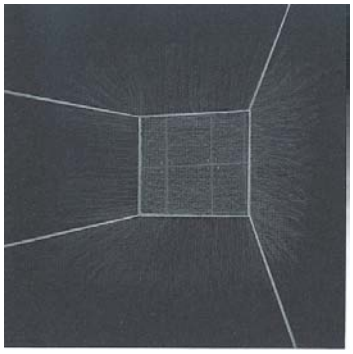


floor plan

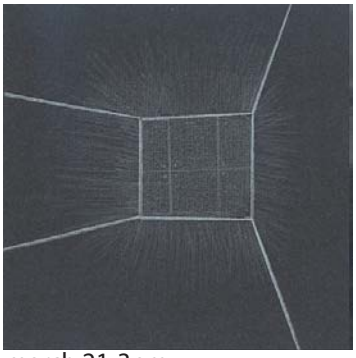


section

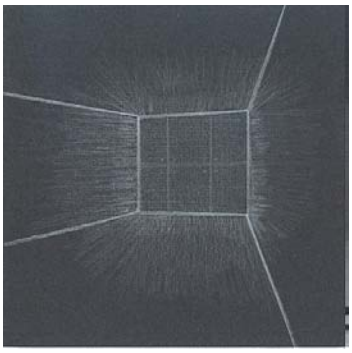
interior shadow renderings



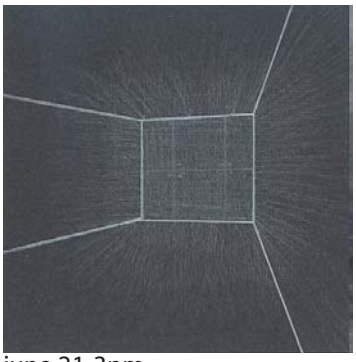
march 21-10am



march 21-3pm



june 21-10am



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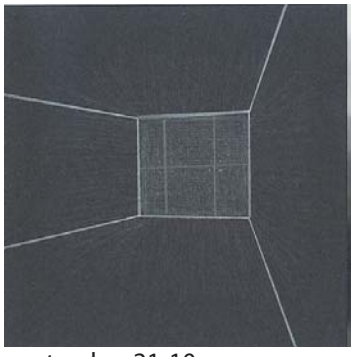
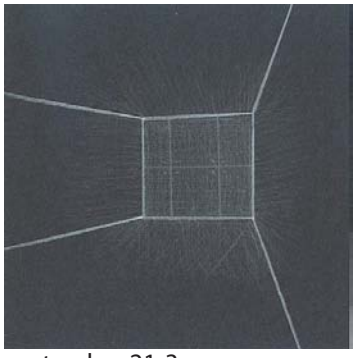
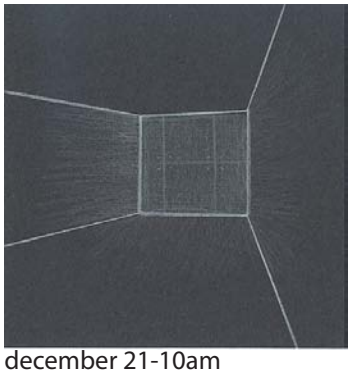


