I, Deepa Priyadarshini Parthasarathy, hereby submit this original work as part of the requirements for the degree of:

Master of Architecture

in Architecture (Master of)

It is entitled:

Phenomena of light, color and material exerted in architectural setting promotes healing

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Phenomena of light, color and material exerted in architectural setting promotes healing

A thesis submitted to the
Graduate School
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of

Master of Architecture

In the School of Architecture and Interior Design of the
College of Design, Architecture, Art, and Planning

by

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India, May 2007

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The objective of this thesis is to understand the factors involved in creating an environment that is healing to the patients. “Health is a state of complete physical, psychological and social well-being; not only the absence of illness.” Center of Health Design is conducting Evidence based design that proves that healing environment can reduce stress, create positive distraction, reduce perception of pain and use of pain medication and create positive feelings/behaviors. Therefore it is necessary to understand the body - mind response to various environmental factors. Phenomenology is one of the contemporary design philosophies which give equal importance to the physical experience of building materials and their sensory properties. Phenomena like light, color, material interact to evoke senses in a body. These elements are inter-related and depend on each other to create a better healing space. Throughout history, light and color therapy is believed to heal sick. Exposure to natural daylight has been used as a therapeutic factor for depressed patient population. Color has a provable influence of the patients experience, mood and performance in a particular environment. Positive distractions are provided by the elements of nature and art work. The analysis of works of the contemporary architects Erik Asmussen, Steven Holl, Peter Zumthor and Louis Kahn helps to explore the mind-body relation to the physical environment. The use of light and color to give an essence to the space is explored through the works of Artists Robert Irwin, James Turrell and James Carpenter. The analysis of this has lead to the design of Cancer treatment center at Pondicherry, India. The aim of this design is to develop a space that stimulate the senses of the patient and family and promote healing.

I would like to convey thanks to Prof. Tom Bible and Prof. Jerry Larson for their invaluable assistance and support. I also wish to express my love and gratitude to my beloved family for their understanding and support. Special thanks to my friends, especially, Rekha Kumar, Preethi Srikanth and Dhanasekar Murugan who always been there.
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02.00 Introduction

Many hospitals in India are devoid of imagination and greatly lack in the organization of the building plan which create psychological stress and fear for patients, their families, and staff alike. Inadequate lighting, excessive noise, poor air quality and ventilation, fear for infectious disease transmissions, harmful toxin from biomedical waste incineration, lack of strong nursing presence are the few problems encountered in the healthcare design.

“Health is a state of complete physical, psychological and social well-being; not only the absence of illness.”

Center of Health Design is conducting Evidence based design that proves that healing environment can reduce stress, create positive distraction, reduce perception of pain and use of pain medication and create positive feelings/behaviors. To create a healthy ambience, it is important to understand the patients first hand perception of space with regards to light, color, materials.

Historically, Assyrians, Babylonians, and Egyptians all used sunlight and color therapy for healing. The healing temple of Greece used light and color therapeutically to heal the sick. Today, the Evidence based research in healthcare proves the

same. The hospital environment should provide a maximum exposure to the natural daylight. Scientific experiments show that light has a curative factor for ageing and depressed patient population. Also adequate lighting is required to minimize the medical errors and improve the work efficiency for the medical staffs. Color has a provable influence on the patients experience, mood and performance in a particular environment. Horticultural therapy places patients in a caregiver role, helping to restore their self-confidence and sense of purpose. It also reduces stress and alleviates pain through pleasant distraction. Art work links the hospital to the community and act as subtle clues for way-finding/landmark.

Phenomenology is interpretive study of human experience or first-hand experience of the space. This approach in architecture clearly relates to the spatial and experiential aspects of the space with respect to sensational qualities such as light, color, perspective, movement, time and sound. The development of thesis begins with exploration of the importance of body in Architecture. The study of phenomenology through the work of architects helps to understand the sensory response of the body to the space. Various phenomenologists referred to, including Martin Heidegger, Juhani Pallasmaa, Steven Holl, Peter Zumthor and
Daniel Libeskind. Exploring the design philosophy of these architects would be background for my design exploration.
Beyond our natural desire to understand the human activity of the making and enjoyment of art, there is a profound motive and primitive need behind philosophies of art. A powerful analogy immediately comes to men when they think about themselves and the universe they inhabit: the maker of the universe and the objects he makes are like the human maker and his artifact. The order and harmony of the cosmos are like the beauty of art. Somehow man participates in the ordering of the universe in his power to make and to respond to art objects. Thus, early philosophies of art and beauty are intermixed with cosmological inquiries and it is only relatively late in the development of philosophy that the philosophy of art can be thought of as distinct from ontology and theology. The greatest philosophies of art, then, are part of broader inquiries into man and nature. –

A. Hofstadler and R. Kuhns, Philosophies of Art and Beauty

Historically, visual senses have been the bases to understand the experience of architecture. Architecture largely focused on beauty of the building with respect to surface treatment and ornamentations. The historical approach to architecture was through the representation of the human body. Man, as an element of nature and composition of form, act as a fundamental measurement of our self in this world and also a tool which represented the built environment for a long way. This has neglected the power of the mind and the emotional relation to the surroundings. Therefore the human body and
mind relationship to architectural experiences has been totally disregarded till recently.

Going back to the history of architecture, there was shift from the artistic illustration of human body and spirit as one, towards the relation of symmetry and proportion. During the Greek period, art and architecture worked on the philosophy that “man is the measure of all things”\(^2\). Vitruvius has written treatise of architecture in *De architectura*, today known as “*Ten books on Architecture.*” Vitruvius believed that architecture and artwork had their origin from nature and there is equilibrium between human and environment. The human body lives in harmony with the divine order of the universe. Symmetry and proportions in architecture are derived from the human body. The human body is the basis for right proportioning as is very well seen in the design of Greek temples. Nature has formed the human body symmetrical about a vertical axis and the body parts are in certain proportion to each other and to the whole body. These rules of nature form the basis for the composition of buildings and their parts. Vitruvius describes this concept as

\[\text{“Similarly, in the members of a temple there ought to be the greatest harmony in the symmetrical relations of the}\]

different parts to the general magnitude of the whole. Then again, in the human body the central point is naturally the navel. For if a man can be placed flat on his back, with his hands and feet extended, and a pair of compasses centered at his navel, the fingers and toes of his two hands and feet will touch the circumference of a circle described therefrom. And just as the human body yields a circular outline, so too a square figure may be found from it. For if we measure the distance from the soles of the feet to the top of the head, and then apply that measure to the outstretched arms, the breadth will be found to be the same as the height, as in the case of plane surfaces which are completely square.” - Marcus Vitruvius

Doric, Ionic and Corinthian are the three columnar order based on the human body. Vitruvius work of body and architecture had a great influence on Renaissance architect, Leon Battista Alberti. He wrote architectural treatise, On the Art of Building in Ten Books. He states that architecture is a replication of nature and building is a form of body which is composed of lineament, form and matter. The proportion of the human body was the guiding rule for the building composition and design though out the Renaissance period. This relation of body and architecture had a great influence on artist and architects of Renaissance, including Leon Battista Alberti (1404-72), Leonardo Da Vinci (1452-1519), and Michelangelo (1475-1564). The diagram of Vitruvian figure by Leonardo Da
Vinci, inscription of a circle and a square over man’s body was symbolic representation of human body harmony and proportions.

“In a letter discussing architectural principles, Michelangelo reinforced the idea of bodily proportions. He called architects “figural artists” because of the way that the symmetry and apertures of buildings imitate the form and orifices of the human body.”

Renaissance architect, Francesco di Giorgio believed that architecture is mediated by the body and vice versa. He posited that the primary source of architectural proportion was the body and used man’s features for not only the orders, but the elevations and plans of buildings.

Le Corbusier used the golden ratio in developing the Modular system for the scale of architectural proportion. The Modular creates a system of harmony and proportion in the building. All these theories and principle use the human body as a tool of scale and proportion to the design of the building. Throughout history, the understanding of the emotional relationship to the space or building environment is ignored. It is evident that historically there is a strong connection between the architecture and human body. Also we can see that human

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mind and body is considered as different entity and experience of the space is neglected. This idea known as dualism is described as “the view that the mind and body function separately, without interchange.”

