

ILIGLOW

Intelligent Lighting Institute | Edition 6, November 2016

**GLOW
IN THE
DARK**

/ GLOW: illuminating icons

/ GLOW TU/e Campus overview

/ Creating ILI's contributions to GLOW

/ Chimney TU/e Campus

/ Creating continuous smart city innovations

/ And more....

Harold Weffers | Operational manager



Welcome

I am extremely pleased to present to you another GLOW edition of our magazine, which has a strong focus on this year's edition of the GLOW light festival and its GLOW Next program along its 'science route' developed at the TU/e campus.

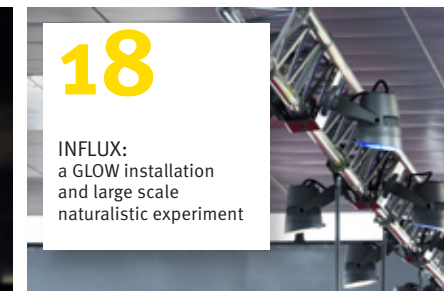
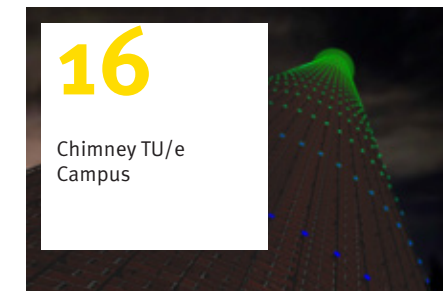
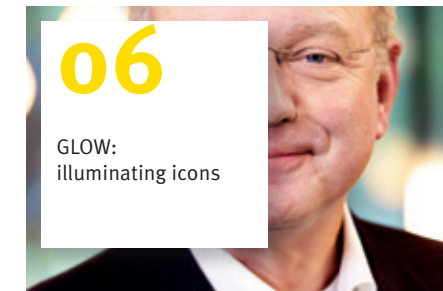
I hope that after reading the various contributions in this magazine you will be, just like me, impressed by the many exciting and promising developments that have been happening since the previous edition of our magazine.

Amongst others you will be informed about some of the latest relevant developments in our research programs, our research infrastructures annex Living Labs and our ecosystem.

Pleasant reading!

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Let ILI GLOW

After ten years of its existence most inhabitants of Eindhoven know that fall is the time for the yearly GLOW festival. This year's edition, from November 12th to 19th, is partly routed over the TU/e campus. This offers ILI an excellent opportunity to showcase its research, both via an outreach event as well as via light installations along the route.

Lighting and Bright Environments, to the morning session. The afternoon program is a collaboration between ILI and the Holst committee, and starts with the Holst Symposium, a yearly event co-organized by the TU/e and Philips, and this year dedicated to Philips Lighting. The theme of the symposium is Quality of Light, and includes speakers addressing light application in various fields, such as horticulture and street lighting. The program ends with the Holst lecture, given by Dr. Andrew Watson, recently working for Apple, but with a long-standing career at NASA Ames Research Center. He will present his vision on "Windows of Visibility", addressing visibility limitations of the human visual system and how they affect optimization of products, such as lighting systems. The full program of this one-day event is advertised in more detail by Joep Huiskamp, later in this magazine.

Visitors of the ILIAD and Holst Symposium event hopefully also spend some time on walking the GLOW route, since as a scientific director of ILI I'm proud that ILI together with students has built four installations on this route showing derivatives of the type of research we do. Philip Ross was indispensable in getting this done, and I don't want to cover his ground by describing

the installations here, since he and his team are doing that later in the magazine.

Apart from GLOW I want to emphasize two other events of the last months, since I'm very proud about them. The first one is the official start of the collaboration of ILI with the Gemeente Eindhoven, Philips Lighting and Heijmans to experiment with smart lighting solutions in 5 different districts of the city. This collaboration is built on a 15-years roadmap for innovative lighting solutions for the whole city, a roadmap established under the guidance of Elke den Ouden of ILI, together with Rianne Valkenburg of TU/e LightHouse. I was fortunate to be part of the signing ceremony of the agreement on October 13th in the Philips Museum. The second event concerns the future Living Lab in the Atlas-building, for which the TU/e signed an agreement with Philips Lighting. New inhabitants of the Atlas building will experience innovative lighting solutions that should balance energy savings with light for optimal performance. These two events clearly show our close collaboration with Philips Lighting, but at the same time possible extensions of this collaboration to other, probably unexpected partners, such as Heijmans.



To take advantage of the GLOW opportunity, we organize our yearly ILIAD outreach event on Thursday November 17th. In contrast to earlier editions of ILIAD we will limit the overview of progress in our three ILI research programs, being Light by Design, Sound

ILI Short

■ International Conference on Networking, Sensing and Control (ICNSC)

Paper submissions are welcome to the "Smart Lighting Environments": Sensing and Control (SLESC)" special session of the 14th IEEE International Conference on Networking, Sensing and Control (ICNSC, Calabria, Southern Italy, May 16-18, 2017). Extended versions of the papers published in SLESC will be invited for a submission to the Smart Lighting special issue of the Energies Journal (IF: 2.077). Both the conference special session and the journal special issue are organized by ILI.

