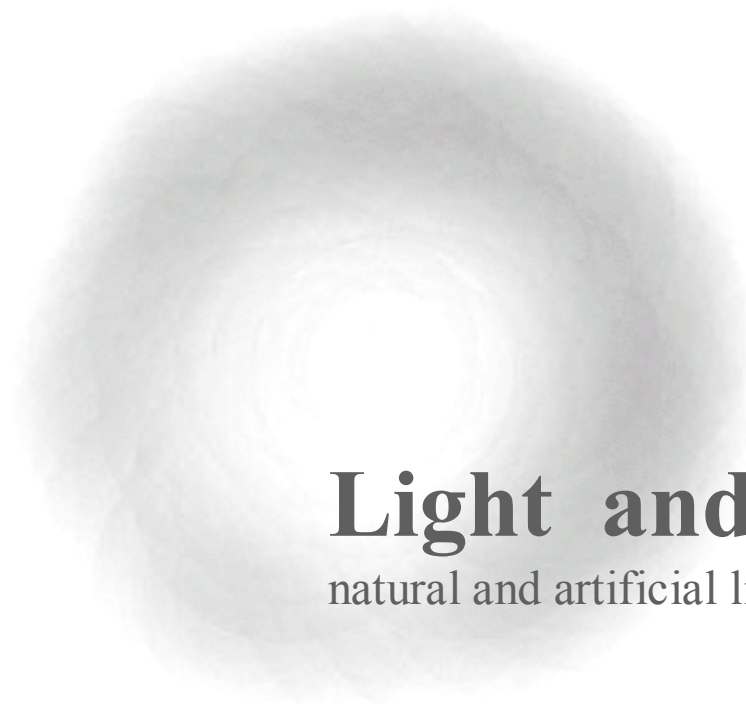


Light and Space :
natural and artificial light
in spaces



Light and Space

natural and artificial light in spaces

Guided by :Prof. Suresh Sethi
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IDC, IIT Bombay
2002-2004



Light and Space :

natural and artificial light
in spaces

Approval sheet

This special project entitled ‘ Light an Space:
natural and artificial light in spaces’, by
Vidya Joshi, roll no. 02613013, is approved for the
partial fulfillment of the requirement for the
Master’s degree in Industrial design.

Guide: _____

Internal examiner: _____

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Light....

Light is universal.

The sources of universal light are the sun and the stars. In the form of the sun, it is the source of all life. It drives all our known biological processes.

It is the maker of the world.

It is one of the principal 'makers' of the world; one of the *panchamahabutas* – elements of life. It is the medium through which we not only 'see', but also directly 'experience' our surroundings- without light; we cannot comprehend and appreciate colour, depth, space or volume.

It is the source of transformation.

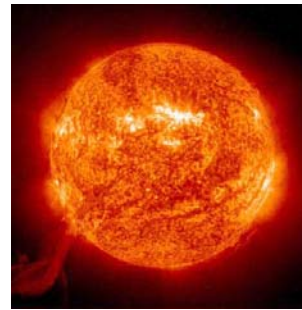
It has the power of transformation of night into day...
..of darkness into brightness. Light can determine our deepest emotions and moods.



Motif at the Deeg
palace, Bharatpur,
India

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Sun, the source
of universal light

It is mystifying.

ever-changing nature...
...innumerable hues...
...element of unpredictable change...
...ability to create an atmosphere...
...like a divine revelation by an unknown power.

Light captivates us.

It inspires art, literature, science.... our culture as a whole. Light has been seen with curiosity and wonder since pre-historic times. References to the magic and power of light are found in different cultures across the world. Mythology also talks elaborately about light.

Light as God

In ancient cultures, Sun is considered as God. Hindu and Greek Cultures talk of the Sun as the source of universal light, dispeller of darkness and destroyer of evil. It has been associated with the divine, glorious and dynamic

Helios, the Greek Sun god,
young, handsome, crowned
with a circlet of rays.



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The sun as space

The sun temple at Konarak, Orissa

It is a pageant of human grandeur, in its perception and execution.

It is built as a colossal chariot, with 24 wheels, pulled by seven horses, and has a three-tiered pyramidal roof topped off by a fine spire. The spokes of these wheels serve as sundials, and the shadows formed by these can give the precise time of the day.

The chariot, represents the seven days of the week, and the 24 hours of the day

Impressive sculptures depict every aspect of life.

There are several temples with the Sun God as the principal deity. Many of these shrines are designed such that the sun's rays illuminate the sanctum (of Shiva) on certain days of the year.



The planners of Konarak visualized the Sun god standing in Time's winged chariot, harnessed to a team of seven spirited horses, blazing his way across the heavens from dawn to dusk. This imaginative allegory must have tempted the temple designers to translate the myth into stone for everlasting permanence.

n a t u r a l l i g h t



What is interesting about this is we are not actively aware of its presence till we are deprived of it. This may be because it does not provide any visual excitement to the eyes to notice.

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There but not there...

Two aspects/ qualities of light can be realized: diffused (ambient??) light with a quality of ‘there but not there’. This light is felt rather than seen. It is not seen as ‘light’ itself. We realize its presence by seeing the objects that surround us. It has a character of omnipresence.

The changes in character of this light are very slow and subtle ... many a times we don’t even realize the change of morning to noon, noon to afternoon and afternoon to evening. This light is the part of the surrounding and plays a significant role in forming the ‘feel’ of a space.

This light is more or less a passive element in the atmosphere, more or less homogeneous when static or in change and could be called as ‘illumination’. When we say that a space is not well lit, it is this quality of light that we are talking about.

n a t u r a l l i g h t



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Light as light...

The other aspect of light surfaces when it is seen as 'light' itself defined by different profiles, forms or patterns. This could be called 'play of light, shade and shadow'. This is the most exciting aspect of light as it results from the reaction between light, form and space. The changes in character if light are more dramatic and distinct here and provide lot of visual excitement.

Natural light entering a space through an opening forms pockets of brilliant, shaded and dark areas in the space. These areas then become focus points for the play of light. Such spots in day-to-day spaces then become identifiable with that particular time and place. This has an important role in building the character of the space.

Onlookers remember that space with respect to a specific pattern of light and shadow in pockets of that space-image building of a space.

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Regular habitants of a particular space may not very consciously 'notice' these phenomena of light in space and at first thought, these may seem to be too ordinary to even attach any importance to them, but one can't deny the fact that sub- consciously we do identify a space with a specific feel or character and light plays a major role in defining it.

(Supported by user statements- when asked to think of the particular space, the image that formed in their mind was always of day time- of noon 10.00- 11.00 or 3.00- 4.00 p. m. when the space was most active in terms of reacting with light- patterns of shadows, ambient light)

It is interesting to see that hardly any 'space- images' of ours are actually of nighttime unless we specifically think of it as 'so and so space at night'. But when we think of Diwali, the first thing that comes to our mind is lot of lights and firecrackers. This is because Diwali has a direct association with lights and also because Diwali lamps and firecrackers have a distinct experiential quality.