Contemporary theories attempt to understand the sensory and psychological experience of architecture. Architecture should also focus on the experiential qualities for the human body. “Gestalt” is a German word which means “whole” or “form”. Gestalt theory believes that “the whole is greater than the sum of its parts. The Gestalt effect refers to the form-forming capability of our senses, particularly with respect to the visual recognition of figures and whole forms instead of just a collection of simple lines and curves.” For example, when we see one dot, we interpret it as such, but when we see five dots together, we group them together by saying a "row of dots.” Without this tendency to group our perceptions, that same row would be seen as "dot, dot, dot, dot, dot,” taking both longer to process and reducing our perceptive ability. The Gestalt principles of grouping include four types: similarity, proximity, continuity, and closure.

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This new theory related to visual perception has greatly influenced the aesthetic of the buildings in modern era. Even today, the design “has housed the intellect and the eye, but it has left the body and the other senses, as well as our memories and dreams, homeless.”\textsuperscript{7} The present work of Santiago Calatrava shows that architecture continues to depend on anthropomorphic representation for the creation of space. In doing so, architecture emphasizes visual representation over the mind and body’s experience in space.

In healthcare design, understanding of the human behavior in build environment is very important. The human mind and body interaction with space evokes the senses, emotions and memories within the human. A person who is physically and psychologically active has a better wellness - a positive mental, physical, and spiritual health. Architecturally, Phenomenology is a design philosophy that studies the experiential aspects of the space with respect to sensational qualities such as light, color, perspective, movement, time and sound. Also Evidence based healthcare design is formulating design parameters for better wellness in hospital through experiments.

\textsuperscript{7} Pallasmaa, Juhani, “The Eyes of the Skin: Architecture and the Senses”, p.10
Phenomenology is a philosophical design approach in contemporary architecture. It is based on the “physical experience of building materials and their sensory properties”.

Phenomenology is interpretive study of human experience or first-hand experience of the space. Aim of this approach is to examine and clarify “human situations, events, meanings, and experiences.” With respect to architecture it clearly relates to the experiential aspects of the space with respect to sensational qualities such as light, color, perspective, movement, time and sound.

Some concepts of Phenomenology are:

“A school of philosophy whose principal purpose is to study the phenomena, or appearances, of human experience while attempting to suspend all consideration of their objective reality or subjective association. The phenomena studied are those experienced in various acts of consciousness, mainly cognitive or perceptual acts, but also in such acts as valuation and aesthetic appreciation.

A systematic investigation of consciousness and its objects - Edmund Husserl

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A method that urges a “return to things”, as opposed to abstractions and mental constructions - Christian Norberg-Schulz

Phenomenology strives to depict phenomena appealing directly to the consciousness as such without any theories and categories taken from the natural sciences or psychology. Phenomenology thus means examining a phenomenon of the consciousness in its own dimension of consciousness. - Juhani Pallasmaa"^{10}

**History of Phenomenology:**

Edmund Husserl, father of phenomenology “believed that beneath the changing flux of human experience and awareness, there are certain invariant structures of consciousness”^{11}. He viewed consciousness and its structures as a separate entity from the “actual human experience taking place within the world of everyday life.”^{12} This type of phenomenology is known as transcendental. Husserl analyzes the intentional structures of mental acts and how they are directed at real and ideal objects. “It studies the structure of various types of experience ranging from perception, thought, memory, imagination, emotion, desire, and volition to bodily awareness, embodied action, and social activity. The structure of these forms of experience typically involves what Husserl called

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{10} Leon, Ann, “[http://undertow.arch.gatech.edu/homepages/gt7267a/6201KN-2.html](http://undertow.arch.gatech.edu/homepages/gt7267a/6201KN-2.html)"

{11} David Seamon, Ibid

{12} David Seamon, Ibid
“intentionality”. Intentionality refers “to the notion that consciousness is always consciousness of something and the object of consciousness doesn't have to be a physical object apprehended in perception. It can just be a fantasy or a memory. Therefore, “what we observe is not the object as it is in itself, but how and inasmuch it is given in the intentional acts”. “Husserl distinguished between the act of knowing (noesis) from the object (noema), whether existent or imaginary. To be conscious is to experience an act of knowing in which the subject is aware of an object”. Summarizing this, according to classical Husserlian phenomenology, “our experience is directed toward — represents or “intends” — things only through particular concepts, thoughts, ideas, images, etc. These make up the meaning or content of a given experience, and are distinct from the things they present or mean.”

Martin Heidegger had a different approach towards phenomenology. He argued that consciousness was not separate from the world and human existence. The existential

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16 Smith, David Woodruff, Ibid
correction to Husserl’s approach suggests that phenomenology should interpret essential structures of human experience rather than as cerebral consciousness. In recent philosophy of mind, the term phenomenology “is the characterization of sensory qualities of seeing, hearing, etc.: what it is like to have sensations of various kinds. This addresses the meaning things have in our experience, notably, the significance of objects, events, tools, the flow of time, the self, and others, as these things arise and are experienced in our “life-world.”\textsuperscript{17}

David Seamon defines “phenomenology as the exploration and description of phenomena, where phenomena refer to things or experiences as human beings experience them. Any object, event, situation or experience that a person can see, hear, touch, smell, taste, feel, intuit, know, understand, or live through is a legitimate topic for phenomenological investigation.”\textsuperscript{18} Elements like light, color, architecture, place, etc., are considered phenomena because human beings experience or come across or survive through them in some ways.

“For Husserl, the phenomenological reduction is the method of leading phenomenological vision from the natural attitude of the human being whose life is involved in the world of things and persons back to the transcendental life of

\textsuperscript{17} Smith, David Woodruff, Ibid
\textsuperscript{18} David Seamon, Ibid
consciousness and its noetic-noematic experiences, in which objects are constituted as correlates of consciousness. For us, phenomenological reduction means leading phenomenological vision back from the apprehension of a being, whatever may be the character of that apprehension, to the understanding of the Being of this being.”\textsuperscript{19} - Heidegger

Traditional phenomenology has focused on subjective, practical, and social conditions of experience.\textsuperscript{20} Recent philosophy of mind, however, has focused especially on the neural substrate of experience, on how conscious experience and mental representation or intentionality is grounded in brain activity.\textsuperscript{21}

**Phenomenological method:**

Rolf von Eckartsberg, phenomenological psychologist has given two methodological approaches which are the existential and the hermeneutic. David Seamon’s third methodology form of phenomenology research is called first-person. The aim of these methods is to understand the phenomenon through direct involvement but proximity of researchers to the experience of study varies. These three approaches can be used separate or in combination.

\textsuperscript{20} Smith, David Woodruff, Ibid
\textsuperscript{21} Smith, David Woodruff, Ibid
The first-person approach is the most personal approach as “the researcher uses her own firsthand experience of the phenomenon as a basis for examining its specific characteristics and qualities.”\textsuperscript{22} His or her own lived experience provides a valuable insight to understand, enquire and approach the phenomenon. This approach can also be used to identify the researcher “preconceived notions and biases regarding the experience being investigated.”\textsuperscript{23} It is important for the researchers to be aware of these biases so that these are not imposed while interpreting the phenomenon.

Existential approach focuses on the lived experience of another individuals or group of person. “The basis for generalization in existential-phenomenological research is the specific experiences of specific individuals and groups involved in actual situations and place.”\textsuperscript{24} According Van Eckartsberg, heart of this approach is "the analysis of protocol data provided by research [respondents] in response to a question posed by the researcher that pinpoints and guides their recall and reflection.”\textsuperscript{25}

Hermeneutics approach is the practice of “interpretation of texts, which may be any material object or tangible expression
imbued in some way with human meaning— for example, a public
document, a personal journal, a song, a painting, a dance, a
sculpture, a garden, and so forth.” 26 David explains this approach
as “the creator of the text is not typically available to comment
on its making or significance, thus the hermeneutic researcher
must find ways to discover meanings through the text itself.” 27
The researchers can interpret the text in numerous ways and
therefore the understanding process is always underway, never
complete.