ICNSC 2017 special session on Smart Lighting Environments:
<http://icnsc2017.dimes.unical.it/SLESC.html>

Energies Journal special issue on Smart Lighting Environments:
http://www.mdpi.com/journal/energies/special_issues/smart_lighting

■ Lighting control in open-plan offices

Currently, two ILI PhD's, Thomas van der Werff (from Industrial Design) and Christel de Bakker (from Building Lighting), are collaborating to investigate user interaction with lighting in open-plan offices: in November 2016 a pilot study is performed for a living lab study that will take place in February 2017. As they have different backgrounds, they believe this cross-over of knowledge will result in innovative results.

■ New Association ELEA founded

The European Lighting Expert Association has been founded by the four national lighting associations LiTG (Germany), LTG (Austria), SLG (Switzerland) and NSVV (The Netherlands) on August 26 2016. The goal of this association is to establish a common qualification level for light and lighting, the so-called European Lighting Expert (ELE). The association maintains a register of all qualified ELE professionals. The ELE qualification can be obtained through an exam at one of the member lighting associations. Dr. Matthias Hessling has been elected as first president of the ELE. more info: www.europeanlightingexpert.org

■ STW project "Optilight":

"Mathematical Optimizations for Human Centric Lighting" has been granted. The overall goal of this project is to make lighting control systems more centered towards the human user. This requires not only better insights in how humans experience light but also demands quantified models and optimization algorithms that are executed by automated lighting control systems.

■ Studies on user control in Ambient Intelligent Systems

B.W. Meerbeek of the Department of the Built Environment has gained his PhD cum laude. He defended his PhD thesis, Studies on user control in Ambient Intelligent Systems, on July 5th in the Auditorium building of the university. His first promotor was prof.dr.ir. E.J. van Loenen. PhD awards with the honor of 'cum laude' are relatively rare, and an average of five percent of all theses at TU/e are considered for this distinction. To be eligible the PhD work must be of exceptional quality, and must be performed with an exceptional level of autonomy.

GLOW: illuminating icons

interviewed by: Michiel de Boer (Moesasji)

Seven kilometres of light sculptures, unprecedented projects, experiments mixing science, technology and art: the 10th edition of GLOW promises to be spectacular. Five enlightening questions to Jan Mengelers, President of TU/e and Chairman of Stichting GLOW (the GLOW Foundation).



Jan Mengelers

Why do you take part in the organization of GLOW?

Jan Mengelers: "I owe my chairmanship to my outspoken opinion. When they once asked me what I thought of GLOW, I said: Why doesn't every GLOW edition leave one permanent light sculpture in the city? That way we would by now have ten lighting icons in Eindhoven. My grumpy answer derives from the feeling that we are hardly profiling our city from our core... We have a heritage that is strongly rooted in technology and light. Oddly enough, you will hardly experience that when walking through Eindhoven. I had this same feeling years ago, when I saw that Philips had decorated the Empire State Building with a spectacular LED light show. It just was beyond my comprehension: why don't we have this in Eindhoven? Speaking about my sentiments has eventually led to my appointment (October 2015) as chairman of Stichting GLOW, and I very am happy to be part of it."

Is GLOW a city marketing tool?

With 750.000+ visitors last year, GLOW is clearly a festival that adds to our image. We are currently carrying the label 'Brainport' in Eindhoven and its surroundings, which is fine and suits certain purposes perfectly. But to me, light is much more tangible. For anyone!

Some time ago there was a city-slogan-beauty-contest in which the slogan 'Eindhoven Allicht' emerged. I found it a perfect, iconic fit. Light as a part of our history and our future. However, the slogan was abandoned because it is hard to translate it adequately into other languages (Eindhoven Allicht is a combination of the phrases Eindhoven All Light and Eindhoven Evidently). I think that light art and light experiments can be valuable assets to our city marketing. Light associates directly with technology, science, innovation, the future. We should use it more permanently."

What will the 2016 edition bring?

"This edition of GLOW will bring two loops, 3,5 km each. We need this length to be able to handle the large number of visitors. One route runs through the city centre, the other along TU/e Campus. Since it is a free festival for a wide and diversified audience, we have selected works that reflect a broad taste and shows and projections with lots of spectacle. The projection at Catharina Church, for instance, will be a traditional highlight. However, this year, we are trying to raise the bar even more. The Campus Loop will show about 10 works with an exquisite experimental and scientific character. With performances such as the 'Exploding Wire' and 'Photonic Modulation' we leave 'standard practice' and bring the visitors unique experiences to discover and reflect on."

In what way is TU/e involved in GLOW projects?