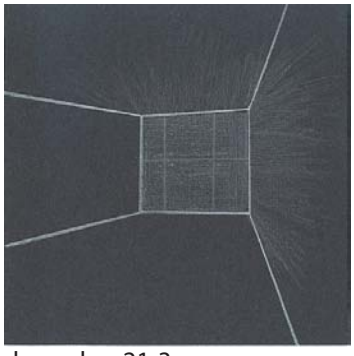
september 21-10am



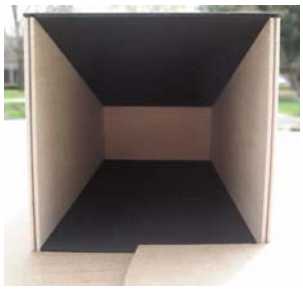
september 21-3pm



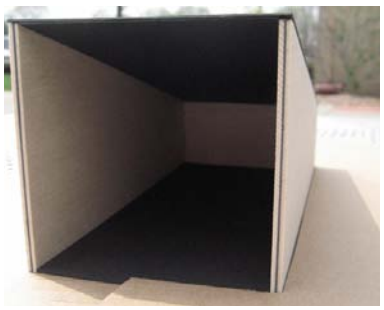
december 21-10am



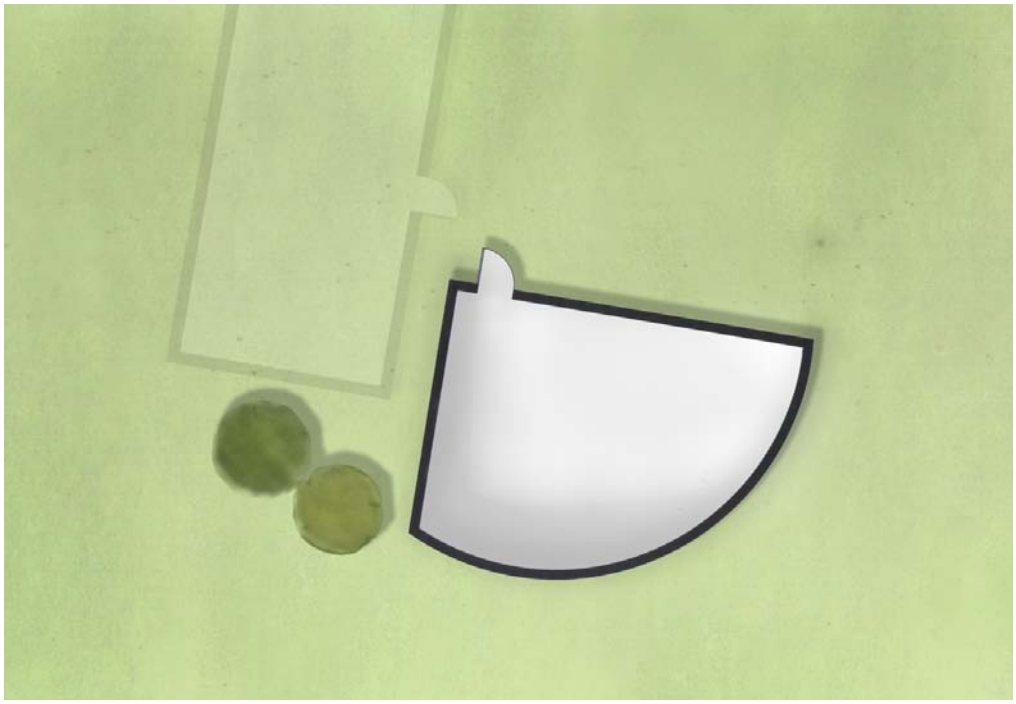
december 21-3pm



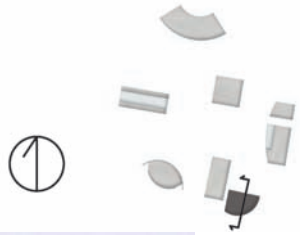
photographs of shadows

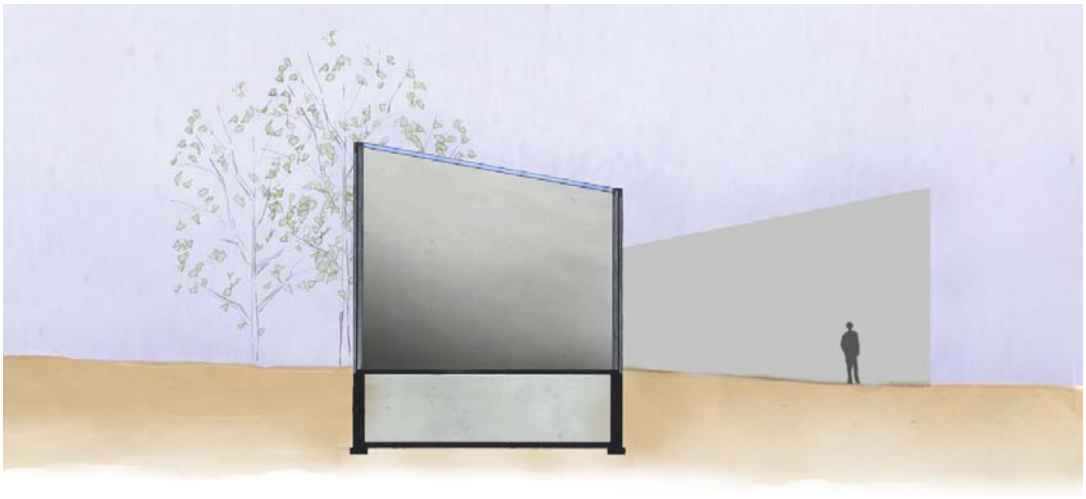


top light gallery



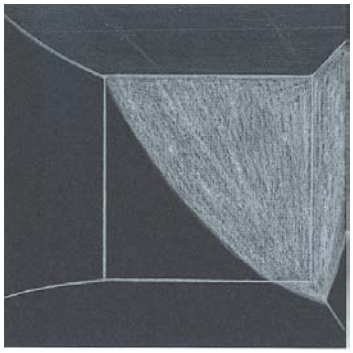
floor plan



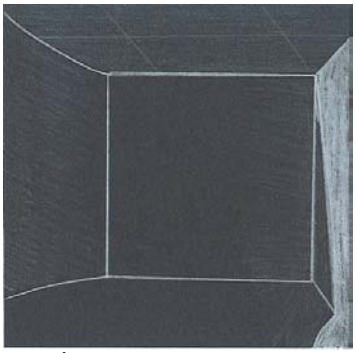


section

interior shadow renderings



march 21-10am



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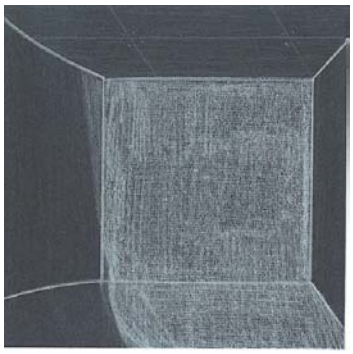
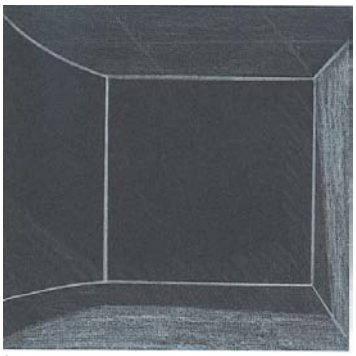


june 21-10am



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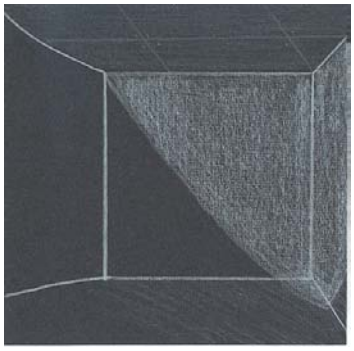

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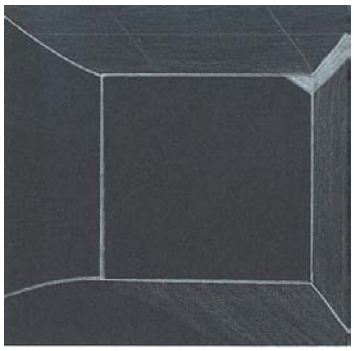
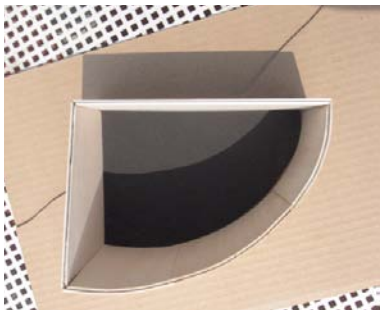
september 21-3pm

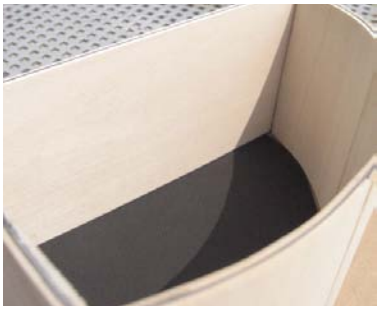
december 21-10am



december 21-3pm

photographs of shadows





7. final thoughts

7.1 conclusion

looking back over the course of the year, my thesis position only started to develop itself into a final building proposal. the challenge of doing a project using only natural light proved to be a difficult one. there are numerous aspects of natural light that must be explored, when trying to understand the affect it has on our experience of space. from pattern and rhythm to location and material. after exploring and researching these important factors, it was hard to translate them into a formal building. the search for a form was a struggle with how to incorporate all important aspects of light with creating a continuity of the buildings themselves. it came to be that the form was of secondary importance and it was more about the experience created inside the spaces. here location came to the forefront of determining building forms, and materials and pattern were not developed to their fullest extent.

