

Effects on light and colour on our environment



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Light and colour have the ability to have a profound effect on the way we perceive and interact with our environment, affecting us holistically, in mind, body, and spirit. Altering the way we experience space, changing our perception of spatial definition and proportion.

Light and colour serve as mediums for communication and information. They aid orientation and influence movement; differentiate space, establish hierarchy and indicate function; convey symbolic messages; they are an expression of the Zeitgeist and connect us to the world in which we live.

Light and colour have major impacts on our psychology, influencing our emotion, feeling and creating associations, physiologically impacting on our well-being on both a visual and non-visual basis.

Pituitary gland etc.?

One would usually associate the above solely with the sense of sight but both light and colour induce synesthesia, evoking associations with senses such as taste, smell, kinesthesia, temperature and according to some even affect our perception of time.

The way we comprehend and experience light and colour is more complex than a simple optical stimulation. Our perception is a result of interplay of both physiological and psychological factors in the conscious and subconscious. We have many prepossessions and preconceptions of light and colour which can be formed through personal experience, be a result of cultural influences and/or education or be part of genetic make up, developed over millions of years of evolution.

There are six basic interdependent factors which combine to give us are perception of light and colour, biological reactions; the collective unconscious; conscious symbolism and association; cultural and mannerisms; trends, fashions and styles; and personal relationships and factors

Biological Reaction

Our biological reactions occurs not just as a result of the visual pathway. Light and thus colour aslo effect us a through neural pathway or 'energetic' pathway. Through the energetic pathway light and colour stiumli are carried directly to the brain and onto the pineal and putrity glands, which control the production of hormones. This in turn can effect the likes of, metabolism, blood pressure, stress and aggression.

The Collective Unconscious

the collective unconscious refers to perception which is not rationalised by our conscious thoughts or our own personal experiences. According to Jungian psycholgy " the collective unconscious is the part of our psche that has nothing to do with conscious or unconscious reaction based on personal experience amessed during our life time"

The collective unconscious consists of architypes, primordial and latent images, impressions and associations, in our gentic make up. Predispositions devloped thorough millions of years evolution and the development of our species and cause us to interpret the environment in same way our predecessor

The authors Hall and Nordby describe it as:

“ the collective unconscious is a reservoir of latent images, usually called primordial images by Jung. Primordial mean the ‘ first’ or the ‘ original’ therefore the primordial image refer to the earliest development of the psyche. Man inherits these images from his ancestral past, a past that includes all of human ancestors as well as his prehuman or animal ancestors.”

Conscious Symbolism

Fundamental associations and impressions made in the conscious. There are many associations to certain colour which are universal, and are read the same no matter the culture or education, for example yellow with light, blue with the sun and green with nature.

The symbolism of the light and colour can be particularly significant in the field of architecture due to their connection to evoking mood and feeling. Light and colour suggest warmth or coolness, alter one's perception of whether a room is friendly, etc

Cultural influences

Although there are many colour associations which are universal, we must also consider how different cultures have different associations for some colours. For example Japanese culture tends to be more responsive to softer colours, perhaps this relates to a greater appreciation of materiality. Indian culture on the other hand has a greater affinity to loud, bright and vivid colouration.

There are also certain colours which gain greater significance in a certain colour. An example of this is the religious importance of green in Islam.

Trends Fashion and Style

Our interpretation and preferences of colour can be affected by what is in vogue at a particular time. Trends in the built environment tend to change on a less regular basis than in other. Although responding to trends in architecture and interior design may not result in creating the most beneficial environments as different environments have different requirements, trends can be important in producing a sense of zeitgeist. Such as ?

Personal Relationships and Factors

Our relationship to space is highly influenced by personal and subjective factors such as personal disposition and specific personal experience, for example one would usually associate blue with coolness but if burnt by a blue object may induce an association with heat. Other personal factors that can change perceptions of light colour include sensitivity, age, character and temperament and are part of physical and psychological makeup.