**Insideness and outsideness:**

In Place and Placelessness, Relph argues that the human
experience of place is the essential part of peoples’ existence in
the world. He defines places are “fusions of human and natural
order and are the significant centers of our immediate
experiences of the world.” 28 The experience of the place can
vary from small room to an entire continent. But at all scales,
places are composed of natural and man-made objects,
activities and function, and meanings given by intentions. “Out
of these components the identity of particular place is the
special quality of insideness and the experience of being inside

26 David Seamon, Ibid
27 Ibid
28 Seamon, David, “A Singular Impact: Edward Relph’s Place and Placelessness,”
that sets place apart in space.”29 For Relph, the essential quality of place has its potential to create and focus human intentions, experience and behaviors. “Kevin Lynch defines the identity of a place simply as that which provides its individuality or distinction from other places and serves as the basis for its recognition as a separate entity. Ian Nairn offers some expansion of this “there are as many identities of place as there are people, for identity is in the experience, eye, mind and intention of the beholder as much as in the physical appearance.”30

According to Relph, the essence of place lies in the experience of insideness and this experience transform the space into place. If a person feels inside a place, he or she is here, safe, enclosed, at ease rather than having a feel of threatened, exposed and stressed. When a person feels more profoundly inside a place it gives him or her stronger identity with the place. In contrast to this, when a person feels a division between himself and world, he can be separate or alienated from the place. This experience of the place is called outsideness.

“Outsideness and insideness constitute a fundamental dialectic in human life and through varying combinations and

29 Edward Relph, “Place and Placelessness,” (Routledge 1984) p. 141
30 Ibid p.45
intensities of outsideness and insideness, different places take on different identities for different people, and human experience takes on different qualities of meaning and feeling. In *Place and Placelessness*, Relph discussed seven modes of insideness and outsideness grounded in various levels of experiential involvement.

- **Existential outsideness**
  - self-conscious and reflective uninvolvemnt
  - alienation from people and places

- **Objective outsideness**
  - deliberate adoption of dispassionate attitude
  - places things having certain attributes

- **Incidental outsideness**
  - places experienced as background
  - places incidental to activities in them

- **Vicarious insideness**
  - secondhand experience without visiting in place
  - deeply felt involvement e.g. by artistic experience

- **Behavioral insideness**
  - place as set of objects, views, and activities arranged in certain ways
  - sight most important element of experience

- **Empathetic insideness**
  - deliberate effort of perception
  - openness and respect to place

- **Existential insideness**
  - place full of significances without deliberate or self-conscious reflection
deep and complete identity with place

The strongest sense of place experience- *existential insideness*, a situation of deep, unself-conscious immersion in place and the experience most people know when they are at home in their own community and region. The opposite of existential insideness is *existential outsideness*—a sense of strangeness and alienation, such as that often felt by newcomers to a place or by people who, having been away from their birth place, return to feel strangers because the place is no longer what it was before.”

**Phenomenology of architecture:**

In the Renaissance, vision was considered as the highest in the hierarchy of senses, while touch was considered the lowest. The influence of the eye over the other senses makes the experience of space incomplete. The experience should be multisensory with the interaction of self and the world. Modern architecture which is dominated by the aesthetics and visual perceptual has repressed the multi-sensory experience. The phenomenological philosopher Maurice Merleau Ponty states, “My perception is [therefore] not a sum of visual, tactile, and audible givens: I perceive in a total way with my whole being:

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I grasp a unique structure of the thing, a unique way of being, which speaks to all my senses at once.”

The experience of space is created when all the senses of the body interact to perceive the space. Therefore the theory of phenomenology insists the architects to extend the approach of visual experience of space to the involvement of body as a whole with the space. “Sense of touch is considered to be the “mother of all senses” without this sensation, architecture can only be deemed as similar to a photograph.”

Space which lacks the involvement and interaction of human body makes it a meaningless two-dimensional form.

Contemporary architect Juhani Pallasmaa insists for multi-sensory approach to architecture and physiologically based phenomenology. “Every touching experience of architecture is multi-sensory; qualities of space, matter and scale are measured equally by the eye, ear noise, skin, tongue, skeleton and muscle. Architecture strengthens the existential experience, one’s sense of being in the world, and this is essentially a strengthened experience of self.”

The way in which we understand and experience the built environment should be through our senses and interaction of our body with the space.

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34 Ibid p.31
35 Ibid p. 41
“All sensory experiences perceived by the body are a means of touching, for our sensory organs are capable of perception within a particular boundary line or a limit. Merleau-Ponty says “to see is to touch with the eyes, that they are the means of touching the stars and the sun. Likewise, to smell is to touch with the nose …”36

The continuous improvements in technology have created a detrimental effect in senses of architecture. Pallasmaa believes the natural materials can invoke emotions and unconscious thoughts. “Stone gives a sense of rigidity and hardness. Brick gives the idea of earth and fire.”37 “Wood has the power to calm and smooth through time.”38 Wearing and ageing action of natural materials express their history, duration and time. But materials of today like glass, enameled metal and synthetic materials which are more technologically demanding do not show this. Natural materials are coated for resistance from wear and tear. Therefore “natural materials are losing their essence and their real texture, and as a result, deadening the sense of touch.”39 Similarly the sound of architecture is essential to have a strong connection between space and

inhabitant. Pallasmaa blames that the contemporary architecture has lost its echo.

The dialogue between “an architectural work and its viewer extends to senses beyond hearing, including scent, particularly in its strong association with memory, and touch- our ability to sense the temperature of space and the density and texture of surfaces.”

With passage of time, memories are accumulated within space, and to ignore this in architecture means to disregard valuable memories. “Pallasmaa suggests two different incarnations- that of the body and that of the gaze: whilst touch determines nearness and intimacy, the eye recognizes separation and distance. A sweeping gaze enables an unconscious mimesis. Never under the strict control of an architect, it generates an individual perception. Equally, there is the thrust of one’s body through a work of architecture, on no one pre-determined path. That architecture is not formed by the frozen choreography of design, but by the body’s explorative dance.”

In western architecture, light is the symbolic representation of truth. Le Corbusier regards architecture as “the masterly, correct and magnificent play of masses brought together in

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41 Ibid
Traditional Japanese architecture shows the play of mystery and shadows, in the absence of light. Darkness is essential to phenomenology because it weakens the visual sensitivity. Even when a person is familiar with a space, darkness lessens the familiarity and gives the person a sense of innocence within the space. As visual sense weakens, it activates the other senses to participate in the experience.

Further Pallasmaa considers lack of multi-sensory experience of the space as problem in architecture. Fragile architecture or Weak architecture, “without visual bias, allows the inhabitant to understand architecture through experience, and experience is achieved when one ceases to be a mere spectator and starts being a participant. This is said to be the 'strength of weakness,' wherein a balance of the senses is achieved.”

A successful architecture help to identifies ourselves with its space, moment and place. Therefore a space should keep the person emotional connected and physically aware of the surrounding. Healing process in the healthcare can be speeded by creating such spaces. Phenomenology process in architecture shows the awareness and interaction of body with the space. The following part of the chapter covers the architectural

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43 Chinoise “http://chinoise.multiply.com/journal/item/34”
precedence’s which exemplifies the phenomenological approach.

Steven Holl:

His work focuses on the experiential quality of architecture. The phenomenological approach to the design shows his concern for the man’s existentialist and mind-body engagement with the surrounding. His interest about sensory architecture developed from the phenomenology philosopher Maurice Merleau–Ponty and architect-theorist Juhani Pallasmaa. He explains “The challenge for architecture is to stimulate both inner and outer perception; to heighten phenomenal experience while simultaneously expressing meaning; and to develop this duality in response to the particularities of site and circumstance.”

The complete bodily experience of architecture takes place when there is an interaction of light, shadow, transparency, color, texture and material with the space. This series of fractional experience helps us to perceive the space. Spatial definition changes with the angle of perception. The best example for this is the study of parallax condition in science. “Parallax – the change in the arrangement of surfaces that define space as a result of the change in the position of a viewer – is transformed when the

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movement axes leave the horizontal dimension. Vertical and oblique movements through space multiply our experiences and also set a new framework for perceptions. The turn and twist of the body engaging a long and then a short perceptive, an up-and down-movement, an open- and –closed or dark and light rhythm of geometries – are the core of the spatial score of architecture.”45 The architectural synthesis of foreground, middle ground and distant view together with all the subjective qualities of material and light, form the basis of complete perception.