Classroom,
IDC, IIT Bombay



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Light and space

The character of light in a space depends a lot on the orientation of the space in relation to the light source (in case of natural light, it is position of the sun, extent of cloudiness in the sky, structures/vegetation surrounding the space and many more).

Also it depends on the 'formal character of the space- the play of light and shadow in a columned corridor would be distinctly different than in a dome structure with a skylight on top.

Many a times, the most distinct character of the space is dramatized by this play of natural light and shadow-light only enhances the columned quality of a corridor (by way of shadows), which is its most significant visual character. At the same time, it is interesting to see that light can also be used to totally change the character of a space, totally break it down and give it a 'new form' (meaning change the way a space is perceived).

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How do people perceive the character of a space?

What role does light quality of a space play in forming the 'image' of a space in one's mind?

Are any images of day-to-day spaces related to artificial light – which spaces and in what way? Why?

Most of the works of lighting design focus on the following:

General purpose and task lighting

Brilliant Illumination

Light and Space art

General purpose and task lighting :

This is more to do with designing lighting for indoor spaces for general illumination and specialized tasks. The focus here is providing enough light for comfortable visibility while doing a particular task. This is designed by taking into account various factors such as light direction, kind of lighting, and kind of activity. A lot of work has been done by companies like Wipro, Philips, etc. which specialize in providing general lighting and task lighting to spaces.



General purpose and task
lighting in offices

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They also design lights and fixtures for appliances, automotives, external lighting for monuments and external spaces (urban lighting) .

These companies survey the site and produce data about the quantity of light required in measurable units. They have, over the years, developed standard fixtures for different types of lighting, which are mostly used. If required, they do develop customized fixtures for a particular site for customized solutions. Realizing the importance of lighting in the entertainment industry, they have developed halogen and gas discharge lamps for the specific use in this industry.

Most of the leading companies have recognized the potential of experiential quality in lighting design. They collaborate lighting designers, architects, urban planners, etc. resulting in impressive lighting schemes. Also they now concentrate on giving more and more customized lighting to the customers.

The lighting products in this category belong to the utilitarian purpose in lighting. They are discreet and compact results of the progressive miniaturization of light source technology. They emphasize energy efficiency and perform their task unobtrusively.

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Chandelier in Kawasaki civic plaza, Kanagawa
Source: My world of lights, Motoko Ishii
Lobro Port Co. Ltd.

Brilliant illumination

Lighting is not only something technical, but something creative. Lighting designers like Paul Henningsen, Ingo Maurer, Motoko Ishii and many others have successfully put forward this idea by focusing on the artistic and aesthetic potential of lighting, as opposed to purely technical calculation of illumination. These people have overcome the traditional division between the world of light fitting or luminaire design – design of instrument or fixture that directs or diffuses light- and the design of the light itself within an architectural environment.

The evolution of the modern electric light fitting is partly rooted in art and partly in industrial design. It is a field that has advanced constantly, spurred by technological development (new materials and new light sources), social and economic changes, (rise of the middle class with more buying power and need for a style statement), and aesthetic movements (from Art Deco, Machine age themes to Post Modernism)

But it was not until a pioneering group of stage lighting designers in America in the 1940s and 50s began to take their skills outside the theatre into public and commercial spaces that artificial lighting was given any real artistic consideration in architecture.

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Source: My world of lights, Motoko Ishii
Lobro Port Co. Ltd.

What is lighting design?

Art, science and space

As an artist uses tools to create pictures, so does the lighting designer uses sources to create lighting as **art**

Only technical aspects of lighting design have been concentrated on for more than a hundred years, but **science** is indeed essential for design

Light is the first thing people see in **space**. The shape of the space changes with light.

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James Turrell, *Afrum Proto*, 1966
Quartz Halogen Projection

Light and space art: the minimalist approach

These are experiments made exclusively with Light and Space.

In the mid-1960s a small cluster of artists began intense investigations on art. Each of them began to discard selected truths about art and to build a structure within which ‘new truths’ could be examined. The terms *art* and *object* are virtually synonymous, yet for a decade and half, these artists produced no objects. Light and dark, sunlight and shadow, time and space, sound and silence, fire and smoke were their original materials.

Eventually they began to utilize far more complex media and methodologies, and over the years their materials have included di-electriccoated glass, luminescent or phosphorescent materials, Plexiglass, polyester resin, cast acrylic, fiberglass, neon, florescent lights, high-intensity xenon projectors, and so on.

In most cases the artist’s intent was to offer a situation on which the percipient could inscribe his or her specific experience.

Key amongst the artists creating such works are Robert Irwin, James Turrell, Doug Wheeler, Maria Nordman, Larry Bell and Eric Orr..

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Danaë, 1983
Permanent Installation
Drywall, paint, ultraviolet & incandescent light
500 Sampsonia Way, 2nd floor

From a darkened entryway, you walk into a long, white-walled room. On the far wall stretches a rectangle in lavender grey. As you move toward it, you slowly realize that instead of a painting, or a solid plane of any kind, it is an opening into a smaller room saturated with ultraviolet light.

Work of these artists has been variously termed experiential, situational, phenomenal, phenomenological, site-specific, ambient, or simply Light and Space.

But all these artists have avoided any such designations. The similarity of their investigations in no way indicates cohesiveness. To understand the work of these artists, it is crucial to understand that they do not boast of a movement. There is no manifesto. These artists acquired their knowledge through trial and error.

How we see has been a crucial aspect of art since its beginning. The participant in a work of Light and Space slowly lets go of rational, structured reality and slips into an altogether different perceptual state. In this 'double depth of the dreamer and the world', the presence of light, the sense of colour, and the feel of space merge, becoming far more real than any literal representation of them could be.

Each of these artists has attempted to integrate art in all aspects of life. Out of these attitudes evolve room environments that are the antecedents, philosophically at least, of many of the Light and Space installations.

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Robert Irwin,
Untitled, 1968
Cast acrylic,
Diameter: 60 inch
Daniel Weinberg gallery

The glass and plastic works shared some elements with Minimalism. Like Minimalism, these works were statements reduced to an essence. But the seductive surfaces and colours in these works disqualified them from orthodox Minimalism. Minimalism wanted the object and the material to be separate whereas the glass and plastic works sought to make the statement separate from any object; they wanted to suggest the ripple of sunshine on water, the flicker of light through trees, a spill of moonlight...

Many of the Light and Space artists have used materials offered by sophisticated technology in a more sublime way. During 1960s, many of them began to use materials like fibre glass, cast acrylic, polyester resin, and glass- an Informal movement that was dubbed as ' L.A. Glass and Plastic'. The transparency and the seeming immateriality of these materials made them ideal for conveying in a highly sophisticated yet subtle fashion the local concerns with light, space and colour.