Colour psychology can be separated into interlinked subdivisions, applied colour psychology and 'depth colour psychology'

Applied colour psychology is the one that generally applies to architecture. It deals with the implementation of predetermined psychological effects to create a spatial ambience to produce psychological benefits thus physiological benefits, or to convey a specific imagery. More?

Symbolism and imagery of light and colour.

“ For it is through symbols that man finds his way out of his particular situation and ‘ opens himself’ to the general and the universal. Symbols awaken an individual experience and transmit into a spiritual act, into a metaphysical comprehension of the world”- Mircea Eliade

For thousands of years natural light has been used for its powerful associations, for early man light held more significance than perhaps any other time, it was the giver of life and revered to the extent of worshipping the sun. Its significance however has diminished especially since the intrusion of artificial light

Light can be regarded as metaphorical in conjuring thoughts of another place or notion. It can be symbolic, representing something else often that which immaterial such as infinity, and often symbolic of that which we do not fully comprehend. Light has the quality to produce a power ephemeral state of being.

For link to times season Zeitgeist?

Darkness is also important in this experience not only as a contrast too dark but in its own symbolism and representations, and the states of mind it creates, the lack of light suppress the visual, heightening the other senses. Strong darkness presents the unknown leading to states of apprehension, unease and even to phobia.

The interplay of light and dark can lead to the the creation of contemplative or theatrical light.

Luis Barragan advocates the use of what he calls half-light

“ architects are forgetting the human need for half-light the sort of light that imposes a tranquillity, in their living rooms as well as their bedrooms... we should try to recover mental and spiritual ease and to alleviate anxiety, the salient characteristic of these agitated times, and the pleasures of thinking, working, conversing are heightened by the absence of glaring light”

One of the few cultures in which the design of such environments is prevalent is in Japanese traditions. Quote for in praise of shadows and example?

Another way to create places of contemplation is to use diffuse or baffled light, producing a level of uniformity “ contemplation is nourished by the lack of distractions”

Metaphorical Light

Metaphorical light extends the role of light beyond that of simply of revealing, it denotes light that is used to conjure a visions of a different locality, for example its can be used to as a representation of nature, blurring boundaries giving one the impression that they are not in a interior setting.

The use of metaphorical lighting is vivid in the works of artist Edward Hopper. In his painting New York Movie, Hopper uses contrasts in light to differentiate between the fanstay world of the theatre and the reality in which the usher carries on with her everyday life.

Symbolic light is used as a representation of the immaterial and the unembodied, beyond that which is portrayed by the metaphorical, complex notions such as life and death.

An powerful example of this is the Vietnam War memorial in Washington D. C. The names of the dead are inscribed in the specular granite surface of the wall. The ever-changing reflections of light and the surrounding remind us of our place and temporal natural in this world and thus our mortality.

For thousands of years light has been associated with the spiritual facets and seen as the manifestation of divinity and the ethereal. Since prehistoric man light, the sun have been connected to the scared, prehistoric worshipped the sun build monuments align to its summer solstice to honour it, as this was when its was its most powerful. Tombs were also built with reference to the sun, often align to face the sun rise on the summer solstice. The light of a new day and the rising sun gave hope of an after life

“ the natural language of light and dark is a powerful one with which to express architectural meaning”

Specific colour also hold symbolic associations. Many of these are fairly obvious, however these initial associations over time have lead subsequent affiliations or can take on induce different connections. The collective findings from a number of experiments have shown that many are universal however there may be slight variations in different cultures and religions.