To further understand the phenomenological design approach of Steven Holl, I analyzed one of his buildings – St. Ignatius Chapel at Seattle, Washington.

**Use of light:** Rhythm of light and dark is used to direct the person from the entrance to the altar. The entrance has different size and height of openings and narrow ramp which creates a different perception from various vantage points.

Light entering the building are reflected of colored wall surface to produce diffused light. Most of the openings are provided in ceiling with

minimum wall opening. The light entering through the ceiling are scattered by reflecting on wall surfaces which makes the space sacred and religious.

**Color:** The design evolved from the concept of “gathering of different light” to a form of “seven bottles of light in a stone box”. Each bottle or vessel of light relates to a specific function in the chapel.

Light hits the color field painted on the back of suspended baffles and bounces to create a halo on the surrounding wall. Also light passes through the colored glass lenses to cast colored light on the wall and floor.

The position of the casted colored light changes with the angle of sun - architectural sun dial. This overall makes the space interact with the human body and conscious aware of time and duration.
Material: Light reflected from the hand-textured plaster wall, Alaskan cedar, sand cast glass defines the haptic dimension of the building.

Peter Zumthor:

He uses the most basic elements like material, nature and light that are found in the real world to make people aware of their existence through memories, feelings and thinking. Memory is very powerful and one of the most important aspect in architecture. He tries to relate the person to past joyful experiences. By triggering the person's memories he makes sure the actual experience of the building will also be related to the feeling of joy and of being alive. He explains how his personal experiences affect his design:

“When I think about architecture, images come to my mind. Many of these images are connected to my training and work as an architect. They contain the professional knowledge about architecture that I have gathered over the years. Some of the other images have to do with my childhood. There was a time when I experience architecture without thinking about it. Sometimes I can almost feel a particular door handle in my hand, a piece of metal shaped like the back of a spoon.

I used to take hold of it when I went into my aunt's garden. That door handle still seems to me like a special sign of entry
into a world of different moods and smells. I remember the sound of the gravel under my feet, the soft gleam of the waxed oak staircase; I can hear the heavy front door closing behind me as I walk along the dark corridor and enter the kitchen, the only really brightly lit room in the house...”

The body and mind interact with the space through our senses – sight, touch, smell, hearing and taste. This sensory quality of the space connect the person with the past memories and feelings. He believes that the experience of architecture should go beyond our daily interaction with functional spaces. “To experience architecture in a concrete way means to touch, see, hear and smell it. To discover and consciously work with these qualities.”

“The strength of a good design lies in ourselves and in our ability to perceive the world with both emotion and reason. A good architecture design is sensuous. A good architecture design is intelligent.”

He uses light and material as major element in all of this design. He says: “I try to use materials like this in my work. I believe that they can assume a poetic quality in the context of an architectural object, although only if the architect is able to generate a meaningful situation for them, since materials in themselves are not poetic.”

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48 Ibid
49 Ibid p.10
This approach is quite evidently seen in Thermal Baths in Vals, Switzerland. His belief that architecture is a balance of emotion and reason is seen in this building. The bath house is a simple rectilinear structure with a rectangle outdoor pool and other functional spaces logically placed around this pool. The emotional balance of the building relates to the quality of the experience created using light and material.

**Light:** There is a minimal separation of the interior space with the exterior. Series of light and dark space guide the human through the building. It is strongest where the hallway opens into the exterior.

Narrow slits and openings on the ceiling is the main source of light.

On the exterior, the rhythm of small and large openings relates to the function of the interior space. Various auxiliary functional spaces in the bath house are logically placed with the sun orientation.
Material: The building is made up of local stone, gnesis. The stratified and layered pattern of the wall surface gives a carved sensation to the space. The human body is in constant touch of the solid floor and wall.

Color: Fire bath and ice bath have different water temperature and interior color. Fire bath has water temperature nearly 42°C with dark warm red color. Ice bath has water temperature nearly 14°C with bright whitish-blue tint. Red symbolizes the speed and heat of molten lava and whitish-blue connotes the stillness of frozen snow.

Louis Kahn:

The work of Louis Kahn represents an extensive use of light for revealing pure material and pure form. His portfolio of completed works shows various methods to inlet light into the building. Natural light enters the building through openings in walls and ceilings, reflected off structural objects, deflected by screening panels, and accepted through lighting fixtures. In 1930’s and 40’s he used overhangs and trellises to control and modulate the light entering the buildings while in 1960’s and 70’s, he used the complex method of layered approach where
light penetrated through the structural mass. Kahn believed on the concept that “We were born of light. The seasons are felt through light. We only know the world as it is evoked by light...” With this concept of light, he uses pure forms to create a dynamic space that intrigue the visual senses, feelings and memory.

Light and material is closely related to each other and material is considered as spent light. When light hits a material it makes them visible and creates a specific color. The visual penetration of light makes us perceive the objects. Therefore the relation between light and materials is very important in architecture. He says about light

“Inspiration is the feeling of beginning at the threshold where Silence and Light meet. Silence, the unmeasurable, desire to be, desire to express, the source of new need, meets Light, the measurable, giver of all presence, by will, by law, the measure of things already made, at a threshold which is inspiration, the sanctuary of art, the Treasury of Shadow.”

He treats light with great importance in his projects. He designs the interiors as spaces where light becomes the most important element. All the materials he uses are related to specific tones of light.

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50 Paul Righini, “Thinking Architecturally: An Introduction to the Creation of Form and Place,” (Univ. of Cape Town Pr January 1999) p.125
I analyzed his work, First Unitarian Church and School in Rochester. He describes an entirely different approach to interior illumination - ‘The getting of light below was a problem ... though one could get light to shape this room above; it was difficult to get light to shape this room below. So I devised four wells for light in the four corners. The light came in above and went down to define this space below. This space being an oblong ... only two sides in light was not sufficient to express the oblong ... and therefore I felt that getting the light from above and down a well into the corners of the space gave expression to the form, to the shape, of the room chosen.”

Louis Kahn is concerned about daylight reaching the corners of the space so that the viewer can visualize its shape in plan. The building design is based on his concept of form and design theory. “Kahn describes his preliminary pictograph for this building as a ‘form diagram’, representing the transcendent ‘form-essence’ on which all Unitarian church/school projects should be modeled.” In the morning, the congregational space at the east does not receive direct sunlight. Indirect light or refracted light from the corner of the space spreads through the entire room and gives a sense of sacredness. “Such a condition naturally leads the viewer’s eyes upwards – as heirs to a philosophical and theological tradition in which sunlight is deified, it is not hard to imagine the church members’ minds being turned upwards as well, even if the connections made in this paper are never contemplated explicitly.”

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52 Paul Righini. p.125
54 Ibid p.32
**Light:** The façade has an excellent play of light and shadow which is created by sunken windows and projected fins. All the rooms receive equal amount of light. The central auditorium is well light by the sky-opening. The functional spaces are strategically placed with respect to the sun position. The west of the building encloses service area so that the heat effect is less. The corridors break at regular interval.

**Material:** The building is made of simple material like brick and concrete. The wall surface is accentuated by the effect of light.

**Color:** No specific color scheme is adopted. But the natural color of the material comes into play with the effect of light.

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Fig 4.15 Unitarian church - Congregation space

Fig 4.16 Elevation

Fig 4.17 Congregation space

Fig 4.18 Congregation space
Erik Asmussen:

“Anthroposophy is a spiritual philosophy based on the teachings of Rudolf Steiner which postulates the existence of an objective, intellectually comprehensible spiritual world accessible to direct experience through inner development—more specifically through cultivating conscientiously a form of thinking independent of sensory experience.” Organic architecture is primary base of social relationships that exist between human being. A living architecture can be created only out of this organic process in which the human being opinions are considered. Asmussen never designs a building to merely reflect abstract principles but for the people who are the inhabitants for the place considering their circumstances and materials and site condition of the project. The seven themes which generate his design are natural outcomes of his organic process or social interaction with the inhabitants and his artistic method of designing. The first three themes unity of form and function, polarity and metamorphosis are fundamental for the remaining four themes building envelope, building-site relationship, architectural color and spatial order and experiences.

