ANFA 2014 CONFERENCE

PRESENTER ABSTRACTS

ACADEMY OF NEUROSCIENCE FOR ARCHITECTURE

Mesopic Vision in Architecture: Exploring Connections Between Visual Comfort and Heightened Awareness

BEN MCDONALD
Associate Principal, Montalba Architects, Inc.
benarimcdonald@gmail.com
Los Angeles, 90034, USA

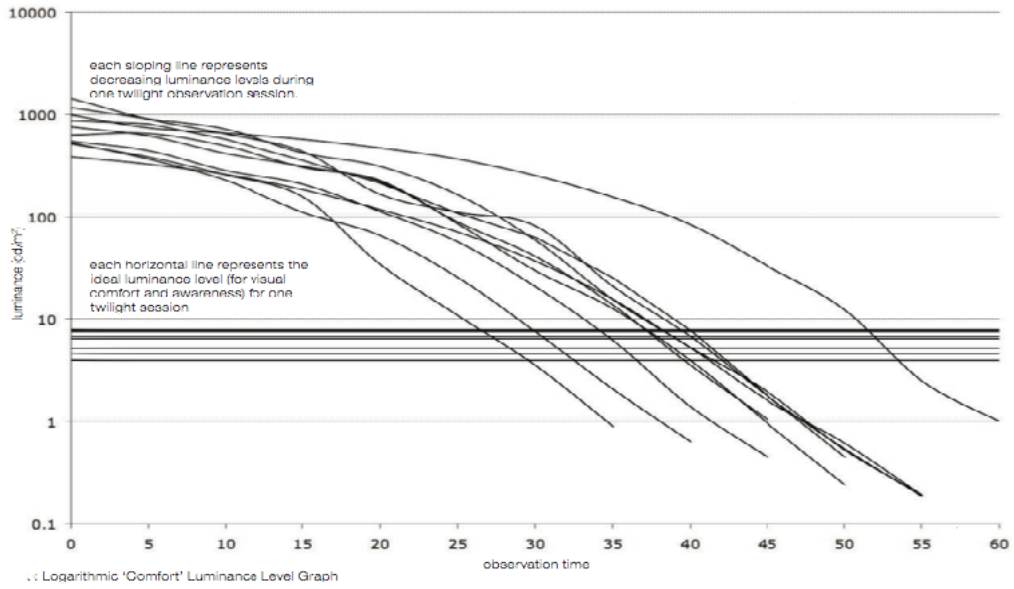
This study explores the existence of a particular quality of light that provokes a heightened sense of perceptual awareness. Perhaps because light is such a dominant stimulus in our experience of the world, we tend to be less familiar with its subtleties. For example, visual signals tend provoke less comfort reaction than the way our skin quickly judges thermal or tactile comfort. Yet based on observational experience, this study speculates that our visual perception does trigger these similar precise value judgments; it is just that they are too often ignored. A refined knowledge of perceptual visual awareness is in our evolutionary blood. It may be that only in recent years, with the advent of electric lighting, we have been able to live without it -- but not without experiential sacrifice.

1. ABSTRACT

The study of light, particularly since the invention of the electric variety, has had a strong connection with production. For good reason --we need light to do most things. We need light to bath, cook, read, work, play, etc. A Lot of effort has been put into finding the most appropriate light levels to facilitate productive efficiency. Organizations like the IESNA (Illuminating Engineering Society of North America) have published recommended light values for tasks ranging from grooming to ironing to casual reading in bed. This particular investigation, however, is set apart from the tradition of lighting for productive tasks --and instead focuses on lighting environments suited to moments when we are introspective or social --time when we are more engaged with thinking than with doing. An environment which is tuned to the ideal comfort level of our senses may also be one that opens our mind to free and creative thinking.

Twice a day, at dawn and dusk, photoreceptive cells in our eyes reach a 'crossover' point of equal efficiency in response to ambient daylight. At these low light levels (around 1 cd/m2), color and detail sensing cone cells share responsiveness with shape and contrast sensing rod cells. This perceptual phenomenon within the 'mesopic vision range' marks a potentially unique moment of visual awareness and the starting point in the search for the 'right' kind of light.

To test the relationship between perceptual response and ambient light levels, a method was created for objectively recording light along a smooth gradient from intense to subdued. The transitioning sky during twilight was selected as an ideal environment for doing this because the sky offers a uniform field of light which eliminates potentially distracting detail. To record light level, images from a calibrated digital camera were processed by a software program to measure accurate luminance (visual power per unit area, measured in candelas/m2) values for each pixel of the image. The advantage of this method over using simple light meters measuring illuminance is that the record of the light is more closely matched the light we perceive in the environment. Luminance values were then recorded at regular intervals during the twilight period and associated with the perceptual observations oriented toward finding the particular moment when the light quality was most comfortable



.: Logarithmic 'Comfort' Luminance Level Graph

After multiple sessions of twilight observation, this study revealed that the 'most comfortable' light

level was remarkably consistent (hovering somewhere around 7cd/m2). The physiological experience at these low light levels simultaneously created a heightened sense of environmental awareness – almost a condition where my sensing powers were amplified. In turn, there was a stimulant effect on my thinking – both calming and energizing.

The speculation here is that something neurological is happening at these light levels that might warrant further investigation. I am curious to expand this study to gather more data from more participants to find if there is a degree of consistency among us of what luminance levels we consider to be ideal – and how our mental state during that moment is affected. A refined knowledge of perceptual awareness is in our evolutionary blood. It may be that only in recent years, with the advent of electric lighting, we have been able to live without it - but not without experiential sacrifice. The recovered knowledge of visual perception may be able to be used in architecture to tune the behavior of light in space to maximize both our comfort and our creative intensity.

2. AUTHOR BIO

Ben McDonald is an architect in Los Angeles with 15 years of experience and is always inspired to apply principals of light and perception to the design process and ultimately the material realm. The study presented here stems from his mid-career graduate thesis exploration at the University of Arizona under the guidance of Alvaro Malo.