Associations have from human experience, going all the way back to early man. As discussed above primordial images etc have been stored in the

human genome passed on from generation to generation and contribute to our colour perception. Eckart Heimendahl suggests that our colour perception develops from three types of symbolism: ritual symbolism, traditional symbolism and aesthetic-emotional (psychological) level symbolism, which fuse to give us our experience of colour

“ one of the most striking features of the results concerning preference, connotation and colour-mood associations is the consistency from one individual to another, from group to group and cross-culturally. There has been a great number of cross-cultural studies comparing subjects in America, Lebanon, Kenya, Botswana, Greece to mention a few. Monkeys have been compared to Man, men to women, children to adults, layman to architects. As another author concludes, it would indicate either that our heritage is such that we learn correct responses, or that there is some innate mood reaction to different colors” (Kuller 1981 p. 164)

The message a colour conveys and thus its psychological effect is dependent on colour's hue and the environment in which it sits. Even the slightest change in a hue's nuance can alter its meaning. The materiality of the colour also plays a significant role in this process, which will be discussed later.

The following will give an overview of the imagery and messages that the prominent hues are affiliated to.

Red is a warm, stimulating colour with both positive and negative associations. Its positive connotations include the aforementioned warmth due to its connection to fire, as well as passion, strength, activity and love. Its more negative affiliations include rage and aggression, ferocity, although

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these have served a purpose throughout history. An example of this in military, where red was used to change mind sets and convey a aggression.

Red also represent blood, which to some may portray an unfavourable message, can also represent life. This is perhaps linked to early man who may have concluded that blood gave life after seeing blood leave the body a slaughtered prey.

Love?

Red is the dominant and attention grabbing colour as its focus point is behind the retina which give the impression that it is protruding

pink?

orange is a largely positive colour and is generally considered to have very few negative connotations. Although less assertive than red its is still vibrant and energetic, with lighter tone being cheering. Orange also has connections to nature reminding us of autumn and sunsets.

Brown is a darker tone of orange which again has strong connections to nature, prompting thoughts of the earth. As it is earthly is suggest security and stability. However certain shade of brown may be less pleasant and dreary and even dispiriting.

Yellow is considered to be the 'happiest' colour due to it luminous and radiant nature and thus it tends to raise ones spirits. Perhaps its is most powerful and spiritual affiliation with the sun, and therefore with light and life. Yellow was also the colour of mercury in, best known for being the

messenger of the god, but was the god of commerce and profit, as well as the god of the traveller, thus yellow can represent spiritual enlightenment.

Green focus precisely on the retina and therefore is the easiest colour on the eye. As a result green is relaxing and refreshing. One of green major associations is nature and vigorous growth. Early rituals were based around the lush green of vegetation and thus is a symbol of food and life, and as a subsequence in Christianity represents hope and immortality. Green also has significant religious value in Islam where it is regarded as a holy colour. In stark contrast certain variations of green can convey a message of mould and decay and as a result death. Depending on its position between yellow and blue green has different effect, a green closer to yellow will appear to be more stimulating where as bluish green appear cooler and more tranquil

Blue like green is relaxing and retiring, but appear cooler than green although darker tones appear to feel warmer. Materiality also affects its relative warmth, a dark blue, thick carpet will not provoke a cold feeling. Blue induces feelings of calmness and as a result contemplation and due to its obvious connection to water blue gives expresses cleanliness. However if not used correctly blue can be cold and depressing as referred to in the phrase “ I have the blues”.

Blues symbolism has a number of cultural variations. In Rome blue was the colour of a philosopher robe and reflected wisdom. In China blue symbolises immortality and holiness to Hebrews.

purple/violet

white symbolises many positive things, architecture it prompts a sense of openness and freedom, a white space will always feel more expensive, however if the portion of white is too greater it gives a sense of emptiness. From a multi-discipline perspective, white conjures images of cleanliness, purity, innocence and peace. In Asia white is the colour of mourning but in a positive way, as they believe that death on this earth is the beginning of a better life.

black**grey**

Over and under stimulation

In terms of both physiological and psychological factors the balance of stimulation is important in providing the right environment. Both over-stimulation and under-stimulation can have adverse effects on our well-being and the overall impression of a space. For an environment to be most beneficial a balanced variety should be sought.