The function is made visible in the form. “For example, the door handles for pulling is shaped so that the fingers can get the good hold of it while the handles for pushing offers a broad surface that fits the palm of the hand.”\textsuperscript{56} Similarly, the Cultural center is a composition of masses with each mass defining a separate function or space. The largest mass is the auditorium, establishing its functional importance within the building. “Everything in the phenomenal world exists along a continuum of polarized opposites and all architectural experiences are made perceptible, tangible and real by the contrast of polarities.”\textsuperscript{57} Contrasts of color, massing and material occur at different scale to create a fabric of polarized elements. He creates a special sequence in which opposites up and down, light and dark, small and large space come in one existence. Asmussen strives to emphasis the formative process of metamorphosis in his design which was discovered by Goethe.

\textbf{Light:} A series of light and dark spaces through the corridor changes the perception of space and makes the path experiential. The corridor that widens and narrows keeps the person active and aware of the space.

\textsuperscript{56}Gary Coates, Erik Asmussen, Max Plunger, Susanne Siepl-Coates “Erik Asmussen, architect”( University of Michigan, Byggförlagte, 1997) p.
\textsuperscript{57}Ibid p.188
The sill levels of windows are low in the patient room which extends a wider view to the exterior. Polarity in type of window gives a different connection to the exterior.

**Color:** Social spaces are painted in subtle shades of yellow to express and encourage friendship and lively conversation. In the Clinic, rooms for patients suffering from “warm” illness characterized by fever and inflammation are painted in cool shades of green or blue and blue-violet, while rooms for those with “cool” illnesses such as cancer are painted in warm rose and rose-violet.

**Materials:** Buildings are combination of wood, brick and plaster. He matches with the architecture of the neighborhood.

**Tadoa Ando:**

He uses the concept of dematerialization of the reinforced concrete elements through the impact of light. The action of light on the concrete creates an illusory surface transforming the cast concrete to light fabric wall hung against an invisible
place. “Here the passage from materiality to immateriality is inseparable from the movement of the light.”\(^{58}\) He believes in

“Nature in the form of water, light, and sky restores architecture from a metaphysical to an earthly plane and gives life to architecture. A concern for the relationship between architecture and nature inevitably leads to a concern for the temporal context of architecture. I want to emphasize the sense of time and to create compositions in which a feeling of transience or the passing of time is a part of the spatial experience.”\(^{59}\)

His approach to architecture is based on the concept of the uniting nature and architecture. He designs building where people come in existence and feel the nature through the architecture. The spatial experience makes the person constantly aware of his/her own physical being. While walking through long corridors, galleries, ramps or bridges one is aware of his/her physical being and also experience the relation to the earth and its gravity. “Spatial experiences in childhood exert an enormous influence on one’s later life. For that reason, we ought to create buildings that are not only safe and functional but endowed with aesthetic individuality so that they leave an imprint on human memory.”\(^{60}\)

\(^{58}\) Tadao Ando, “Tadao Ando: Light and water,” (2003) p. 6
\(^{59}\) Ibid p.6
Most of his buildings are made up of cement which gives a solid even surface. This surface is contrasted with patterns of light which creates an experiential space. He uses water to reflect light and create patterns. Water also addresses the auditory quality of the space. Flowing or falling water produces sound which becomes a focus point while static water creates serenity which provides spiritual effect.

Church of light: The church is oriented with respect to the sun. The rectangular plan is cut by a freestanding concrete wall at 15’ angle. This wall separates the entrance from the chapel and creates a threshold between the exterior and interior sacred spaces.

**Light:** There is a transition from dark to bright space. Vertical slit type of opening and minimum connection to the exterior makes the space sacred

**Material:** Concrete wall with no decoration are used. The tactile experience enhances the perception of the architecture. The rough nature of the material future isolates the interior sacred space from the exterior.

**Color:** Less use of color.
Artist:

Artist like Irwin, James Turrell and Bruce Nauman involved in Light and Space movement studied the effects of light and landscape on perception. Artist used various materials starting with “light, dark, sun, shadow, time and space, fire, smoke, scrim and string and them progressed to plexiglass, resin, acrylic, fiberglas, neon and fluorescent lights, xenon projectors, dielectricoated glass, and luminescent and phosphorescent agents in their exploration of philosophic and metaphysical issues, based on their study of both Oriental mysticism and scientific studies in sensory perception.” They also worked with scientist and engineer under the program called E.A.T – Experiments in Art and Technology to understand the perceptual phenomena. Work of these artist has been variously termed as “experiential, phenomenal, phenomenological, site-specific or simply Light and space.”

Artist Axel Madsen describes phenomenology as

"Phenomenology was . . . a movement trying to understand the way man thinks and to redefine his relations with himself and the world. . . . Phenomenology wanted to go back to basics by describing things--phenomena--without trying to explain or analyze them, and from the narrowed notion of thinking moved forward to a new, more intuitive grasp of our sense of being.

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62 Jan Butterfield, “The art of light + space,” p.9
Phenomenology meant to stand back and suspend all judgment and to try to grasp things and ideas with a kind of primal intuition."\(^{63}\)

“The concept of light (and dark) has influenced artists since the days of classical Greek sculpture. Besides for the play of light and dark on forms, light has also been used extensively as a symbolic or expressive element in art - and an extremely powerful one which also has alluded to spiritual beliefs since the dawn of time. Light has many historical meanings, from cosmic to alchemy, as well as in the sense of life/death, transcendence/ignorance, good/evil, etc."\(^{64}\)

**Robert Irwin:**

Irwin’s art is based on how phenomena are perceived and altered by consciousness - phenomenological experience. The influence of Minimalism is reflected on the works of Robert Irwin and James Turrell, “who held onto its ideas of dematerialization, importance of the viewer, the experiential nature of art, extreme economy of formal means (color, composition, space and other elements) and the structural properties of light.”\(^{65}\)

In 1968 he began making installations, to alter the viewer's

\(^{63}\) *Ibid*

\(^{64}\) Nancy Doyle, [http://www.ndoylefineart.com/irwin.html](http://www.ndoylefineart.com/irwin.html)

\(^{65}\) *Ibid*

His outdoor works also are involved with the viewer's experience of site and place, and involve landscape design, architecture, and aesthetic philosophy.

An indoor installation, *Who's Afraid of Red, Yellow & Blue*, 2006-07, was made of 6 pairs of painted panels, each pair of primary colors: red, yellow and blue.

Panels were mounted on the floor and ceiling rather than on walls so that the visitor walking towards the work perceives the shape of the panels as trapezoids rather than rectangles. In work emphasizes the fact that in art similar to life, sometime what we know differs from what we see. Irwin and many other artists chose to use intangible materials of light in their installations rather than tangible objects. “Light is so powerful in our lives, and its expressive potential is great. It also has a
healing reputation - it is the province of the divine, however the
divine may be conceived.”

**James Turrell:**

Though, both Irwin and Turrell’s work examines perception,
there was a slight difference in approach. Irwin uses a material
or object that dissolves in light, while Turrell uses light to
create objects/materials. He states “There is no object in my
work. There never was. There is no image within it. I have –no
object –no image –no point of focus. My interest is in
plumbing the space.” He manipulates light to create a
different visual experience within the space. His works are
primarily focused on ways to modify the perception of space
by utilizing light. His works create a visual sense which is
difficult to differentiate what is real and what is not.

Formation of light and space: Cross-corner projection is art
installation where lighting techniques are used to create forms
and shapes that are physically absent but visually present. He
also developed single wall projection where he uses “the
monolithic character of single wall to create strong, flat areas
of resonant light. Like the cross-corner projections, the single
wall projections give light a palpable sense of location.”

Wedge work series is an installation where multiple spaces are
created using light and planes. Turrell also designed rooms
called Skyspaces where sky level is brought down to the
ceiling. The daylight that hits the wall and floor planes creates
shape that change colors with the movement of the sun. These
works are designed to consider space and time.

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66 Ibid
67 Butterfield, p. 68
68 Ibid p.16
This chapter explains about the healing process in general and also with respect to hospital environment, historical belief and scientific evidence of light and color as a medicine for healing. According to World Health Organization, health is defined as a “state of complete physical, psychological and social well-being; not only the absence of illness.”