"The featured projects are exclusively of Eindhoven origin. Artists are from the region or collaborate with local professionals. The TU/e and its students are well represented in GLOW. Throughout our faculties, Electrical Engineering, Applied Physics, Industrial Design, Built Environment, Industrial Engineering & Innovation Science and Mathematics & Computer Science people are also involved in projects and

organization. With regard to science, I can say that several projects will feature trailblazing applications of technology and knowledge. And of course the Intelligent Lighting Institute (ILI) is involved. ILI is currently conducting different studies on the influence of light on human behaviour. They make use of what we call 'living labs' to perform their studies. And of course, GLOW is an excellent research

"This edition of GLOW will bring two loops, 3,5 km each. We need this length to be able to handle the large number of visitors."

environment. During GLOW, ILI will look further into the influence of specific lighting conditions on the behaviour of crowds. An actual topic that may deliver interesting results for crowd management during events and for applications like prison control or waiting room comfort. In MetaForum, ILI has a permanent set-up of research equipment for data collection and analysis."

What does the future of GLOW look like?

"How far can we go? I think one million visitors is about the maximum. After that it will be extremely difficult to manage in terms of public safety and experience. In the next years we will shift to a smaller and more diversified GLOW. Putting our effort into quality instead of quantity. In side festivals such as GLOW Next, for instance, and more permanent projects.. If all goes well, the Ceres-project will remain a permanent light sculpture at the TU/e Campus. This project features a grid of LEDs, positioned around the chimney of the Ceres building. The grid is dense enough to display all kinds of compositions and even images. It will be a true eye catcher for Eindhoven. And with a permanent sculpture I will have lived up to my promises!"

‘Impact on your senses’

interviewed by: Michiel de Boer (Moesasji)

In June, Ronald Ramakers succeeded Eric Boselie as Managing Director of GLOW. With his roots in theatre, lighting technology and management, Ramakers seems a perfect fit for the job. His aim is to help the festival evolve into an even deeper experience combining art, technology, science and Eindhoven culture effectively together.

Ramakers: “I came into contact with the GLOW organization because of their interest into one of my art works. During our conversations I was asked if I would be interested in the position of Managing Director. I didn’t have to think long to accept. This job brings all my working experience and interests together. Now I can contribute to a sound organization of one of the greatest festivals in the world and have a chance to work on the artistic side as well. I feel like a director in a light play!”

Program

In ten years, GLOW has evolved into a mature light festival for a wide audience. In 2015 around 750.000 visitors, young and old, enjoyed the lighting spectacle. Ramakers: “That is a starting point you have to respect. We do that by trying to find a proper balance in the programming. A mix of accessible art works, light shows, installations and projections, is located in the city centre. At the TU/e Campus we program GLOW Next, a more

experimental, innovative area. I have no doubt both ‘program lines’ will impress on their own side of the spectrum. And equally important, with the great number of visitors we will also bring more ‘ease’ in the route. Several hospitality squares function as resting points for the visitors. Giving you time to process your experiences. You will need that!”

Experiment

“In all honesty, I think this year’s edition will be amazing. At certain points, the art works will stretch the boundaries of perception. The project ‘Exploding Wire’, for example, is genius. This is an installation that mimics a lightning strike. Running an immense load of energy through a thin copper wire. In a ‘big bang’ the matter will be vanished. It is a transformation of material, an impact on your senses. Fascinating! I am very happy with the involvement of many TU/e students and scientists in the program. It brings new tech and scientific approaches to the light art stage. I’m surprised to see that there is sort of mutual drive to create new things. A lot of the 2016 works are realized by collectives of people. Resulting in very pure installations. Great!”

Develop

“Of course our aim is to keep developing. To leave standard practice and start endeavours that will reveal new ground. In this perspective art shows interesting parallels with science. The



Ronald Ramakers

scientist works in an area that is similar to the field where the artist gathers his inspiration. On top of all the measurements, calculations and analysis, at a certain point you have to choose, do I go right or left? This is merely an intuitive choice and a good scientist will know or feel what direction promises the best results. I am curious in which way lighting technology and lighting art will evolve. And in what respect they will influence one another. There is a tendency to further reduce energy consumption of light and controlling ever smaller ‘parts’ of light. And also data science is entering lighting technology. Developments that can provide interesting outcomes for the world and for future editions of GLOW.”

The Story

“To me every piece of art has a time frame in which it has effect. Many GLOW visitors have seen great examples of lighting technology already. But in the end that is not what it is about. We want to challenge the artists to search for new ways of using technology to tell their story. That’s why it is so important for Eindhoven to participate in GLOW. To explore the boundaries together. I am curious to see how the audience will respond to the works at GLOW 2016. Will people talk about the technology behind the projects? The scientific angles? The artistic message? And for the TU/e: does the art process provide inspiration for the daily practice of scientists?”

