Exploring the psychology of lighting

Tom Bergman // Principal Scientist at Philips Lighting Research // Masters Physics and Chemistry University of Leiden // Interdisciplinary researcher with a wide variety of granted patents // **Yvonne de Kort** // Full professor Environmental Psychology of Human-Technology Interaction at TU/e // Program manager Sound Lighting ILI // Current research focuses on how light impacts mental and physical health, vitality, cognitive performance and social interaction

Interview | Yvonne de Kort and Tom Bergman
by Michiel de Boer of Moesasji

With the emergence of LEDs, lighting systems are entering a new era. Through programmable digital controllers or even the Internet, artificial lighting has evolved from being a functional aid to a source that can influence our state of mind. ILI and Philips Lighting join forces in exploring the 'psychology of lighting', specifically in the field of enhancing relaxation. Can lighting schemes help humans relieve stress? And what are the characteristics of such lighting systems?

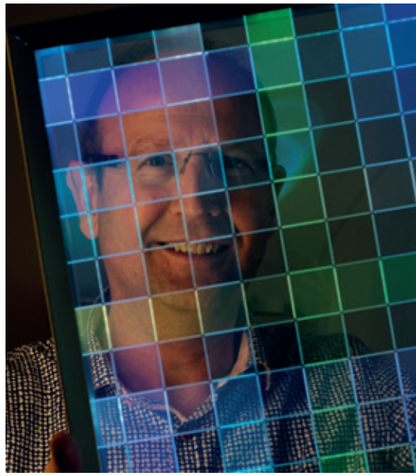
Tom Bergman, principal scientist at Philips Lighting: "I met Yvonne and ILI a couple of years ago in the 'Snoezel Project'. Snoezelen is an original Dutch word, which is even not translated in international literature and describes the pleasant but soft activation of one's senses, used in mental health care. We have developed - together with students - a box with relaxing lights, shapes and sounds to help induce relaxation in people suffering from dementia. The box was tested in different settings with a number of patients and their caregivers. The outcomes were promising and form a good starting point for further investigation in this area. What makes a Snoezel good? And what can this mean for other lighting systems?"

Yvonne de Kort, TU/e professor and program manager Sound Lighting at ILI: "There was an immediate click between us, personally and of course between our organizations. Philips Lighting is a very welcome facilitator for application research via, among others, internships. Together we share a quest in discovering in which way lighting can be beneficial to human wellbeing."

Effortless Attention

Yvonne de Kort has been involved in lighting research for over ten years. With a background in environmental psychology, she tends to keep on looking beyond light. One of the fascinating phenomena she has worked on is Biophilia; the innate tendency of humans to seek connections with nature and other forms of life surrounding us. We all know the calming effect of a walk through the forest, the mesmerizing quality of floating water and flames in a campfire. This effect is caused by something De Kort describes as 'Effortless Attention'. Nature is relaxing because it draws our attention, but not in an overwhelming way. The shapes, smell, light and movement capture eye and thought, yet leave enough space for reflection. Similar to meditation, people tend to have their thoughts coming and going and enter into a more relaxed state when surrounded by nature.

Yvonne de Kort



Tom Bergman

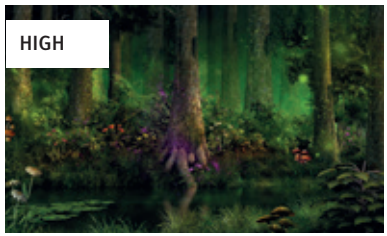
Bergman: "This mechanism triggered me. In designing new dynamic lighting systems I have been and am still looking for a language to properly describe the principles and rules. I think it is necessary to build up the vocabulary to work effectively together on new systems and to be able to make better judgements as to whether a lighting design is good or not. I have been looking towards music, animation, choreography and physics to find out what applies to effective lighting systems and schemes. Specifically focused on systems that could evoke relaxation, biophilia is an intriguing phenomenon. It brings us closer to the rules of beauty!"

Complexity and mystery

De Kort: "Biophilia shows us there are ground rules that apply to almost every individual. Yet in this kind of research we are also dealing with perception and preference, which is a subjective matter. What works for me doesn't necessarily have the same effect on my neighbour. Moreover, the effect can differ within an individual per day or moment. Compare it to music; Rachmaninov can be a great experience, but you do not always want to deal with that kind of intensity, power and complexity. So what is soothing to you today, might be annoying tomorrow.
In this field it is challenging to come up with valuable input for a design perspective that has a generic use. Tom's questions as to whether we can create the same attentional restoration effect known in nature with artificial dynamic lights effects, inspired me to delve deeper into the subject and to form more concrete hypotheses to build on and test new lighting systems."

Further study shows that Effortless Attention has to do with human needs for understanding and exploration. This can be

Complexity



Mystery

translated into two important attributes: the level of complexity and the level of mystery. If an environment or stimulus is very simple (low complexity) the human mind wanders easily as it cannot learn anything anymore. The same happens when an environment or stimulus is too complex. At first we want to understand what's happening but as soon as we realize we will not be able to figure it out, we choose not to deal with it anymore. This is also the mechanism with the level of mystery. We want to unravel, but only to a certain extent. Nature often seems to strike the right balance for both.

Testing perception

Tom Bergman and his team put this hypothesis to the test. They chose one of the lighting system prototypes - resembling a grid of individually LED-powered tiles - in which the levels of complexity and mystery can be tuned by dynamically mixing light intensity, colours and patterns. Together with (TU/e / ILI) master student Nina Oosterhaven they designed an exploratory test. A panel group was invited to experience the set-up and measured in three different ways: heart rate, viewing time and a questionnaire for a measurement of fascination. The results underscored the hypothesis quite accurately. Bergman: "Our findings indicated that we are on the right track. So together with principles such as movement, rhythm and harmony, the aspects of complexity and mystery provide interesting input for dynamic lighting systems design. Next step is to refine the scale of complexity and mystery in order to be able to measure more accurately and to draw more reliable conclusions."
De Kort: "Combining measurements like Tom and Nina have done is a promising route. Objective, physiological outcomes complement the subjective self-reported answers in a questionnaire." Bergman adds: "Sometimes it is more important what the subjective value is as opposed to the objective value. That you feel happy is more important than what physiological recordings say."
De Kort: "True, that's what makes this kind of research so interesting. Light plays a significant role in the subconscious of human beings. There is a lot of unexplored territory in the way we perceive lighting and therefore the way we could design lighting systems. I am certain we will discover the possibilities of using lighting schemes as a source for relaxation and wellbeing. I am glad that by collaborating we can use the power of both fundamental and application research!"