more exploration of materials would have proved how much the experience of different spaces vary. the way light reflects off concrete and is absorbed by soft woods produce atmospheres and generate two distinct moods. it is important though to understand the materials do not have to be cutting edge, the simplest of materials provides enough variation of reflected and refracted light. 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.[16]

in the end, i also discovered this project could have been site-less. when exploring light, light itself should be the main focus and having a site seems almost arbitrary. yes light is inherently different depending on where one is located, but in the larger picture, the same affect can be achieved almost anywhere. what is this project where in an urban setting, or if i designed one building and sited it multiple places across the world. these decisions may have lead to a more fruitful exploration of how light reacts.

overall i feel i have gained great knowledge in understanding how light is filtered into spaces. the struggle was designing spaces that created the experience i was searching for. there were endless opportunities i could have explored and it was hard to narrow them down and create a cohesive museum/park. decisions i made may seem arbitrary, but they were made to create spaces between light and dark which would generate a specific experience. it is these experiences which make a place memorable, that bring us back. it is the play of light and dark which is every changing, no one moment is exactly the same as the next, and making the user experience that situation is my goal.

endnotes

1. Millet, 1
2. DAM, 64
3. Millet (Meyers), 160
4. Millet, 6
5. DAM, 64
6. Pallasmaa, 46
7. Bloomer and Moore, 37
8. Pallasmaa, 47
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11. Millet, 1
12. Millet, 93
13. Millet, 164
14. Marion Weiss
15. James Turrell
16. Louis Kahn

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