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A transdisciplinary investigation and operationalization of dynamic lighting design criteria that supports health and wellbeing

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A transdisciplinary investigation and operationalization of dynamic lighting design criteria that supports health and wellbeing

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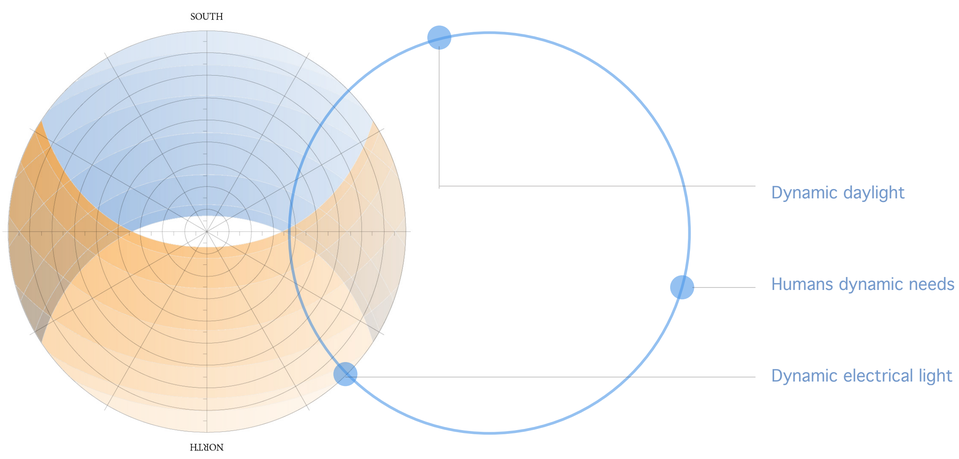
Introduction to the concept of dynamic lighting design

The importance of dynamic light to support health and well-being has been more and more recognized [Hansen et al., 2017]. Humans has through many years of evolution adapted to the changing light of the sun, varying through the day, seasons and under various weather conditions, creating a multitude of light settings. Humans live in interaction with this dynamic light and consider it as a natural part of our world [Mathiasen, 2015]. Furthermore, it has by the recent discovery of *intrinsically photosensitive retinal ganglion cells* in 2002 [Berson et al., 2002] become apparent, that light, beside serving a purpose of enabling visual orientation, also are influencing the internal body clock, affecting sleep-wake cycle, immune responses, appetite, behaviour, mood, alertness and attention - depending on the duration, timing and quality of light [Schlangen, 2014]. But, as humans spend more than 90 % of the time inside a build environment [Klepeis et al., 2001] and the daylight intake in our buildings is not always optimal to meet the needs for dynamic light [Hansen et al., 2017], this research project points to the importance of considering the indoor lighting environment that support health and wellbeing as a total sum of electrical light and daylight in a dynamic interplay.



Process [Hansen et al., 2014]

2017

TRANSFER

A systematic literature review will be performed to investigate the biological and phenomenological aspects of dynamic lighting that supports health and wellbeing. The result will be an overview of theory, that uncovers the need for dynamic lighting from the field of natural science and architectural science.

2018

TRANSLATE

Reviewed theory that covers the biological and phenomenological aspects for dynamic light that supports health and wellbeing, will be studied through a a preliminary synthesis of the gathered theory; and an exploration of the relationships between the findings from the theory to generate new insights. The outcome of this phase will be a set of criteria, uncovering the phenomenological and biological aspects of dynamic light that supports health and wellbeing.

2019

TRANSFORM

After establishing a set of criteria for dynamic light design that supports health and wellbeing, a series of initial testing will be conducted in order to qualify the criteria and the test methods. The main objective of this phase is to test and qualify the criteria and the practical use of them before testing in full scale in the test phase.

TEST

After qualifying the dynamic lighting design criteria through an iteration of initial testing, the criteria are distributed to transdisciplinary lighting design teams, that will implement indoor lighting design applying the criteria for dynamic light that supports health and wellbeing. After implementing light environments that meets the criteria for dynamic lighting, mixed methods will be applied to get an understanding of the complex influence on the occupant's health and wellbeing.

2020

SHARE

In this phase, the test results from the test phase will be reviewed in isolation, and reviewed as a whole to provide an overall interpretation and to make general conclusions which will be discussed and put in perspective. The outcome of this phase, is the final proposed criteria that facilitates dynamic lighting design and supports health and wellbeing

Hypothesis

Combining daylight and dynamic lighting technology in architectural lighting solutions can contribute to better health and well-being.