GLOW TU/e

Campus overview

interviewed by: Michiel de Boer (Moesasji)

What is light exactly? How does it behave? And how do we behave under the influence of specific lighting conditions? Prof. Dr. Ir. Gerrit Kroesen, department of Applied Physics and organizer of the GLOW Route at TU/e Campus: “The GLOW art works at TU/e Campus that are featured during this edition of GLOW are clearly linked to our research.

We aim to even outdo our last performance, which was a highly appreciated experience. This year we have more works, larger works and more spectacular works. None of them is standard, all projects are unprecedented experiments. Nice thing is that nearly all our student associations and faculties are involved. Together the participants have put tremendous energy into the projects, going the extra mile. This resulted in a truly unique GLOW Next experience. Let me take you on a brief tour:

01 Origin of Life

We start at the Dommel tunnel with the Tesla Coil (yes, it's back!). Did you know life on earth started with lightning striking water, transforming into amino acids and eventually forming DNA? This forms the inspiration for the project

‘Origin of Life’. This year the Tesla Coil will be situated above the pond, covering the Buddha statue and water in lightning bolts. In the fountain, images are projected symbolizing the beginning of life. In between the lightning bolts, you will hear music by Eddy de Clercq, especially composed for this work of art.



02 UNBUILT

Next project is UNBUILT. This installation allows the viewer to get a look inside the Vertigo building of the faculty of Architecture, Building and Planning. By means of a rhythmic spectacle of powerful shadows, this installation displays projects created by students, which have yet been unbuilt. Different perspectives bring their

hard labor to life. A project by Maisa van Genderen and Jurre van Kuijk in collaboration with OPENLIGHT. Sound by Joep Le Blanc.

03 Photonic Modulation of light and space

This project is a collaboration between the TU/e and the Van Abbemuseum: both celebrating their anniversaries. The work of the Hungarian László Moholy-Nagy, hovering above the surface of the central pond, will be recreated in a unique way. His ‘Licht-Raum-Modulator’ is present at the Van Abbemuseum. By use of photonics and data science the art work is virtually transported to the TU/e Campus and represented in a transparent cube (3x3x3 meters) equipped with a million of individually controlled led lights. The result is an interplay of light, movement and sound, creating an exciting experience.

04 Influx

When a light is turned on, the light itself starts to move and pushes away the darkness by flowing into every nook and cranny. During this process, the light doesn't move freely but is influenced by the surfaces and edges of the area. At the MetaForum, the surfaces and edges will be delivered by the crowd passing by. The crowd and its behavior will influence the light and

vice versa. An intriguing interactive game which is also part of a study. ILLI researches - during GLOW - the influence of light on the behavior of human beings.

05 AnTUenna

Light installation AnTUenna consists of 10,000 led lights attached to the chimney at the Ceres building. The color and intensity of these leds - positioned in rings - are individually controlled by a central controlling system. Together they form a conic, low-resolution screen which depicts images, videos and animations to be spectated at a great distance. During GLOW, image of scientific and technical processes are represented on the chimney. The images are supplied by several TU/e faculties, exemplary for the many fascinating studies that take place on campus. After GLOW, AnTUenna will remain on site permanently.

06 Exploding Wire

Lightning is an awe-inspiring phenomenon. And ‘Exploding Wire’ is set to mimic the energy outburst at GLOW Next. A voltage pulse of 800.000 volts is fed to a very thin copper wire. When the lightning explodes, this copper wire can neither be seen nor heard, but the plasma induced all the more! After every explosion, drones will bring a new copper wire into position.

Working with wires of 100 meters in length, the Exploding Wire team is aiming to break the world record! An impact on your senses. An initiative of Ivo Schoofs, built by teams of the faculties Electrical Engineering and Applied Physics.

07 LumenUs

The construction LumenUs has been developed by TU/e students and is based on a pull-and-pressure ratio. The complicated construction consists of bars and steel wires that keep each other in balance. The bars are highlighted from within and their illumination will respond to the impulses of the GLOW visitors. In the interaction, colors gradually take over the object by means of sensors. LumenUs resembles the brainstorm process in which several small ideas and impulses can form a complete plan together. An interactive, dynamic and lively work of art, powerful to the eye.

08 A.R.T.

In our daily lives, we are confronted with an ever growing stream of stimuli that fight for our attention. When our brains get little rest we may lose the ability to focus our attention and engage deeply in an experience. Luckily, science can help! Attention Restoration

Theory (A.R.T), proposed by Stephen and Rachel Kaplan, suggests that specific patterns from nature allow us to relax, escape and recharge for new demanding activities. In this A.R.T. work, patterns that emerge from the natural movements of the trees are recorded and translated live into modulations of light and sound. Lose yourself in an unfocused, time-stretched atmosphere and find yourself recovered, recharged and refreshed at the end of the walk. Good to go for the next GLOW experience.