Healing process:

“Healing and place are inseparable.” There is a current interest developed in creating therapeutic environment in places such as hospital. Hospital is a place where physical, mental, spiritual, emotional and social healing takes place. At the time of Florence Nightingale building design providing fresh air, adequate lighting, good accommodation for staff and other amenities would aid healing process. Various dimensions to healing process are as follows,

1. Healing is multidimensional – physical, mental, spiritual, emotional and social. Getting well does not limits to physical cure but also requires mind to rest, spiritual and emotional needs to be met and healthy social relation to be maintained.

With decades of experience with patient, cardiologist Barnard Lown found that psychological factors affect all aspect of

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illness. Many of the medical practitioners insist on the “importance of social support and being able to express one’s feelings to alleviate emotional pain.”

2. Wholeness, connectedness or integration - The word heal is derived from English word haelon, which means wholeness. Therefore the idea of wholeness, connectedness and integration comes into play. Quinn explains this idea as “people are not collections of parts that need to be fixed, but whole bodymindspirits.”

Studies show that mind and body influence each other and are inseparable. Mind has a great influence over the endocrine and immune system of the body. “Positive attitude and emotion can affect the biochemistry of the body to facilitate healing.”

3. Healing from within – Everyone has an inner ability to heal themselves. Patient should feel the need to get well and can achieve it if they coordinate their thoughts, emotions and spirituality.

4. Healing as a humanistic approach – This approach considers patients as their equal, allow them to make their choices, encourage them to contribute in decision making and tries to understand patients views.

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71 Ibid p.3
72 Ibid p.3
**Healing environment:**

Places achieve a healing sense quality through the type of environments created. Four environments – natural, built, symbolic and social are important in creating a healing sense to place. Author Gesler came up with these four terms based on study of three places – Epidaurus in Greece, Bath in England, and Lourdes is France.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Aspects</th>
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<tbody>
<tr>
<td>Natural</td>
<td>Belief in nature as healer</td>
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<tr>
<td></td>
<td>Beauty, aesthetic pleasure</td>
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<tr>
<td></td>
<td>Remoteness, immersion in nature</td>
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<tr>
<td></td>
<td>Specific elements of nature</td>
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<tr>
<td>Built</td>
<td>Sense of trust and security</td>
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<tr>
<td></td>
<td>Affects the senses</td>
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<td></td>
<td>Pride in building history</td>
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<td></td>
<td>Symbolic power of design</td>
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<tr>
<td>Symbolic</td>
<td>Creation of meaning</td>
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<td></td>
<td>Physical objects as symbols</td>
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<tr>
<td></td>
<td>Importance of rituals</td>
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<tr>
<td>Social</td>
<td>Equality in social relations</td>
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<tr>
<td></td>
<td>Legitimization and marginalization</td>
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<td></td>
<td>Therapeutic community concept</td>
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<td></td>
<td>Social support</td>
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</tbody>
</table>

Fig 5.01 Aspects of Healing environment

It is important to understand how these four environments influence each other to create a therapeutic hospital environment. “People expect treatment for physical or mental illnesses in hospital, but rarely anticipate spiritual, emotional or
social healing.” \textsuperscript{73} Starting from the Nuffield Provincial hospitals Trust of 1950s till date, more than 100 studies have been carried out to examine the relation between good hospital design and well-being.

1. \textit{Bring nature to the hospital}: The age old belief that nature heals has guided many people to bring nature into the hospital design. The connection with nature is created through gardens or views looking onto nature or space surrounded by elements from nature. Prof. Roger Ulrich attempts to prove this using various research methods. Water is the most important element; not only cleans the body but also the soul.

2. \textit{Building design as therapy}: Cleanliness, spaciousness, color, lighting, ventilation temperature and the effects of weather are the few features of the built environment that affects healing. Studies have showed that the lack of sensory stimuli have a deleterious effect on health. According to Hutton and Richardson “most aspects of human-made environments affect the senses; in fact, most hospital patients tend to rate the importance of what they see, hear, smell, taste and feel relatively high.” \textsuperscript{74} In 1972 Wilson compared the postoperative surgical patient in two hospitals and found that “the group that had no windows in their rooms had higher rates (40\%) of

\textsuperscript{73} Ibid p.83
\textsuperscript{74} Ibid p.11
postoperative delirium than a matched group who had windows (18%).”

3. *Interpreting symbols in hospitals:* Sensory experience created by things and symbols in a hospital convey a meaning to the patient beyond surface appearance. The meaning comprehended from what a patient see, hear, touch, taste or smell in a hospital depends on cultural heritage and past experiences. “Symbols mediate between a stimulus and a response.”

Chelsea and Westminster Hospital in London have an artwork gallery designed with an idea that the art is therapeutic. Similarly water symbolizes “divine blessing, purity, absolution, washing out sin and disease.”

4. *Fostering social relationships:* Hospitals should have a gathering place for a wide variety of people who play many different roles. It is very important for people to get along with each other, especially for a healthy well being of patient and everyone. “To combat inequalities, four basic themes were developed: democratization, permissiveness, reality confrontation and communalism. These themes were fostered by such practices as facilitating communication, breaking down

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75 *Ibid* p. 87
76 *Ibid* p. 87
77 *Ibid* p. 13
hierarchies of authority, staff/patient consensus in decision making, and providing living-learning experiences.”

Use of light and color as medicine:

In a built environment, it is possible to control light and color to create specific mood that provides positive effect on the patients. Even before the advent of drugs, “doctors utilized healing properties of the sun to improve health, both physically and psychologically.”

Many cultures like Egyptians, Romans and Greeks have used the healing powers of the light and the sun. During Egyptian culture, temples were built where color healing took place. People were exposed to sunlight passed through colored gems, such as rubies and sapphires. “Rooms were constructed for disseminating the color spectrum. The sick were “color diagnosed” and then put into rooms that radiated the particular color prescribed.”

The theory and practice of solar therapy were first documented by the Ancient Greeks. Heliopolis, the Greek city of the sun, had healing temples, where “sunlight was broken up into its spectral components (colors), and each component was used for a specific medical problem. Color, being a manifestation of light, held a therapeutic, as well as

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78 Ibid p. 91
80 Ibid
In Chinese culture, color is considered as cosmic energy that directs our destiny. In India and Tibet, healing was correlated to the seven chakras of our body. “Chakra is described as a system, a set of seven invisible energy centers that animates each person's physical, mental, emotional, and spiritual body. Chakra means “wheel” in Sanskrit and, as a metaphor for the sun, denotes the eternal cycle of time, representing celestial order and balance.”

“Color therapy or chromo therapy is a science that uses different colors to change and maintain vibrations to the body so that the frequency that signifies health and harmony can be applied to the body either physically or through definite exposure of light rays.” Number of medical experiments supports this theory - exposure to blue light is believed to cure neonatal jaundice, photodynamic therapy is used to treat various types of cancer and light therapy is used to cure seasonal affective disorder SAD.

According to chromo therapy, every human being carries certain color and vibration. There are 7 different chakras in our body and their significance is described below.

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81 Ibid
82 Ibid

December 2006
<table>
<thead>
<tr>
<th>COLOR</th>
<th>POSITION</th>
<th>EFFECT ON PHYSICAL BODY</th>
<th>DISEASE HEALED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td>The Base Chakra</td>
<td>Hemoglobin builder, produce heat, vitalizes the energies of the physical body, liver energizer, counterirritant</td>
<td>Anemia, bronchial asthma, bronchitis, aliment of the endocrine system, pneumonia, tuberculosis, constipation</td>
</tr>
<tr>
<td>ORANGE</td>
<td>The Sacral Chakra</td>
<td>Antispasmodic effect, muscle spasms, cramps, increase calcium, enhance body metabolism, assimilation and circulation</td>
<td>Bronchitis, chronic conditions like asthma and rheumatism, colds, epilepsy, gallstones, lung conditions, mental exhaustion, kidney ailments</td>
</tr>
<tr>
<td>YELLOW</td>
<td>The Solar Plexus Chakra</td>
<td>Positive magnetic curves, stimulating, cleansing and eliminating action on the liver, intestine and skin</td>
<td>Diabetes, digestive problems, eczema, flatulence, kidney problems, indigestion, mental depression</td>
</tr>
<tr>
<td>GREEN</td>
<td>The Heart Chakra</td>
<td>Cooling, soothing, calming both physically &amp; mentally, beneficial effect after some time its becomes tiring, lowers blood pressure</td>
<td>Asthma, head colds, colic, irritability, laryngitis, malaria, nervous system disorders, nervous disease</td>
</tr>
<tr>
<td>BLUE</td>
<td>The Throat Chakra</td>
<td>Increases metabolism, builds vitality, promotes growth, soothing/cooling effect, reduces nervous excitement, anti- carcinogenic</td>
<td>Manic-depressive phase, apoplexy, baldness, cataracts, chicken pox, cholera, colic, diarrhea and eye inflammation</td>
</tr>
<tr>
<td>INDIGO</td>
<td>The Brow Chakra</td>
<td>Electric, cooling, blood stream purifier</td>
<td>Parathyroid stimulant and thyroid suppressant.</td>
</tr>
<tr>
<td>VIOLET</td>
<td>The Crown Chakra</td>
<td>Both motor nerve &amp; lymphatic depressor, cardiac depressor, nourishes blood in the upper brain</td>
<td>Leukocyte builder, purifies blood</td>
</tr>
</tbody>
</table>

