Kongsberg Vision Meeting 2021: Abstracts

Kongsberg Vision Meeting was held at the University of South-Eastern Norway in Kongsberg, for the 13th time, on November 16–18, 2021. The meeting was organised as a three-day meeting with a clinical day, a research day and a lighting design day. Rigmor C. Baraas, Eilin Lundanes, Ann Elisabeth Ystenæs, Ellen Svarverud, Klaus Sjøhaug and Are Røysamb organised the three-day meeting. The theme this year was *Speciality Contact Lenses and Architectural Lighting Design*. Keynote speakers for the clinical optometry day and the research day were Eef van Der Worp, Nicola Logan, Fabrizio Zeri and Daddi Fadel. The keynote speakers for the lighting day were Sylvia Pont and Manuel Spitschan. The abstracts from invited and contributed talks on the different days are presented in the order they were given.

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Light and materials in the wild

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Abstract

Light is not flat. It has a spatial structure. In addition, it varies directionally and chromatically. Light interacts with materials and spaces via scattering, shad(ow)ing, (inter)reflecting, etcetera. We interact with light by moving ourselves and our eyes. How can we describe, measure, visualise and design this light, the "all we can potentially see" or "light field"? I will present the multidisciplinary "Delft light(ing) framework", that captures the spatial, directional and spectral properties of light throughout space, including material-shape-light interactions, integrating knowledge from optics, perception and design. This approach goes far beyond the surface-based approach that is still leading in many quantitative lighting guidelines. I will address how to capture physical and visual light fields in 3D space (interior and exterior). In addition, I will present studies into the interactions between light, materials, shape and space in "the wild", linking theoretical, empirical, and practical knowledge, forming a fundament for applied perception and a novel science of lighting design.

Lighting for darkness

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Abstract

When we move around in the city after dark, we need artificial light to avoid tripping over obstacles and to provide a sense of security. Until recently, outdoor lighting has been considered a good thing; only astronomers saw the flaws of widespread outdoor lighting. However, in recent years also biologist are raising their voice about the negative impact that artificial light at night (ALAN) can have on a wide range of species. Research has shown that artificial light affects insects, birds, fishes, amphibians, and even trees and plankton. This actualises the need for a new way of thinking about street lighting. Light has to be used more efficiently, with regard to energy usage and also its perceptual effects on visual appearance and sense of security. Combining knowledge of visual perception in scotopic and mesopic conditions with that of optical interactions between lighting and the environment, we will study possibilities to optimise the appearance of pedestrian paths under low-as-possible light levels.

An important part of pedestrians' sense of security is related to how other pedestrians are perceived. We are currently studying whether different light directions affect how friendly a face is perceived and how that relates to common light conditions on pedestrian paths. The study consists of three parts: A) styrofoam heads are rated under various lab light directions; B) the styrofoam heads are taken outdoor to be rated under two different common light principles. In the analysis the findings from the first and second parts will be compared and related.

Pilot results suggested that certain light conditions influenced how friendly a face looks. If this will be confirmed in our main study, this suggests how perceived safety when walking might be preserved while reducing overall light levels in a city.

Acknowledgements

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The non-visual effects of light on human physiology and behaviour: From principles to practice

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Abstract

Light enables us to see and appreciate the colourful, detailed and moving world around us. In addition to these visual effects of light, exposure to light also affects us fundamentally by modifying the production of certain hormones, such as melatonin, and synchronising our circadian clock with the external light-dark cycle. These so-called non-visual effects of light are largely mediated by a photoreceptor class, the intrinsically photosensitive retinal ganglion cells (ipRGCs), that is different from those that enable us to see, the cones and rods. The ipRGCs express the photopigment melanopsin, which is most sensitive to short-wavelength light. In this talk, I will discuss principles of circadian and neuroendocrine phototransduction and how knowledge gathered from scientific and field studies can be used to support practice in an evidence-based fashion.

Education and research in the fourth stage of lighting design

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Abstract

The third stage of lighting design focusses on assessing light arriving at the eye instead of light incident on planes (Cuttle, 2010). It needs a multidisciplinary approach, integrating fundamental knowledge and tools from optics, optometry, perception, engineering, architecture and design. It also needs an entirely different way of thinking about light, and consequentially about education and research in lighting design. And although we are still working on the third stage goals, in the meantime we entered the fourth stage of lighting design, in which sustainability is acknowledged to be an absolute precondition for any development. This fourth stage is characterised by issues such as high tech, low tech or no tech, lighting or preserving darkness, and other-than-human-perspectives. Our team proposes the following main ingredients for academic education and research in lighting design: building on a scientific fundament as presented earlier today; a design approach centred around sustainable effects on humans, flora and fauna; a didactical approach that integrates theoretical grounding with empirical testing, practical engineering, and explorative tinkering; and regular exchanges with external lighting(-related) professionals and researchers. The approach will be illustrated with examples from ongoing research and education in Delft and at USN and will be worked out to a MSc program proposal.