09 In another light

Light unravels contradictions and contrasts. Yet, you can't always spot everything at first sight and your first impression may not always be correct. The project 'In another light', created by SintLucas students, will surprise you

by providing new insights. Five photographs are highlighted alternately with red and green lights, producing different images each time. This project will make you look at people in a different way.

10 Lithographic World

The impressive Afterlight installation, presented during GLOW 2015 in collaboration with ASML, will return this year. The installation has been updated drastically and provides a completely new show. Again, the lithographic process for producing integrated circuits (chips) forms the source of inspiration for this installation. An intriguing interplay of projections, reflections and led lighting turns this object to life.

11 Intermedia

Technology influences the way we connect, communicate and subsequently behave socially. Think of the rise of Social Media. But what is this influence exactly? The interactive installation 'Intermedia' explores the influence of technology on human interaction. Intermedia continuously takes pictures of its visitors. You are challenged to communicate with these images and to experience how your social behavior is influenced by technology!

12 Tunnel of Light

During their minor 'Be Creative', three students of Fontys School for Electrical Engineering started building the interactive installation 'Tunnel of Light'. The result is a life-size led matrix, consisting of about 3,000 led lights providing a three-dimensional experience. Visitors are invited to walk through the matrix and take control of the lights. By co-operating with other visitors they can create great effects together. The glass side walls enable spectators to enjoy the project from the outside as well. Either way, you are in for an extraordinary experience!

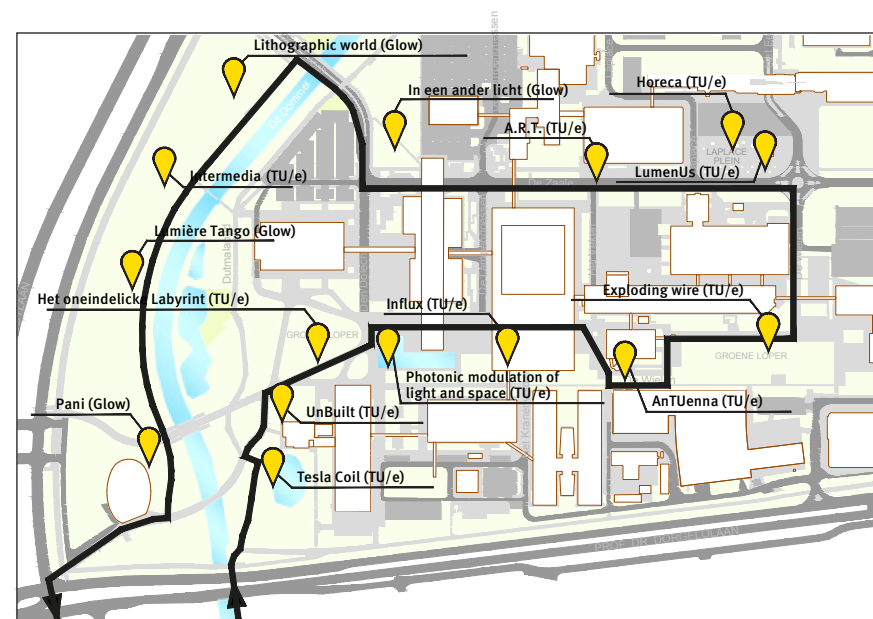
13 Lumière Tango

'Lumière Tango' can be best described as a light choreography, executed by 48 light beams that perform delicately to the tango composition 'NoviTango' by Astor Piazzolla. The intensity of the light beams contributes to the extraordinary interplay of light dissolving into the cold night air. Spectators can enjoy the light show from a distance, yet, the experience gets richer when you're walking right through it.

14 Het oneindelicke labrynt (the endless labyrinth)

To open the 60th anniversary of the Student Association W.S.V. Simon Stevin, students of Mechanical Engineering have built a grand labyrinth. Besides studying, the students are also known to enjoy a tasty beer every once in a while. Mechanical Engineering and the love of beer merge together in this party labyrinth consisting of 12,000 Bavaria beer crates, covering an area of 40 by 45 meters, the largest ever built. Visitors are invited to explore the labyrinth with flashlights.

You are cordially invited to come and explore the GLOW art works at TU/e Campus from November 12-19, 2016.



Calendar

November 2016 - May 2017

November 12-19, 2016

GLOW 2016

Location: Centre of Eindhoven & TU/e Campus www.gloweindhoven.nl

November 15, 2016

LEDTalks

Location: TU Eindhoven, Zwarte Doos www.ledtalks.nl

November 17, 2016

ILI Annual Outreach Event & Holst Symposium

Location: Auditorium, Blauwe Zaal www.tue.nl/holst

January 26, 2017

NSV Licht congress Exterior Lighting

Location: Hoevelaken

May 16-18, 2017

International Conference on Networking, Sensing and Control (ICNSC)

Location: Calabria, Southern Italy <http://icnsc2017.dimes.unical.it/SLESC.html>

Creating ILI's contributions to GLOW

Author | Dr. ir. Philip Ross - Studio Philip Ross

The TU/e welcomes hundreds of thousands of visitors on its campus this year for GLOW. It goes without saying that the Intelligent Lighting Institute has eagerly grabbed the opportunity to contribute to this event. Ingrid Heynderickx asked me to take the lead in developing and realising the ILI contributions to GLOW, together with staff and students. The aim is to engage GLOW visitors in the intriguing new worlds of light that ILI continuously explores in its research.