This work, though object based, became very experiential as successive refinements started to take place.

By the beginning of the 1970s, L. A. Glass and Plastic, initially misunderstood as expensive baubles for the rich, started to be seen as a crucial stepping-stone to an art of far greater sophistication. The technical know-how derived from the engineering and the aerospace industry, was put to use to produce works far more subtle, and perceptually more richer than those of the previous decade. This new work was far more difficult; in many cases it seemed almost invisible.

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art as ‘an act of enquiry’

Many of the profound changes in art over the past twenty years or so have resulted in new awareness of how context plays a crucial role in the process of perception. Placement of a work of art in a museum or an art gallery has traditionally certified or authenticated it, for e.g. three beautifully proportioned boulders seen on a seacoast do not communicate the same message as similar stones in a sculpture garden by Isamu Noguchi.

Robert Irwin has posed this idea of art as “ an act of enquiry”. In this view, private investigations undertaken in the desert, the forest, a vacant plot, or the privacy of the studio are no less real, no less viable, and no less important than works of art put on public view. Investigations that never yield a tangible art object may serve to enrich the matrix from which other works will develop. Such investigations may actually be even more important than the tangible works of art because they offer ideas before the inevitable condensation that occurs when an idea takes finite form.



James Turrell, Red around (night),
Fluorescent light and natural mix. 1983.

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Dan Flavin,
untitled (Marfa project), 1996



The diagonal of May 25 (to Constantin Brancusi), 1963
Col. Dia center for the Arts

Light and Space art shows a direction of making art a spatial experience than an object to merely look at. These artists created installations which were experiences with light and space: where the observer was free to perceive what he sees in his own way and establish his own meaning and association to the experience.

Light and Space artists are primarily concerned not with colours itself but with the perception of colour. When colour is utilized, it is never for colour's sake alone; its use is based on the belief that colour can be not only visual information, not only metaphor, but a physical presence.

The work of American artist Dan Flavin is worth mentioning here. Dan Flavin works with colored fluorescent tubes. He introduced a new aspect to visual art: the pouring, or flooding of color into space. By diffusing in all directions, the light creates a volume of color. Within this volume, however, color becomes visible only when it touches a reflecting plane, such as a wall, a floor, the ceiling, furniture or people. One cannot see the color flowing within a space, as it is not materialized. It is colorful light.

Dan Flavin has enriched art with a new type of color and thus a new sensation. His colors in the form of fluorescent light have a degree of richness previously unknown in art. His work is thoroughly modern, particularly in its use of a standard, prefabricated material, easily handled and available in any hardware store.

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Intention of this project..

Project goal

This project looks at what role light plays in day-to-day spaces and how these spaces can be given an enriched experiential quality by using artificial light.

Day to day spaces would mean spaces like corridors, lobbies, passages, foyers, staircase blocks, entrances to buildings, terraces, semi-open spaces, etc. most of these are more or less transition spaces, that is spaces through which people pass many times and at different times. These spaces are a part of any built environment and are many times places, which interact most actively with natural light.



Institute corridor,
IIT Bombay

Light and space art puts forward the idea of creating an experience with light. The result of this idea is installation art that modulates space and light to create a visually exciting experience. Most of these works are temporary or permanent installations built specifically for the purpose of art (installation).

As against this, most other forms space lighting or monument lighting focuses on highlighting certain characters of the built structure or space. In such works light is used more as a tool to create interesting visual patterns of illumination in space- and not as an integral part of a complete experience.

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Institute corridor,
IIT Bombay

Methodology:

Certain day-to-day spaces were chosen (idc foyer, idc passage, corridor). The following aspects were documented:

- Nature of space- closed space, transition space, semi-open...
- Highpoints of spatial organization
- Activities happening through out the day and night
- Behavior of light in these spaces

The aim:

-To look at how light characterizes space

What are the light-effects resulting due to the reaction of light with that particular space

Does light affect the activities in that space (not only in the functional sense - its like some spaces have a lively or serene 'feel' as against some that would 'feel' dull, boring or claustrophobic.

Case study of one of these spaces is presented:



Corridor,
IDC, IIT Bombay



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Institute corridor,
IIT Bombay

Nature of space:

This is a semi-covered corridor connecting most of the departments on IIT campus. It is a colonnaded structure in RCC.

High points of spatial organization

One main corridor splits into smaller side- branches to connect to various buildings. A typical view shows a long series of columns supporting bays measuring around 3.75m x 4.25m. It is surrounded by structures and spaces performing different functions

One sees frames after frames of structure. One sees right through the space at the light at the end of the corridor. For a person not used to the corridor, this will be the only invitation as the entire corridor is highly monotonous. This is especially during night-why elaborate)

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**Documenting natural light in
the corridor at different
times of the day**



12th Jan, 9.30 a.m



12th Jan, 10.00 a.m



12th Jan, 10.30 a.m

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12th Jan, 11.00 a.m



12th Jan, 11.30 a.m



12th Jan, 12.00 p.m



12th Jan, 12.30 p.m

Similar documentation was done
for the latter part of the day



avoid the harsh sun



parking vehicles



pause and talk



continuously changing shadows

Activities happening through out the day and night

Daytime:

Most people use it to avoid the harsh sun during the day. The corridor is an active space during the day. People use it to move from one building to the other. Some use it through and through.

People often land up meeting in the corridor. They are seen pausing and talking at the junctions of two corridors.

Different pathways have been naturally formed connecting far-off buildings to the main channel of the corridor. The junctions of these become pausing points for people.

Tall trees on surround the corridor. So the corridor space receives diffused reflected light, which is very soothing. Also, the off-white paint on the ceiling enhances reflectivity of the built surfaces.

Also, the built space always reacts to natural light by way of continuously changing shadows. Though this is not noticed consciously by any passer-by, but it definitely adds brightness and visual excitement to the space.

During the day the space opens out to the surroundings

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dull, boring, depressing



Nighttime:

At night the corridor is lit with white fluorescent tube lights at regular intervals. These provide light barely enough to read signage and general visibility.

A typical nighttime view of the corridor would show some staff/ students returning back after a long day, a security man taking rounds and some people out to take walks.

The nighttime atmosphere at the corridor is very dull and boring, even depressing.

Because of this, most people do not prefer using the corridor in the night.

During night time, the space gets cut off from the surroundings and loses its character.

Questionnaire

How often do you use the corridor during the day? Why?

About 4/5 times a day. The corridor is the best place to be in to avoid the sun. In the rainy season it's dead useful. Also it's a convenient way to connect various departments.

How often do you use the corridor at night? Why?