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Specialty Contact Lenses for Refractive Error Control

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Abstract

Our current mode of practice is to correct refractive error to improve visual function however, with recent advances in the field of myopia control and with a variety of interventions to slow myopia progression in children we can now more actively manage myopia in children. There are various contact lens designs that can be utilised to this effect. Currently hyperopia receives much less attention from research than myopia even though the impact of moderate to high levels of hyperopia especially in one eye (anisohyperopia) can lead to amblyopia and strabismus if not corrected fully at a young age as well as having a negative impact on educational attainment and visuocognitive and visuomotor skills. Studies on animals have suggested that manipulating peripheral defocus through an optical means while simultaneously providing correct axial focus can either discourage or encourage axial growth to effectively treat myopia or hyperopia respectively. Recent research has established that progression of myopia and axial growth can be significantly reduced in children and adolescents through the use of different designs of contact lenses that both correct the refractive error and impose simultaneous myopic defocus. Can this type of approach be applied to hyperopes using the converse theory whereby there is a strategy for optimal correction to encourage axial growth in hyperopia? If so could this approach complement amblyopia treatment in children by encouraging eye growth and reduction of hyperopia with associated benefits of improved binocular vision and stereopsis? This presentation will review contact lens options for myopia management in children and discuss applying a similar theory to children with hyperopia.

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Normal eye growth in adolescents from 16 to 18 years of age

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Abstract

Emmetropisation is the process in which hypermetropic children gradually become more emmetropic through development of the eye's refractive components as the eye grows. To maintain emmetropia through continued eye growth, a coordinated development of the eye's refractive components is required.

Data will be presented from a longitudinal study on normal eye growth in 16- to 18-year-old adolescents in Norway (Hagen et al., 2019), a population with a low myopia prevalence and a predominantly low hyperopic refractive error (Hagen et al., 2018). Cycloplegic ocular biometry and autorefraction data were obtained with Zeiss IOLMaster 700 and Huvitz autorefractor, respectively, and repeated after two years. Individual three-surface biconic eye models were used to calculate crystalline lens power.

The longitudinal data showed continued eye growth in 16- to 18-year-old emmetropes and low hyperopes, although they maintained a stable refractive error over the study period. The stable refractive error was maintained by a coordinated decrease in crystalline lens power when ocular axial length increased. Myopic changes in refractive error were larger in those with a more myopic refractive error at baseline and were associated with increases in vitreous chamber depth and crystalline lens power, when adjusted for sex.

Knowledge of normal eye growth, as well as performing regular measurements of ocular biometry, are essential for determining the best mode of refractive error treatment and follow-up (Németh et al., 2021), in both children and adolescents.

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Successful fitting of CL in presbyopes: the long lasting fighting between monovision and multifocal CLs

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Abstract

Presbyopia prevalence is increasing in our society as we have an aging population. According to the estimation of (Holden, 2008), one billion and 300 million people worldwide are currently affected by presbyopia. Presbyopic people have the desire to continue with lifestyle choices that do not facilitate the use of spectacles. However, CL use decreases as the presbyopia increases (Morgan, 2009; 2011) with retention rates falling from 75% to 63%, over the age of 45 years (Sulley, 2017). The presentation will be discussed the two main options available in the CL field, multifocal and monovision, and their difference in the possibility to maximize the success of CL fitting in this category of people.

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Keeping scleral lens issues and complications in perspective

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Abstract

The better understanding of the scleral contact lens (SL) dynamics on the ocular surface and the introduction of new diagnostic instruments to detect the ocular surface have permitted to comprehend better the ocular surface contour leading to the formulation of new SL designs and techniques, resulting in an increase of the fitting rate success. However, problems still occur and some of them have shown up and they are unique to SL wear. While issues related to SLs wear are reversible, they affect patients' satisfaction and lead them to discontinue ScCL use. Some may be challenging, adding to the frustration, time, and costs for both practitioner and patient. Troubleshooting problems is fundamental in SL practice particularly because most of the time, the decision to use SL represents a life-changing event for patients and problems may result in eye surgery and/or depression or psychological problems, and emotional instability. Some practitioners still remain intimidated by preconceived notions, the fitting process, and, especially, the ensue of problems and their management. As a consequence, clinicians rarely, if not at all, prescribe them. The objective of this course is to provide tips and tricks to avoid the ensue of some problems and to describe in detail issues and complications that can arise fitting SLs.

When a patient loves his scleral lens too much

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Abstract

In a case report published in SJOVS vol. 13 no. 1, 2020, we described refitting a 66-year-old male with pellucid marginal degeneration from a corneal rigid gas permeable lens to a scleral lens. At the initial visit he presented with a poor-fitting old corneal gas permeable lens on his right eye. Due to macular changes in the left eye, this eye remains uncorrected. The refit to a Onefit scleral lens was successful (Lundanes & Gustafsson, 2020). The patient was happy with lens handling, comfort and vision, and the optometrists were happy with the overall fit of the lens with no excessive clearance centrally or over limbus. The patient loved his scleral lens and wore it every day for about one year. At a routine visit the patient told us about an incident of pain 5-6 weeks earlier, occurring after sleeping with his lens for tow consecutive nights. An ophthalmologist had given him topical steroids and lubricants. After two weeks the symptoms improved, and the patient decided himself to commence lens wear. At the visit in our office we found corneal oedema, advanced epithelial defects, and reduced visual acuity, and prohibited lens wear. As glasses did not improve vision, and uncorrected visual acuity was logMAR 1.0, low vision devices were prescribed as a temporary solution. After two months the patient was cleared to commence lens wear. We refitted the patient back to a corneal rigid gas permeable lens, a Rose K2 KC, as the risk of corneal oedema was considered too high with a scleral lens. Today the patient functions well with the corneal lens, but he still misses his scleral lens and asks for the possibility to have one fitted in the future.

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