With a workgroup consisting of an interdisciplinary mix of students and researchers we soon came up with three directions that highlight different aspects of light and its impact on people. Here I'll briefly introduce the three resulting light installations, Influx, Intermedia and ART, hoping to interest you in reading the more detailed stories about each installation further on in this ILI Magazine.

The first ILI installation on the route is Influx, situated in ILI's Market Hall Living Lab. Influx involves the GLOW visitor in a live scientific crowd flow experiment. With hundreds of thousands expected visitors, this experiment is unique in terms of scale and approach. Quantitative measurements from an in-house developed sensor system enable detailed analysis of the possible influence of light on crowd behaviour.

Further down the route is ART. Visiting GLOW, taking in a multitude of spectacular artistic installations, can be tiresome. At one point, attention becomes depleted. With ART we aim to create a space for clearing the mind and regaining the ability to focus on new impressions. Inspired by Attention Restoration Theory, we created a subtle light and soundscape that brings restorative qualities of nature into the built environment. We hope the GLOW visitor will leave this experimental environment refreshed and open to new experiences.

Intermedia appears almost at the end of the route. The theme of Intermedia is social interaction through technology. We increasingly become aware of how communication changes with new technologies like social media, yet how these technologies influence us is hard to fathom. Intermedia highlights different ways social media could influence social interaction, making it visible in a playful manner through interactive light projections.

Next to leading development of these three ILI installations, I had the pleasure to contribute to the development process of the AnTUenna (the TU/e light beacon on the campus chimney, see elsewhere in this magazine), and coach student groups making LumenUs and Unbuilt. Countless hours during days, nights and weekends were spent by all contributors. Being involved in all these projects, I can testify for the enthusiasm and collaborative attitude of all the creators.

I would like to close off by thanking the people that have supported the work in the background, the people whose names usually do not end up in the installations' credits: Many thanks to Johan Coset and Bart van Bokhoven of Mansveld Expotech, who have provided knowledgeable and professional support throughout. Thanks to Dienst Huisvesting, in particular Thijs Mooren for creating the right technical conditions. Thanks to Tom Weerts from GLOW for his experience and openness. Thanks to TU/e security and the fire brigade for letting us do crazy tests at crazy hours at crazy locations. Thanks to Joe Joe Wong of BCF Helpdesk for helping out with the PC's. Thanks to Mathias Funk, Pinaki Kumar and Colin Lambrechts for last minute coding help. Thanks to Gerrit Kroesen, Annelies Verschuren and Jovita Moerel of the TU/e GLOW committee for the high ambition level and support to get there. Thanks to Samantha Sperling and Harold Weffers of ILI for their all-round support. Many thanks to Mascha Reek. And last but not least, thanks to all the students and staff I had the pleasure to work with for the great collaboration.