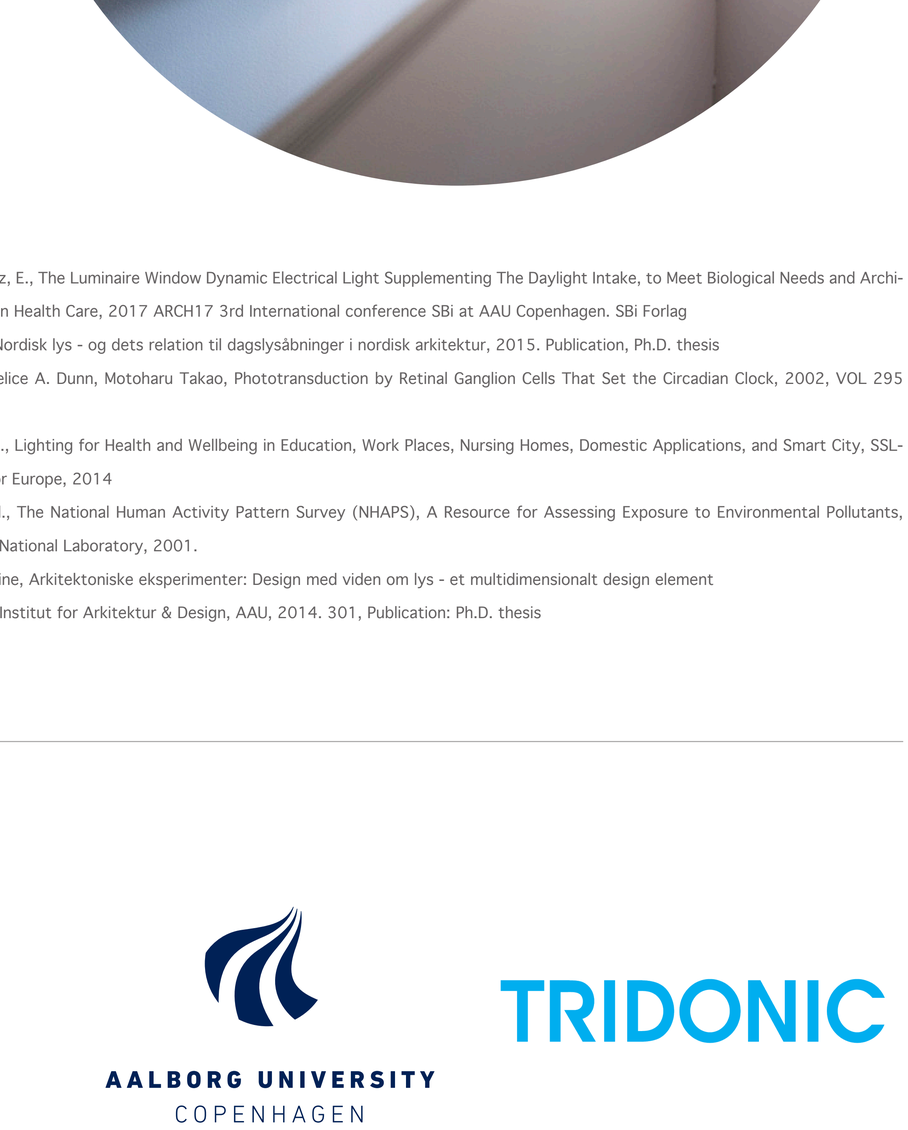
Objectives

1.: To investigate the biological aspects of human needs for dynamic lighting, from the field of natural science.

2.: To investigate the phenomenological aspects of human needs for dynamic lightning from the field of architectural research.

3.: To establish a set of criteria, that meets the biological and phenomenological aspects of human needs for dynamic lighting.

4.: To test the criteria in a series of architectural experiments to validate the criteria's potential for facilitate dynamic lighting design that supports health and well-being.



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Sofie Linnebjerg is among the first lighting designers educated from the new nordic master of science in lighting design from Aalborg University Cph, and designs using both daylight and artificial light by combining the three scientific fields of media technology, engineering and architecture. Sofie has extensive professional experience as a lighting design consultant within urban lighting, lighting masterplans and architectural lighting.

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