Various authors have given one-to-one relations between color and emotion/disease. But there is not enough evidence to establish this result. However experiments have shown that color-mood association exists. “Emotional responses to colors
Evidence-based design:

Centre for healthcare design has been working to prove scientifically that the light and color have healing potentials. They have developed a growing research body called Evidence based design approach. “Evidence-based design (EBD) is an approach to environmental design (architectural, interior, and landscape) that aspires to base design decisions on documented research and well-established best practices, with the aim of improving outcomes.”\textsuperscript{85} This design approach is largely used in the healthcare and it has received support from healthcare administrators who are familiar with the idea of evidence-based medicine. Hospitals and other healthcare buildings designed on basis of this research evidence are projected to have improved patient safety, reduced stress, increased care delivery effectiveness and enhance quality of care. These outcomes are possible only when the environment design is “therapeutic for patients, supportive of family, efficient for staff and restorative for all.” \textsuperscript{86}

\textsuperscript{85} Lyn Geboy, “The evidence-based design wheel” Healthcare Design, March 2007
\textsuperscript{86} Ibid
Roger Ulrich, Craig Zimring and colleagues conducted an extensive review of the evidence based research works we have till date to create a report for The Center for Health Design. Based on this report, Lyn Geboy came up with a new approach to understand the factors in evidence-based design. He conceptualized wheel with 12 studied outcomes that contribute to the healing environment. “The EBD Wheel represents a factors-oriented view, prompted in part by a reading of an earlier article by Ulrich on the effects of healthcare environmental design on medical outcomes, which organizes the literature in terms of environmental characteristics that can affect outcomes. Taken together, the 12 environmental factors and the overall healing environment concept comprise a comprehensive, strategic, values- and evidence-based set of design responses that create therapeutic healthcare environments i.e., curative settings that support healing and improve the healthcare experience.”

87 Ibid
Healthcare design - kit:

**Nature:**
Access to nature reduces stress - staff and patient, bring natural materials to the inside of the building

**Light quality:**
Diurnal lighting emulates rhythms of night and day, Plan unexpected lighting to add sparkle, whimsy
Sound:
Fire burning, Water flowing, Music playing, Quiet – identifies ourselves with the memory

Color:
Color is emotional and can impact stress levels

Art & wayfinding:
Art should be regional and psychologically appropriate, Subtle clues as wayfinding elements

Fig 5.5 Design kit
EVIDENCE BASED DESIGN:

PHENOMENOLOGY:

Phenomenology is one of the contemporary design philosophies which give equal importance to the physical experience of building materials and also their sensory properties. Phenomena like light, color, material interact to evoke senses in a body. Phenomena of light, color and material exerted in architecture setting have a vital role in healing process.

Juhani Pallasmaa: “Every touching experience of architecture is multi-sensory, qualities of space, matter and scale are measured equally by the eye, ear, nose, skin, tongue, skeleton and muscle. Architecture strengthens the existential experience, one’s sense of being in the world, and this is essentially a strengthened experience of self.”
Case study:

I studied the building – Hatfield Health Center, New facility at Chelsea and Westminster hospital, London. It was opened in 1993 as a part of the NHS trust on the site of an old hospital called St. Stephens. The idea was to collaborate 5 hospitals into one at a central location. Important design concept which promotes healing in this building is as follows.

a) Integrate surrounding with community:

- Retail space like shops and cafeteria in the ground floor of hospital are used by the public on a day to day basis.

- Public events such as perfume and book sales, art galleries and exhibitions bring visitors inside the hospital.

b) Create a Sense of place:

- Glazed atrium roof makes you feel like you are outdoors. It brings outdoor inside.

- Atrium allows views of dramatic and playful artwork from many angles.

- Central atrium makes it easy to see all the surrounding departments. It allows ample daylight which creates a healing environment and helps balance hormones.
**Site condition:**

AUROVILLE, a Universal city in the making in South India is located in Pondicherry which is a union territory in India. The place where I am proposing my design is at Quiet healing center which is part of Auroville. Auroville has its own principles and culture and therefore it is important to understand that before the design. Auroville is a universal township that is in the process of making for a population of up to 50,000 people from around the world. The main purpose of Auroville is to unite human from all over the world though there is diversity. “Today Auroville is recognized as the first and only internationally endorsed ongoing experiment in human unity and transformation of consciousness, also
concerned with - and practically researching into - sustainable living and the future cultural, environmental, social and spiritual needs of mankind.”

Auroville is attempting to create universal town where men and women from all countries can live in peace and harmony ignoring all creeds, politics and nationalities.

“Auroville Charter:
1. Auroville belongs to nobody in particular. Auroville belongs to humanity as a whole. But to live in Auroville, one must be the willing servitor of the Divine Consciousness.
2. Auroville will be the place of an unending education, of constant progress, and a youth that never ages.
3. Auroville wants to be the bridge between the past and the future. Taking advantage of all discoveries from without and from within, Auroville will boldly spring towards future realizations.
4. Auroville will be a site of material and spiritual researches for a living embodiment of an actual Human Unity.”

Auroville Symbol:

“The dot at the centre represents Unity, the Supreme; the inner circle represents the creation, the conception of the City; the petals represent the power of expression, realization.”

Meaning of colors: Symbols is made of “center and four powers, white; the twelve all different colors in three groups:

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88 http://www.auroville.org/av_brief.htm (November 14th 2009)
89 http://www.auroville.org/av_brief.htm (November 14th 2009)
90 http://www.auroville.org/vision/avsymbol.htm (November 14th 2009)
top group red, passing to orange towards yellow; next group, yellow passing through green towards blue; third group, blue passing through violet towards red. If white is not convenient, the center may be gold (powder).

According to Sri Aurobindo the colors mentioned generally have the following significances, though the exact meaning may vary “with the field, the combinations, the character and shades of the color, the play of forces”:
red - physical,
yellow - thinking mind,
blue - higher mind,
orange - supramental in the physical,
violet - divine compassion or grace,
gold - divine Truth,
green - life,
white - the light of the Mother, or the Divine Consciousness.”

Evolution of Urban form:
In 1965 Mother- Sri Aurobindo sketched the concept of the town. “This sketch delineated all the important activity areas that would fulfill the vision of making it a universal township. The concept was as much practical as it was visionary and the way in which it is fitting in with today’s international, national and local way of seeing things is quite striking. Through its Master Plan, Auroville wants to break new ground in settlement-planning in such a way as to help other cities, both in India and abroad, which are experiencing high urbanization trends. Auroville also hopes to demonstrate how ‘urban’ &

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91 http://www.auroville.org/thecity/matrimandir/mm_symbolism.htm (November 14th 2009)
‘rural’ areas can complementarily develop in an integral and holistic way for their mutual benefit and well-being.

It took three decades to get the galaxy plan adopted officially. At the spiritual and geographic center of Auroville is Matrimandir, a shiny spherical building clad in circular gold-leaf plates in the middle of a large amphitheatre where Aurovillians go to meditate. On the master plan it is surrounded by four zones — industrial, residential, cultural, and international — that sweep outward from a circular hub.™

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**Auroville Architecture:**

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Steered by the Aubrac architects, the Monolithic School of Auroville, the housing progressed in a harmonious scale and form. The first settlement was established in the 1930s, and the community has been growing ever since. The city planner, Cameron Tholadin, was instrumental in shaping the city’s master plan. He envisioned a city that would be self-sufficient and sustainable, with a focus on spiritual and educational development.