People do use it during the night. But it is not their preferred route. Reasons- fear for panthers, it is very dull and depressing to walk through it during the night, since it is dark; there is nothing more to see than the empty stretch ahead, which becomes irritating after a while.

What strikes you most about the corridor space?

Columns, the sound and echo under the arch; vertical and horizontal elements, grid of the tiles- people often follow the tile sequence while walking, every thing is very straight and same- it doesn't change at all

Where do you generally look while you are walking.. What all do you see (ahead, outside, down..)

Generally in the front, occasionally out side, the structural grid forces our eyes to follow its order

Can you describe your experience of walking through the corridor during the day and night? Do you think both are different experiences? Why?

During the day there's a lot to look at, also there are more number of people; during the night there is hardly anybody also it is very dull and monotonous. Also it is very silent.. its almost as if everything is at a stand still.

When you think of the corridor space, what is the image formed in your mind? Can you describe it? This is an image at around what time during the day? Can you describe the light in the image? (With some probing...)

People generally see is an endless series of structural frames of columns and beams. It is an image of around 10.00 – 11.00 am or 4.00 – 5.00 pm (this is the time when the corridor space reacts most actively with natural light by way of pockets of light and shadows forming patterns, also the quality of reflected light is the best .

Light and Space : natural and artificial light in spaces

Responses from people who use this space regularly

How do people perceive these spaces?

What is their experience of these spaces at different times of day and night?

What feelings do walking through these spaces evoke in them? Why?

What do they see when they recall their experience of that space.? Why?

What role does light play in this perception of a space?

observations

People use transition spaces very often during the day (in this case about 4/5 times)

The same people don't prefer to use the same space during the night because the character and 'feel' of the space changes drastically during the night. The same space, feels distinctly more boring and monotonous at night than during the day.

People form distinct images of the spaces that they experience in terms of the striking character of that space be it an architectural feature or colour of walls.. or light in that space.

Light plays key role in people's perception of spaces.
Most people's lasting image of the corridor is around 10.00 – 11.00 am or 4.00 – 5.00 pm (this is the time when the corridor space reacts most actively with natural light by way of pockets of light and shadows forming patterns, also the quality of reflected light is the best at this time.

One can conclude from these observations that quality of light plays an important role in forming the lasting image of space in a person's mind. It is true that none of these people consciously noticed the play of light in the space, but sub-consciously it becomes a key factor in the way they perceive a particular space (whether it is bright, lively, cozy, scorchy, dull, depressing, soothing, etc.)

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inferences

Whenever people are in transition spaces, they are in a passing phase, that is, they are between tasks- just finished with one and about to start another task. This is the time when the person is generally looking around, observing and experiencing the surroundings (as he is not busy in any task)

Sensitively designed lighting in day-to-day spaces like transition spaces, foyers, etc. would make such spaces much more refreshing and give them a new meaning ... may be also a distinct identity. Also, it will provide much richer experiences to people in built spaces.)

The human senses are always in search of something interesting to experience. We as designers should be sensitive enough to go beyond the norms of ' sense and respond' nature of any form of design- be it visual, auditory and any other. Design should provide an integrated experience to the user.



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Designer's role

Along with providing illumination, light also has an important quality of creating ambience in space. Lighting designer's have so far only looked at space lighting in terms of architectural lighting where in light is a tool to enhance certain features of the form.

The ability of light to create a certain mood and atmosphere is not emphasized in most works of space lighting.

Sensitive modulation of coloured light in spaces would open up a wide area of possibilities for designers to give an experiential quality to lighting design of day-to-day-spaces.

Variable parameters in lighting

Location-

Relative location of light source and the space

Intensity –

Soft wares available to convert these observations into measurable quantities

Technology available to control light –dimmers, etc

Material-

Different materials are used nowadays to control, modulate and enhance the quality of light. Glass is traditionally been an important part of lighting fixtures. Many of the fixtures today use plastic instead of glass.

Many of the light and space artists use materials like fiberglass, cast acrylic, polyester resin, and glass – an informal movement soon dubbed as ‘ L.A. Glass and Plastic’. The transparency and seeming immateriality of these materials makes them ideal for conveying in a highly sophisticated yet subtle fashion, the concerns with light, space and colours.

Colour –

what kind of feelings do different colours evoke- describe – ask people
mixing of colours
retinal effect
coloured light falls on coloured surface

Type of illumination-

Incandescent (tungsten halogen), fluorescent, neon, metal halide, high-pressure sodium.

For the purpose of the project, only fluorescent light was used.

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How artificial light affects space

Simulating coloured light in space

Methodology

Fluorescent light of different colours was lit in the same space (white, red, blue, yellow, violet, green, orange) and user responses taken on what character/quality do each of them posses.

Lights of two or more colours were lit together similar responses taken. Some other observations made:
What is the combined effect of the two – do they mix or retain their colours

Fluorescent light of the same colour was lit in different spaces – does the context change the effect?

Observations were made for the following:

Quality of light *

Quantity of light **

Shadows/ ***contrast between light and dark areas

Visibility ****

* Observations on page 35

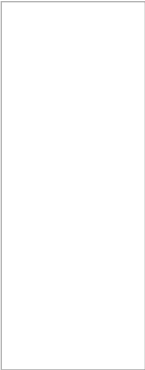


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Explorations

The aim of these explorations is not to highlight any particular part or element of the structure. These are attempts to create an expression to the space inside the structure, and make walking through it a subtle but enriching sensory experience for the onlooker.



Light and Space :

natural and artificial light
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Stage 1

volume of colored light in space

Light and Space :

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Observations and user responses

Green light

Unnatural (cant relate to natural light), if very intense then creates disturbance, if less intense then soothing, negative energies, scary and destructive

White light

Directly hits the eye – irritating but not unusual, taken for granted because people are used to seeing it.

Step 1: fluorescent light of a single colour

Blue light

Meditative, mysterious, gloomy, scary, ghost like, claustrophobic, satanic, caves, evil spirits, not comfortable

Purple light

Disturbing because unnatural, not as uncomfortable as blue, exciting (reminded people of discos, firecrackers- past experience)



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Step2: source of lighting is seen directly

When the source of light is introduced directly, it hits the eye and causes lot of visual disturbance. This is the problem with the location of the tube –lights currently installed at the corridor, the users find them very disturbing

Also, since the rest of the space is in total darkness, the sudden contrast becomes disturbing

Light and Space :

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Yellow and white light



Green and white light



Blue and white light



Orange and white light

Step3: creating 'locations' of white and coloured light

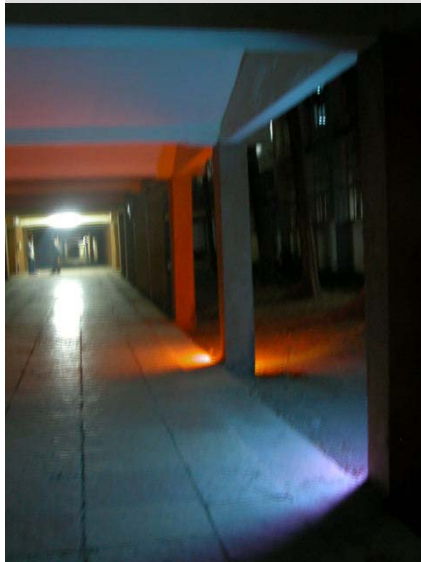
Here, coloured light was introduced as certain locations such that it is seen with the white light of the currently installed tubes lights.