“ Balance is the securing of unity amidst variety. Both variety and unity are required to sustain interest, and these opposing forces must be balanced. Variety is necessary to attract and arouse interest; unity is essential to create a favourable impression and desires. Variety overdone is confusing and unpleasant. Unity overdone is monotonous. The mark of colour arrangement is knowing where to stop between these extremes”

Exposure to an overly complex visually chaotic environment or extremely monotony, whether it be through colour, pattern or contrast can effect us physiologically by triggering changes in rates of breathing, blood pressure and pulse, thus lead to increased stress levels Over stimulation can induce an increase in muscle tension and is believed to increase ones susceptibility to infection which can lead to ulcers and coronary disease.

Surprisingly dull under-stimulating environments can cause increases in heart rate. With no external stimulation one becomes more aware of there inner self. Subject to individuals mentally and nature if their thought, this can lead to fear, anxiety and distress.

On a psychological level an under stimulating and thus sensory deficiency setting is known to lead to a lack of concentration, restlessness and irritability. Under stimulation can also lead to perception disorders.

“ It cannot be stressed enough that the balance between unity and complexity is the first and most important rule in the design in beneficial environments”

However in certain situation it can be the designer objective to create space which are under stimulating. It space may be design as a spiritual and contemplative space which encourages one to look inside themselves for enlightenment...

To understand the extent of light and colours effect, we must consider it on its own as well as the how it reacts and relates to its environment.

Our cognition of light and colour can be largely influenced by how they contrast with their surroundings. There are a number of different contrast relationships which alter the way we perceive and distinguish:

Light-Dark Contrast

In its simplest terms this is the contrast between light and shadow. But it can also refer to the difference between lightness of colours, but the contrast is most prominent in the achromatic i. e. when no hue is involved. Light-dark contrast can be useful for differentiating space. However, too great a contrast will cause visual fatigue and strain.

Chromatic-Achromatic contrast.

Combining the chromatic with the achromatic will alter the perceived intensity and luminosity of the chromatic colour. White and grey nuances weaken a colour's luminosity and therefore can be used to neutralise. On the other hand, black increases a colour's luminosity.

Complementary Contrast

Complementary contrast occurs between two colours which are as different as possible, located directly opposite on a colour wheel. Each complementary contrast has its own unique feature. For example, a contrast between orange and blue gives the greatest warm-cool definition and a yellow-violet contrast gives the most intense light-dark contrast. Effect/importance

Intensity contrast

Describes the contrast between colours of different saturation. Intensity contrast is best used when a small amount of pure colour is used as

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an accent amongst muted colours, which give a particular feature emphases while maintaining the over ambient of the space.

Quantity Contrast

Quantity contrast is the proportional relationship between the colours in a space. The proportion of a particular colour plays major role in establishing spatial definition and impression

Flicker Contrast

Flicker is a over stimulating contrast, occurring when intense colours with similar lightness or darkness are combined in a space. This type of contrast shows that the colouration has not been considered appropriately, flicker contrasts should be avoided.

There are two other physiological contrast which also need to be taken into account when assessing the impact of colour, successive contrast and simultaneous contrast.

Simultaneous contrast is the phenomenon where by a colour will be perceived differently with a different foreground, background or environment. For example if a neutral grey is placed on a surrounding colour background the grey will appear to have a hint of the complementary colour of the background colour. The perceived change is not reality but is a result of one's 'colour sensation'. Simultaneous contrast does not just affect hue and saturation but also brightness. For example grey will appear lighter against a darker background

Successive contrast is a phenomenon where by if one is subjected to a colour stimulus for an excessive amount of time an ' after image' of its complementary colour will occur. For example if one stares at a red surface for a prolonged period of time then look at a white surface, the white surface will appear to be blue green. This ' after-image' is believed to be the result of fatigue. The affect is temporary but nevertheless can be disturbing. e. g.?

“ The physiological reality is that the eye requires any given give colour to be balanced by its complementary, and will generate it if it is not present. Complementary colours also provide psychological balance to warmth and coolness of colour.”