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92 [http://www.auroville.org/thecity/buildingthecity.htm](http://www.auroville.org/thecity/buildingthecity.htm) (November 14th 2009)
“The philosophy followed is to employ local resources in an optimized way, to plan considering the natural elements, passively and actively, and to render the social impact of construction positive, improving lifestyle quality of both, the doers and the users.”

Freedom from the restrictive regulations has allowed the architects to experiment their design approach. The use of local resources cut down the cost of importing materials from elsewhere- low-tech building methods. Ferrocement and hand-made bricks are largely used in the design. “Earth in the form of compressed stabilized blocks and stabilized rammed earth is used for load bearing structure, arches, vaults and domes. Beside the use of stabilized earth, such alternative systems and energies are used: wastewater treatment system, grey water recycling system, rainwater harvesting, solar and wind energy generation system. They are designed and integrated to complete buildings as sustainable systems - economically, socially and ecologically. These buildings can attract local plants and birds, so as to create unique and comfortable spaces.”

**Quiet Healing center:**

The building design I am proposing is at Quiet healing center. “The healing work at Quiet is based on the

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94 Ibid
understanding that man is first and foremost a spiritual being seeking to express its truth through the instrumentality of the mental, vital and physical nature.”95 All therapy offered attempt to improve the energy level of the patient. “Each therapy (and therapist) honors and strives to work in harmony with the body’s own deep wisdom; each recognizes itself as a humble tool of the inner spirit who is ultimately the only healer.”96

Fig 6.11 Quiet Healing center

**Research inference / Design concept:**

Analyzing the architectural precedence, cultural meaning of light and color and scientific believes, the light, color & texture can be used in various ways to get the desired quality of space.

**Light:** Direct light provides a bright environment which is active and dynamic. It also gives a better visual connection to

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95 [http://www.auroville.org/health/quiet.htm](http://www.auroville.org/health/quiet.htm)
96 Ibid
the exterior. Diffused light creates a spiritual effect to the space. Also there is less connection with the exterior and gives a static effect. Light shows the passage of time through the space. Direct and diffused light are created variations in

- Size of the aperture
- Location (height)
- Surface

Also orientation with the sun places an important role in amount of light entering the space. North light is soft with any glare. East light is the essential morning light and the entry of the sunlight has to be controlled with shading device. South and west light is harsh and has to be controlled with shading device.

**Size of the aperture:**

Amount of light entering varies with the size.

Variation in the views

**Location:** Height of the opening from the floor level plays an important role in determining the quality of space created.
Connect well with the exterior  

Surface:

The openings on the ceilings give a sacred quality to the space and also it accentuates the wall on which the light is incident. Opening on the vertical surface connect with the world, but the openings on the ceilings give a spiritual connection and also it accentuates the surface.

Also I studied various type of wall opening with respect different orientation to sun- east, west, south and north.

Following are the image of the final presentation.

Phenomena of light, color and material exerted in architecture setting have a vital role in healing process. Health is a state of complete physical, psychological and social well-being, not only the absence of illness.

<table>
<thead>
<tr>
<th>ANALYSIS</th>
<th>INFERENCES</th>
<th>PRINCIPLES</th>
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<tbody>
<tr>
<td>Steven Holt: St Ignatius chapel</td>
<td></td>
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<tr>
<td>quality of space, sacred space</td>
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<td>Transitive thru light &amp; dark space</td>
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<td>Twill/Turn and Upward</td>
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<td>Openings - small sizes &amp; different height</td>
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<td>Diffused light</td>
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<td>Peter Zumthor: Thermo Vals</td>
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<td>quality of space, use</td>
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<tr>
<td>Transition thru light/dark space</td>
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<tr>
<td>Diffused light - slits in ceiling</td>
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<td>Mir reflection - inter/inventory</td>
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<tr>
<td>Size of opening - function</td>
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<tr>
<td>Louis Kahn: First Unitarian church</td>
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<tr>
<td>Quality, teaching/learning</td>
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<tr>
<td>Uniform opening - shadow effect</td>
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<td>Mirrored reflector windows</td>
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<td>Ceiling opening - focus/identify the space</td>
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<tr>
<td>Erik Asmussen: Vidar clinic</td>
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<td>Quality of space, healthy nursing</td>
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<td>Transition thru light/dark</td>
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<tr>
<td>Corridor separation</td>
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<tr>
<td>Wide and low sill openings</td>
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<tr>
<td>Artist:</td>
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<tr>
<td>Robert Irwin - begins with material &amp; dissolves in light</td>
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<tr>
<td>James Turrell - uses light to create material</td>
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<tr>
<td>James Carpenter - &quot;Building&quot; is still</td>
<td></td>
<td></td>
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<tr>
<td>North light - soft light without glare</td>
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<td></td>
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<td>East light - less intense requires sunshade</td>
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<td>Western and over long periods, warm light</td>
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Phenomenon of light

Pondicherry:
Latitude: 11°55'N, Longitude: 79°50'E

PHENOMENON OF LIGHT
All sensory experiences perceived by the body are a means of touching. For our sensory organs are capable of perception within a particular boundary line or a limit. Lifeless-Porty says, “To see is to touch with the eyes, feel they are the means of touching the stars and the sun. Likewise, to smell is to touch with the nose…” Pallasmaa believes natural materials can incite emotions and unconscious thoughts.

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<tbody>
<tr>
<td><strong>Steven Holl: St. Ignatius chapel</strong></td>
<td>Brick makes one think of earth and fire; gravity &amp; the absence of tradition of construction</td>
<td>Existing sequence of texture</td>
</tr>
<tr>
<td>Quality of space: sacred space</td>
<td>Resin of beach, dampness &amp; cool temperature</td>
<td>Stone is used in a phenomenal way to have a continuity and balance with the existing texture</td>
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<tr>
<td>&gt; Light reflected from the hard, textured plaster wall. Alabaster ceiling, sand cast glass defines the haptic dimension of the building.</td>
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<td>&gt; Water-phenomenal lens</td>
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<tr>
<td><strong>Peter Zumthor: Therme Vals</strong></td>
<td>Phenomenal lens - power of reflection, spatial enclosure, reflection of signs of light, the surface has texture, consistency, viscosity &amp; color</td>
<td>Master plan has line of force - which are the major route</td>
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<tr>
<td>Quality of space: spa</td>
<td>Stone sense of rigidity &amp; hardness, its distant geologic origins, its density &amp; inherent symbolism of permanence</td>
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<tr>
<td>&gt; Building is made up of local stone, gravel. The stratified and layered pattern of the wall surface gives a sense of memory to the space</td>
<td>Flexible in nature, wood has the power to calm and smooth the mind</td>
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<tr>
<td>&gt; The human body is in constant touch with the solid floor and wall.</td>
<td>Reminders of beach and smooth surface</td>
<td></td>
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<tr>
<td><strong>Louis Kahn: First Unitarian church</strong></td>
<td>No wear and tear, light material, self-reflection</td>
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<tr>
<td>Quality: teaching/learning</td>
<td>Every material has a texture - rough or smooth. Rough texture: positive feeling of strength, sense of existence, negative - sharp edges</td>
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<tr>
<td>&gt; The building is made of simple material like brick and concrete. The wall surface is accentuated by the effect of light.</td>
<td>Smooth texture: positive - comfortable and feels light in weight, negative - less dominance over other materials</td>
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<td><strong>Erik Aasmusen: Vidar clinic</strong></td>
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<td>Quality of space: healing/learning</td>
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<td>&gt; Buildings are combination of wood, brick, and plaster.</td>
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<tr>
<td><strong>Artist: James Carpenter</strong></td>
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<tr>
<td>Casting objects are metal and glass, ideal is used for its reflective qualities, as a glass.</td>
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<td>Gothic glass - color &amp; reflection, mirrored glass can reflect exact or distorted image, &amp; acid etched glass</td>
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<tr>
<td>Diffuse light &amp; obscure understanding of an image</td>
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07.00 Bibliography


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