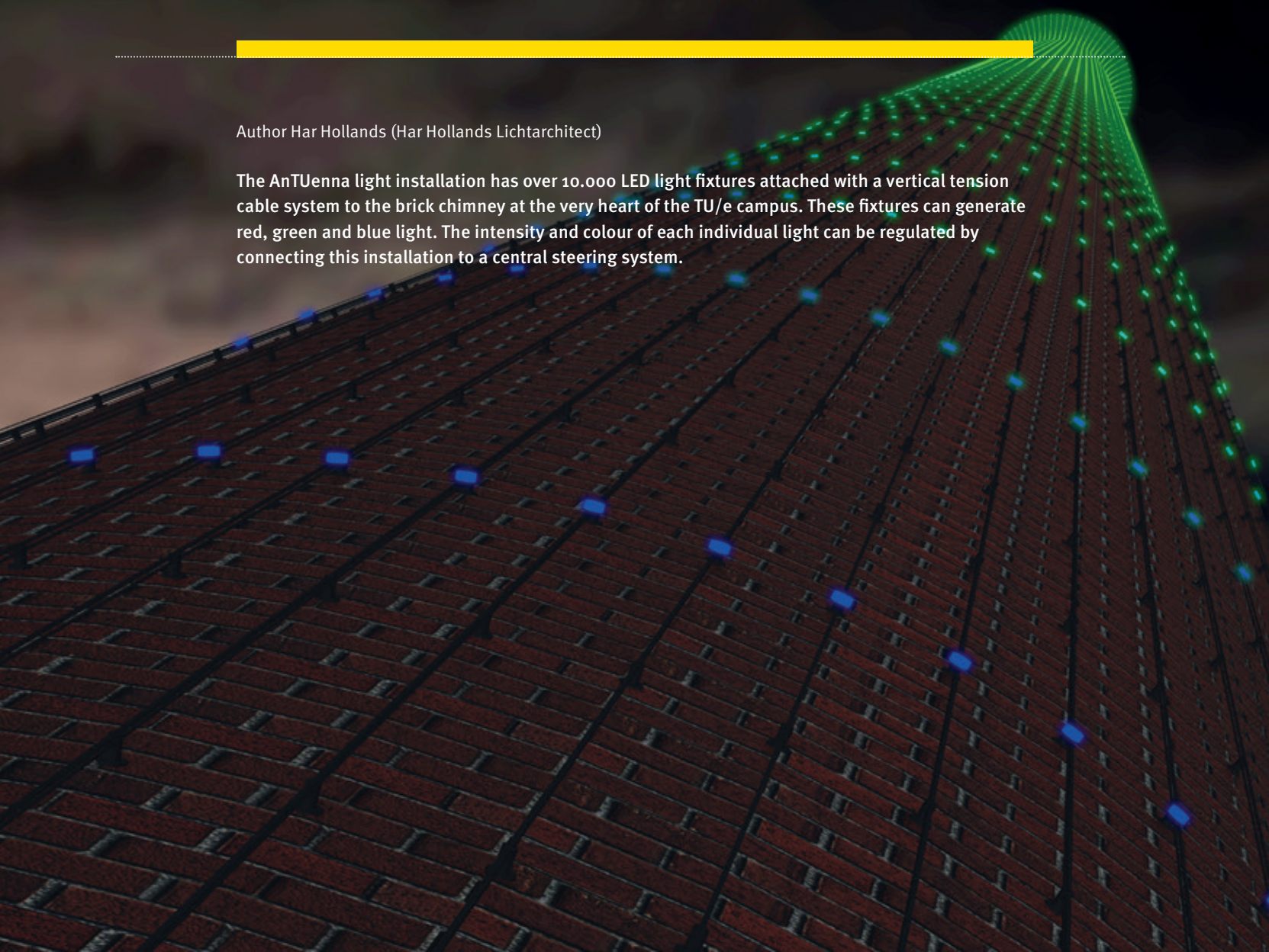
I wish everyone a great visit to GLOW 2016 and hope you'll be as inspired by light as we are!

Philip Ross

Chimney TU/e Campus

Author Har Hollands (Har Hollands Lichtarchitect)

The AnTUenna light installation has over 10.000 LED light fixtures attached with a vertical tension cable system to the brick chimney at the very heart of the TU/e campus. These fixtures can generate red, green and blue light. The intensity and colour of each individual light can be regulated by connecting this installation to a central steering system.



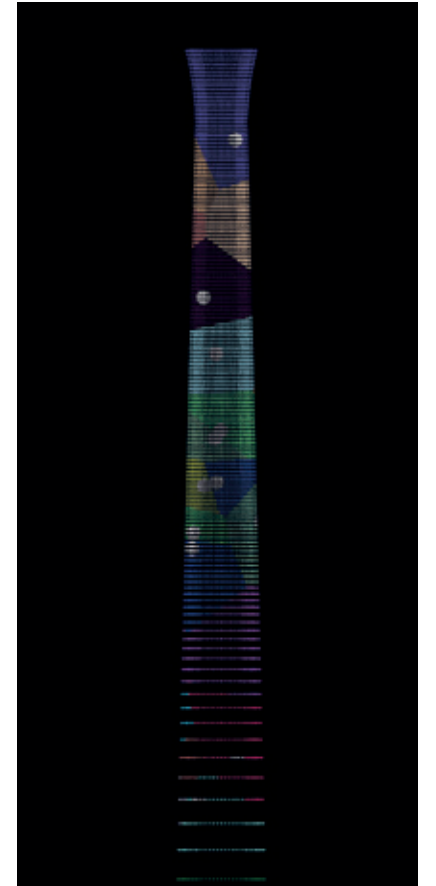
The light points are arranged in rings of 60 LED lights around the chimney. The vertical distances between the 178 rings of LED lights are calculated by the mathematical formula:
 $f(x)[\text{cm}] = 15 + (1,1^{(1,2^*(x-125))})$.
The distance between the two highest rings is 15 cm and gradually increases up to several meters for the two lowest rings. The horizontal distance between the LED lights varies from almost 14 cm to over 32 cm. Although the LED lights are arranged in groups of horizontal rings, the lights are powered and controlled by cables mounted vertically. The arrangement of the LED lights creates a cone-shaped low-resolution screen to show images, videos and animations which can be seen from a great distance.