Locations were chosen near to the ground.since they are below eye level, they pose less visual disturbance. Also the source of light is hidden till the viewer comes very near to the coloured light.. The source comes as surprise only for a brief moment as against the white light where constantly seeing the source is disturbing.

Introduction of coloured light reduces the harsh impact of the white light .By introducing more than one visual foci, the viewer is allowed to take his eyes off from the white light source ahead.

Light and Space :

natural and artificial light
in spaces



Step4: combinations of three or more coloured lights

This created minimum visual disturbance and maximum interest in viewers. What was critical here is the relative intensities of different coloured lights. This needs to be sensitively adjusted for subtle yet effective space lighting.

Light and Space :

natural and artificial light
in spaces



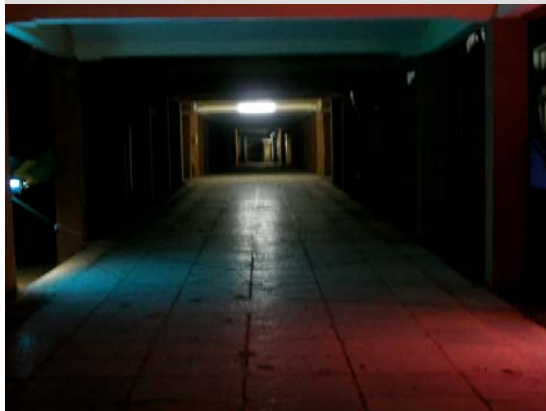
Step5: creating 'spaces of light'

Here, the intention is to create a **space of light** in the corridor. The space itself becomes focus areas for the person passing by. This effect was more subtle than creating spots of lights. Viewers found it more more interesting and comfortable.

Passing through this space is an exciting experience, especially because the source come as a surprise. The space keeps growing as one nears it and then passes away as on walks past it..

Light and Space :

natural and artificial light
in spaces



Step 6: Mixing of coloured light

Here, the effect was more dramatic, but subtle intensity of coloured light successfully compensates for it

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The walk through experience

This is how the lit area is seen by the user walking through the corridor space.

These areas also diffuse the glaring quality of the white light and provide interesting visual foci.

They add an element of surprise as movement towards the light is a gradual revelation of it. Walk through experience is like walking towards a goal... which gradually reveals itself.

Observations and outcome of interactive sessions with users * Ref. Page 26

Quality of light- colour

Blue light	Meditative, mysterious, gloomy, scary, ghost like, claustrophobic, satanic, caves, evil spirits, not comfortable
Purple light	Disturbing because unnatural, not as uncomfortable as blue, exciting (reminded people of discos, firecrackers- past experience)
Green light	Unnatural (cant relate to natural light), if very intense then creates disturbance, if less intense then soothing, negative energies, scary and destructive
White light	Directly hits the eye – irritating but not unusual, taken for granted because people are used to seeing it.
Combination white and coloured light	Coloured light soothing because of location and intensity- because of location near ground, it doesn't hit the eye. Diffused- source not seen, so its not overpowering.
Combination of lights of three colours at different locations	This created minimum visual disturbance and maximum interest in viewers. What was critical here is the relative intensities of different coloured lights. This needs to be sensitively adjusted for subtle yet effective space lighting.

Quantity of light-

due to the limitation of hardware, fine variations in intensity could not be achieved.

Shadows/Contrast between light and dark areas

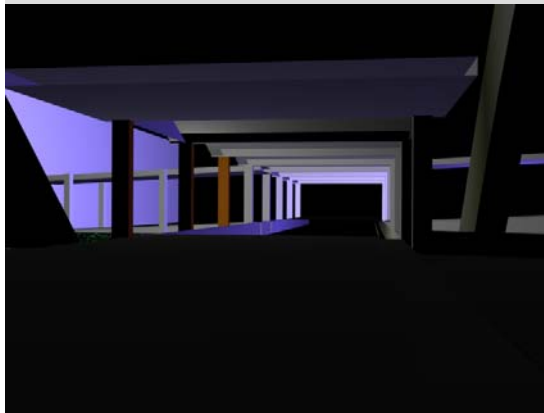
different coloured lights of the same intensity produce different contrasts between lit and dark areas.

Visibility

General visibility requirements differ from place to place depending on the location and function of the space. any habitable space should have enough visibility for the user to feel secure. Certain visibility is important to read signage, mark dustbins, fire hydrants, etc.

Light and Space :

natural and artificial light
in spaces



Destroying the boundaries of between
The built and the open
Filling the corridor space with coloured light
That flows out into the open space around.
This would reduce the claustrophobic feeling
And expand it visually- merge it with the surrounding



Space markers
Spaces of conjunction – are meeting spaces,
Houses elements like fire hydrants, dustbins,
Signage, etc. so these spaces are highlighted to
Give them prominence and also to create visual foci

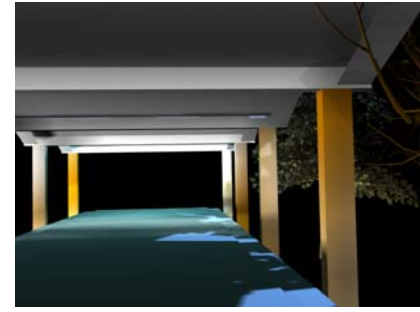


Breaking the structure..
Light sources do not follow the
The column grid. They break away
From the straightness of the structure
And create a bold focus

Certain renderings were generated in earlier stages of the project to illustrate concepts of lighting the corridor space.

Light and Space :

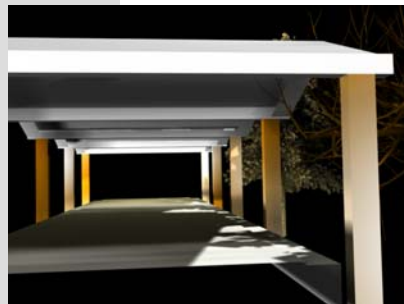
natural and artificial light
in spaces



Colours like green and pink look out of place – because the onlooker cannot relate these hues to the hues of natural light



Colours like yellow, blue, orange gel better in this effect because the onlooker can relate these hues to the hues of natural light



This effect is the most close to natural – the first option creates a subtle ambience while the next is almost like moonlight

Natural light reacts with the space and structure in and around the corridor resulting in light pockets. This effect is more true to the space and its surroundings.