The after image is a physiological effect which indicates than use us of complementary colours the the most effective way of creating a harmonious space

Synesthesia

Synesthesia (Greek, syn= together + aisthesis= perception) is a neurological condition in which the stimulation of one sensory modality evokes a experience in another modality, or the crossing of two or more sense. Light and colour not only stimulate the sense of sight but arouses sensations in many other of the other senses through visual and non visual means.

Perception of weight

as a general rule darker and more saturated colours will appear to be heavier and more dense than lighter and less saturated colours. Warmer colours will also seem heavier than the cooler coolers if the same hue

Perception of volume and distance

The lighter a space is the more open it will be perceived to be thus a space will appear to have a larger volume than a dark space. Within a space lighter colours, cooler colours and small patterns will appear to recede. With darker or more saturated seeming the protrude thus making distances seem shorter.

Perception of temperature

it is widely believed that visually, colour can alter our perception of whether a room is warm or cool. Since the formation of the hypothesis several experiments have been observed which seem to prove what was thought .

One such example is described by Johannes Itten in his book *The Elements of Colour*, is experiment illustrates a significant difference in the temperature at an individual felt cold in different coloured room

“ Occupants of the blue-green felt that 59 degrees Fahrenheit was cold, where as the temperature had to fall to 52 degrees Fahrenheit in the red-orange room before the subjects felt cold”

evidence from a corresponding Norwegian study drew a similar conclusion, in which subjects set a thermostat four degrees lower in a red room compared to a blue room.

However test also showed that the effect where only temporary and after a period of time the effects begin to diminish.

Perception of Taste and Odours

Certain colours can evoke associations with tastes or smells. Colours such as lavender, pale yellow and pink have pleasant associations with smell and colours such as coral, soft yellow and light green are associated with pleasant tastes. These affiliations can be useful in industrial situations to help improve unpleasant environments.

Perception of Sound

Gestalt psychologists such as Heinz Werner, Kravov, Allen and Schwartz have produced evidence that strong odour and taste can alter our perception of colour. It is suggested that strong taste and odours make us more sensitive to red and more to green.

On a similar note, through colour association can be used to offset loud environments. For example, one may mentally connect highly saturated warm colours with being loud, cool and low saturated colours having the opposite effect, thus cool or low saturated colours can be used to help offset noisy environments.

“ a noisy atmosphere will be experienced subjectively as noisier or more bothersome if painted with glaring yellows or reds. Shrill and high pitched sounds may be offset by olive green”

Perception of Time

Some researchers believe that light, colour and pattern can alter our estimation of time. One theory is that subdued, monotonous spaces cause one to overestimate time. Perhaps this is related to boredom and under-

stimulation. It is a common conception that time passes more quickly when one is enjoying themselves.

Light, colour and our perception of space.

“ Space remains in oblivion without light. Light’s shadows and shades, its different sources, its opacity, transparency, translucency and conditions of reflection and refraction intertwine to define or redefine space. Light subjects space to uncertainty, forming a kind of tentative bridge through fields of experience” – Steven Holl

The way we use and perceive a space is greatly influence by light and colour along with the factors described. Above the have the ability to define boundaries and differentiate spaces. They provide orientation and consciously and unconsciously affect how we move through a building. Furthermore due to the synesthetic sensations they induce as described above, light and colour alter the perceived dimensioning of a space. “ Space, as we experience it in architectural settings is a result of our entire perceptual system. One sees the environment not with the eyes but with eyes-in-the-head-on-the-body-resting-on-the-ground”

As we have found out light and shadow can be a powerful tool with which to reveal meaning. However they also play a major role in defining our sense of space, if we manipulate light we alter our perception of architectural space.

Before structure, walls, ceiling and floor, it was light which estbalished boundaries. At night a ‘ room’ for early man was defined by light admitted by fire, the extremity of which came when light faded into darkness.