A similar effect is simulated with different colours of artificial light. The source of light is placed outside the built space (amongst the trees or on the façade of the dept, building) . Light flows into the space from outside bringing in shadows of the vegetation around.

Summing it up...

Light and colour

We all perceive colour in our own way. Partly this is shaped by our own personal experiences. Light and colour are linked, as light is the means by which we perceive the rainbow colours of the spectrum.

Light is also the means by which we can introduce colour directly into living spaces. Coloured light can produce mind-blowing effects. The potential of coloured light and its ability to dissolve boundaries has been used only by a few like Dan Flavin. Designers' too have started using coloured light in public spaces but it is not used to its potential in space lighting. Probably the most innovative use of lighting happens only in theatre and installation art.

The way light affects perception of colour, and the way colour affects perception of space, is critical in lighting design of spaces. Blue colour can increase sense of spaciousness (blue sky and the sea), but in a room that receives little natural light, blue feels cold and clinical... also blue light gives a feeling of eeriness and mystery. Red in small quantity feels warm but in a large expanse might become forbidding. (justified by user responses)

People's perception of colored is related to their past experience

People's perception of colour and light of the same colour is generally not the same. (blue colour is refreshing, but blue light is mystifying)

People are more comfortable with light colours that are seen as part of natural light (yellow, white, orange, red) where as other colours were termed as unnatural (blue, purple, green)

An inherently dull space like the corridor can only be made more interesting by the addition of :

- **colour**

- **more appropriate foci for visual attention** (location of light sources to create interest to a passerby)

-**shadows from directional light which emphasize the nature of its three dimensional forms** (this may not work in the corridor space as the structure is very poor in terms of size and scale of form. In this case, it is required to dissolve the boundaries of the space and sort of merge it with the open space around)

- **dramatic luminance** (pools of light highlighting certain areas.)

(renderings and on site explorations illustrate the above)



Light and Space :

natural and artificial light
in spaces

Inferences

Our senses are constantly monitoring the environment for signs of change. The perceptual capacities produce rapid reaction to change, where as in an unchanging environment they may cease to operate effectively. (This happens during night time in the corridor space - so no one has lasting images of night time experience of the corridor space.)

Objects, which are often relatively bright or strongly patterned with regard to their visual background or context, automatically attract our involuntary attention.

If these automatic foci give us desired or needed information we find them satisfying or reassuring; (eg. a well placed illuminated EXIT sign, bright enough that we are aware of it , but not so bright as to interfere with our other perceptions.

However, when bright or strongly patterned stimuli, which trigger our involuntary attention, are information less, ambiguous, or distracting, we find them annoying. This happened when I placed fluorescent tubes vertically against columns. These same tubes placed in a space- Dan Flavin's work – created an overwhelming impact, may be because in most cases it is an *installation to be visually experienced* and not a habitable space. Most importantly, the built space in his works does not itself sport any strong pattern or visual character.

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The corridor already has a strong structural pattern established. So the vertical tube lights become annoying distractions. So it is preferable to install the tubes such that they are directly not seen – in the ‘V’ of the ceiling

If the biological information needs (stimulation, sustenance, security and safety)of the user are satisfied, very low lighting levels may be perfectly adequate for safe circulation. (For an everyday user, the low illumination levels of the corridor are perfectly fine, though it may not be very comfortable for a new user. But the location of the corridor is such that there would hardly be any new user there after office hours. Here, location and context become important)

Meaning is determined by as much by the perceived context as by the unique, individual characteristics of the stimulus itself. (So a blue colored light in the corridor space may evoke different feelings in the user as against blue light washing a plain white wall)

Light and Space :

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Sensation of visual gloom

Visual gloom is caused by lack of some desirable quality in the luminous environment- in this case lack of appropriate focal points. (At nighttime, the luminous environment in the corridor has no desirable focal points to stimulate the senses. The repetitive occurrence white fluorescent lights fitted to the beams fails to break the monotony.

Dull versus interesting

Something, which is inherently dull, cannot be made more interesting by merely increasing its surface luminance. (So the corridor space cannot be made more interesting merely by increasing the intensity of illumination and making it brightly lit.)

Sensitive modulation of coloured light in spaces would open up a wide area of possibilities for designers to give an experiential quality to lighting design of day-to-day-spaces.



Light and Space :

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in spaces

Further...

Explorations till now mainly focused on creating a volume of light in space. Though this concept has a potential to impart a sublime kind of quality to space, a lot of refinement and clarity of thought was required to make the lighting look intentional and not just be interesting instances of colored light

It was required to bring in more ‘control’ and modulation of the variable parameters that light offers to create an effect with a clear definition.



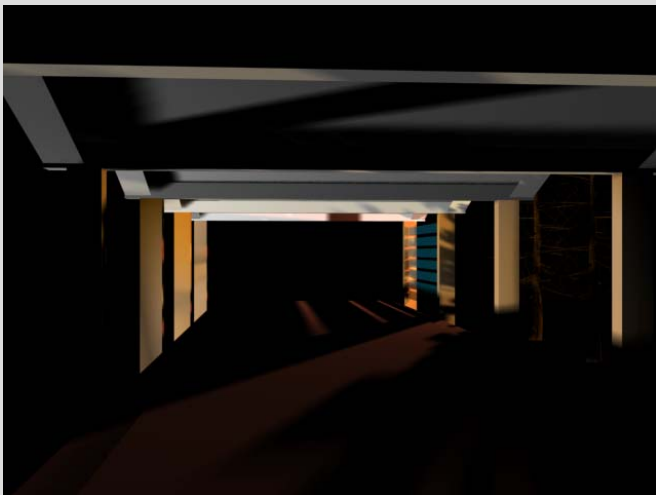
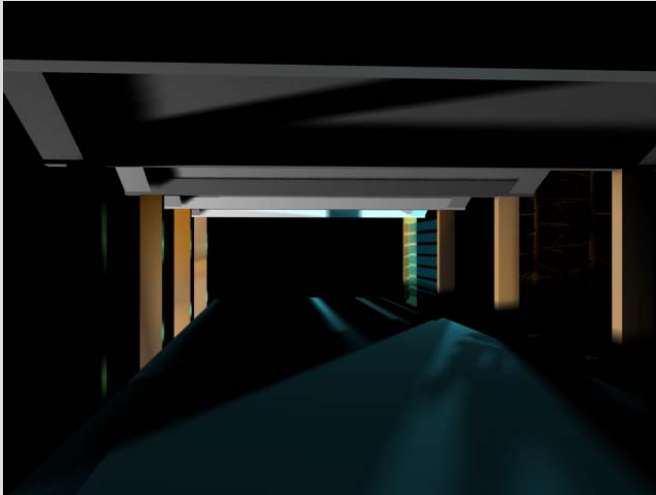
Light and Space :

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Stage 2
creating installations of light

Light and Space :

natural and artificial light
in spaces



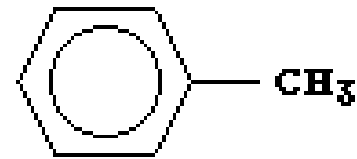
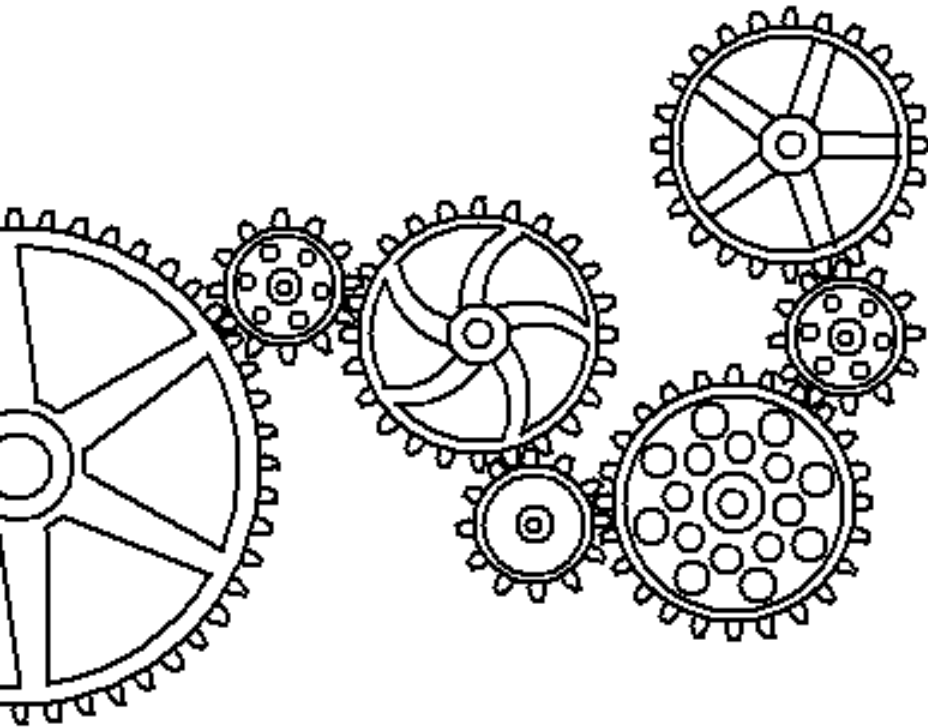
Creating installations of light

Area in between the columns can be used to create ‘installations for light’ that is objects that result in interesting patterns of light and shadow during the day as well as night.

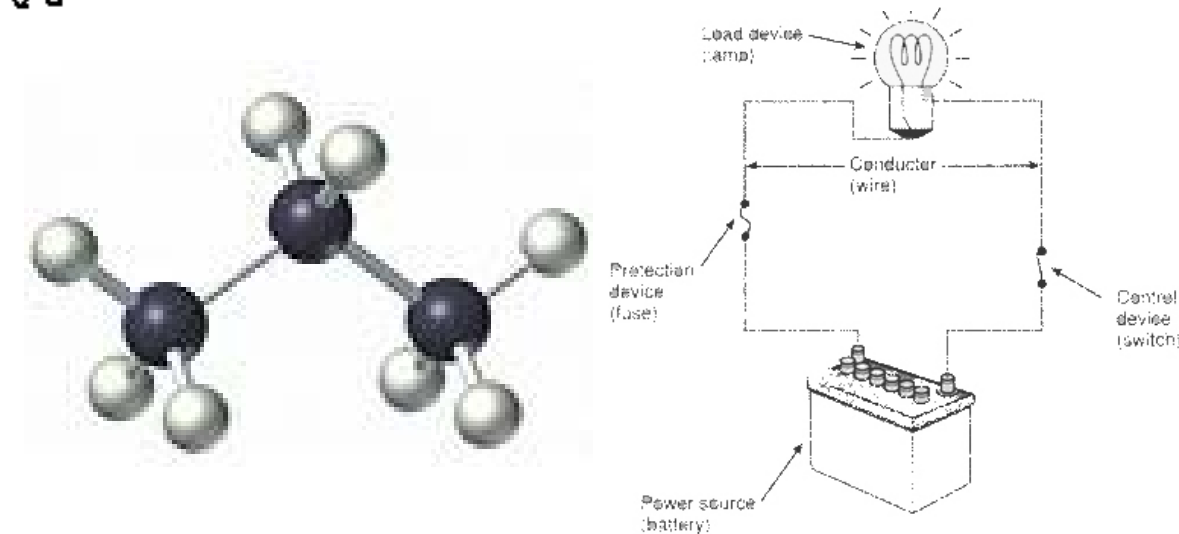
These could be used as interesting ways of giving distinct identity for various locations along the corridor.

Light and Space :

natural and artificial light
in spaces



Creating imagery for installations



Certain imagery was created to understand what kind of images signify a particular branch of science.

For example, images of molecular structures of elements and compounds would relate to Chemistry and gears would relate to Mechanical engineering

These could be used as interesting ways for giving an identity to various locations along the corridor. The entire stretch of the corridor is lined up with various departments where research work in different branches of science is conducted.

These locations generally become hubs of activity during the day. Lighting can be effectively used to give a distinct identity to these locations signifying the branch of science they pursue.

Light and Space :

natural and artificial light
in spaces

This does not mean designing signage for the same. Signage for the same is not critical as most people who use this spaces are students who are very familiar with various locations. So minimal signage is enough.

These installations are more in the spirit of giving an identity to these spaces.





Light and Space :

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Stage 3

Creating patterns of light

In this phase of the project, the emphasis was more on creating interesting effects of light in space. patterns were generated which could bring out a specific effect and characterize the surrounding space in some way.

Light and Space :

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in spaces



Textured paper lit from behind



Textured paper lit from behind



Bunch of crumpled papers lit
from behind

Here, a light source illuminates a textured or a patterned surface from behind. The resulting effect is a ‘ silhouette’ kind of an effect which is subtle and serene. The nature of effect can be controlled by varying the nature of surface and intensity of light source.

Here surfaces made of translucent colored paper were used. Crumpled or textured paper was used.



Light and Space :

natural and artificial light
in spaces

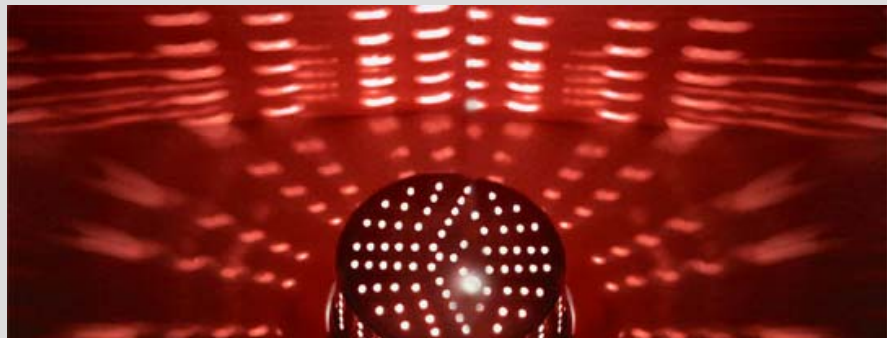
Various color schemes were tried out to vary the nature of the effect a mere change of color makes similar patterns reflect different moods. Blue and green create a soothing water-like effect whereas red, yellow, orange reminds one of flames of fire.

Light and Space :

natural and artificial light
in spaces



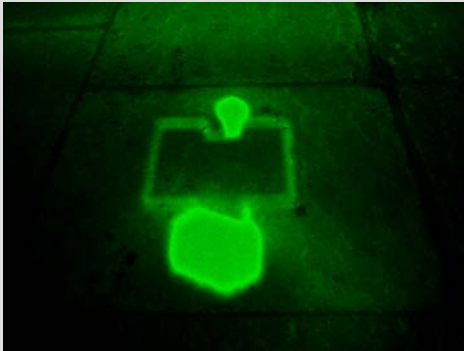
patterns of light on
a single plane



patterns of light get
more interesting
when projected on
perpendicular
planes

Here, the attempt was to create an
effect that was bold and spectacular.

A light source behind a screen of
patterned punctures was used. Though
this is a known technique, the attempt
here, was to play with how certain
patterns can be playfully projected on
different planes



Light and Space :

natural and artificial light
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Final concept

The idea of projections was carried forward for the final concept. This was because the intention was not to create an installation (a form). This would have disturbed the architectural organization of the space. It was to create a particular effect of light in space which can enhance the experiential quality of space.

Projections were given different forms. These forms were derived from the imagery relating to each branch of science.

Form and nature of the projections were kept true to the context of the space under consideration (corridor space) . So even though the technique can be applied elsewhere, the colours, intensity, etc. of the projections will have to be varied as per the location.

Initial explorations were random projections of forms. This was to check the impact of the same.

Diagram to show the method of projecting

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A sole projection forms the focus of the space around. It becomes like a glowing symbol identifying certain nodes

Also, a projection is like a floating form. This adds a mystic quality to it, which is very suitable for an institutional setting.

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The next step was to explore how various projections could be composed to create more interesting effects.

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natural and artificial light
in spaces



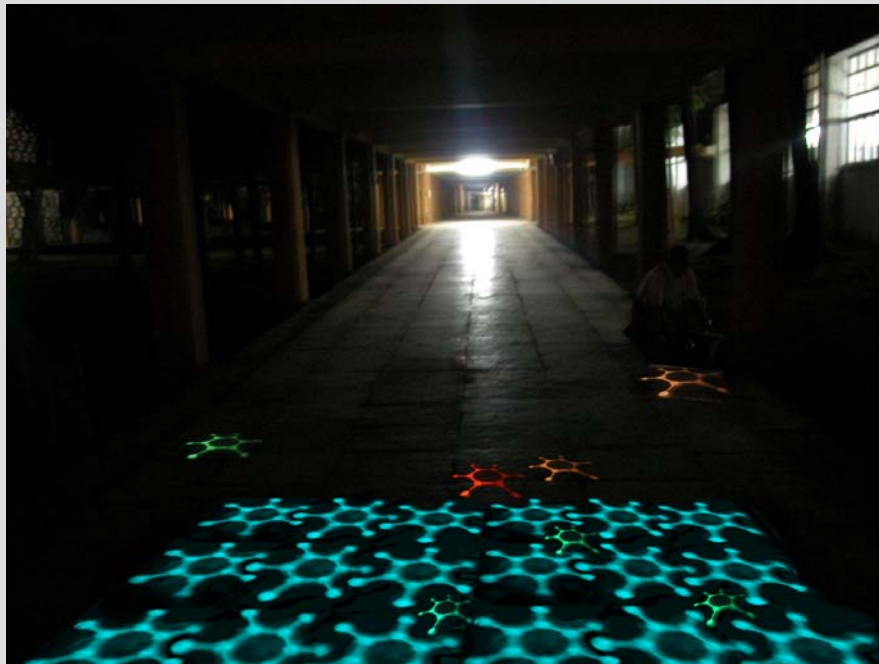
Projecting shadows...

Here, it was tried to negate the effect of a glowing projection by projecting the silhouette of a form instead with a surrounding halo of light.

Light and Space :

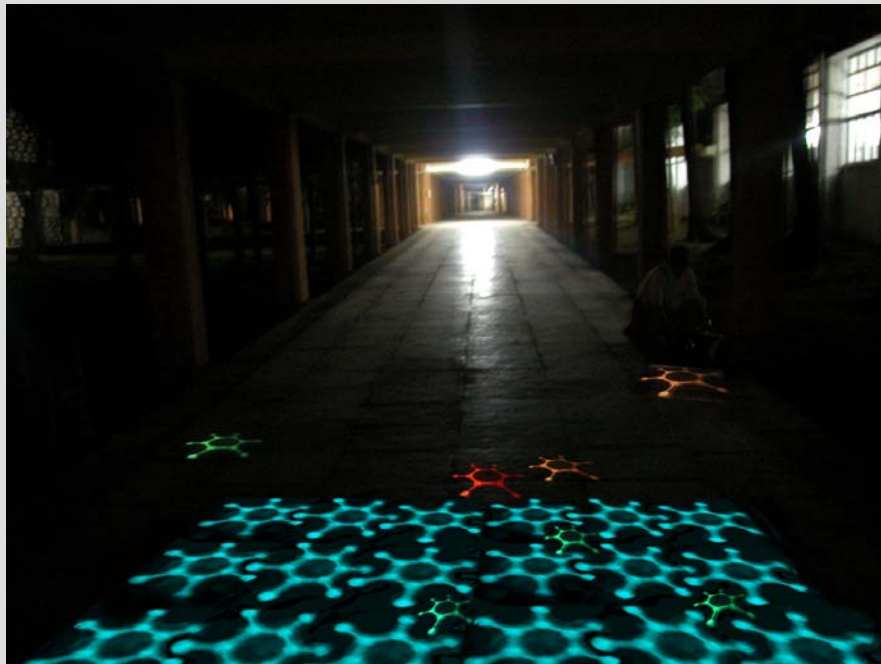
natural and artificial light
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Variations in colour and compositions were tried out
to achieve varied effects



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