During the GLOW 2016 Festival different moving images will be displayed based on scientific and technical processes. These processes, introduced by the staff and the students of the university, exemplify the fascinating research and developments now taking place at the TUe. The processes are shown by computer-generated animation. The animation will be accompanied by sound (www.AnTUenna.nl) transmitted through the internet, which can be received, for example, by mobile phone. The soundscape was developed by the sound artist Rob van Rooij (Rot8ion). After the GLOW Festival has ended, the installation will be used for communication purposes by the TUe's 'Communication Expertise Centre'.

The design was developed by lighting designer Har Hollands (www.hollands.info), who has a fellowship at the TUe's Intelligent Lighting Institute (ILI). The content was developed in cooperation with Rombout Frieling and partially implemented by Monique Huveneers, Diane Schoenmaker, Jérôme Simons and Fenna Wit, students in ILI's honours program 'Lightforce'.

The AnTUenna lighting installation forms part of the new lighting vision developed by Har Hollands and Rombout Frieling (ILI) to illuminate the Science Park. Public lighting based on this vision has already been realized in the area close to the chimney. At present this lighting vision is being further developed for and implemented in other parts of the Science Park in cooperation with the Real Estate Management Service

Because of the height of the chimney and its central location on the TUe campus the top of the chimney can be seen from various places in the city outside the Science Park. Towards the top of the chimney the distances in between the LED's become smaller and therefore the resolution gets higher. This means that the light installation can send information from a great distance and it can also act as a light beacon for the TU/e.



Har Hollands

INFLUX: a GLOW installation and large scale naturalistic experiment

Authors | Antal Haans, Alessandro Corbetta, Federico Toschi

When a lamp switches on, light instantaneously flows into every corner of a room, abolishing darkness along its path. When a large group of people sets itself in motion, they too flow; occupying the once empty space through which they transfer. This flow of crowds—whether of photons or people—is necessarily restricted; influenced, for one, by the edges and surfaces that make up our physical environment. Without such influences, visual perception fails and we would have little guidance in how to direct ourselves. The INFLUX installation at GLOW explores this relation between flows of light and people, and makes GLOW visitors to experience the scientific research of the TU/e Intelligent Lighting Institute (ILI).



The INFLUX installation is being built in and around the ILI Living Light Lab Markthal located in front of the entrance to the MetaForum building. The Markthal is a laboratory located not somewhere deep inside the buildings of the university but in a public space used by people in their everyday life; whether students and staff transferring from one building to another, or attendees of large scale events such as the Hajraa Festival or the opening of the academic year. The Markthal Living Light Lab is a playground and ecosystem in support of scientific research, education, and demonstration in such domains as innovative smart-lighting services, internet-of-things concepts and infrastructures, and the effects of light on human behaviour and experience. One research focus is on applications for crowd management, and the effects of light on crowd behaviour. With the TU/e campus being part of the route this year, GLOW and its prospected 700.000 visitors provide an excellent opportunity, not only for letting the public experience the research of ILI, but also for conducting a large scale naturalistic experiment on the effects light on crowd flows—which, as far as we know, is unique in both its kind and scale.

INFLUX—which means flow of crowds but also influence—makes use of the Markthal research infrastructure, including its grid of twelve overhead Microsoft Kinect™ sensors, and the innovative technology for pedestrian tracking developed by dr. Corbetta and prof. Toschi to study crowd dynamics from high statistics experimental data. At INFLUX such technology measures changes



in the flow of GLOW visitors while subjected to various dynamic lighting scenarios. After passing underneath the Kinect™ sensors, visitors will be presented with a visualization of the measured flow data to experience for themselves how light may possibly have affected their motion.

INFLUX is a scientific and technological challenge, requiring the automatic analysis of high density pedestrian dynamics whose imaging data, that will hit the Terabyte during the GLOW week, need to be processed and accommodated in real-time. INFLUX thus is an excellent example of the Living Lab research of ILI

which typically involves activities that cross multiple disciplines in support of society-relevant and high quality scientific, technological, and psychological research.

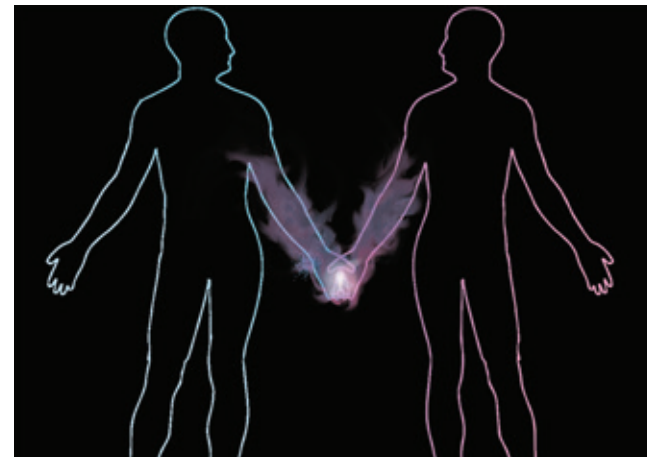
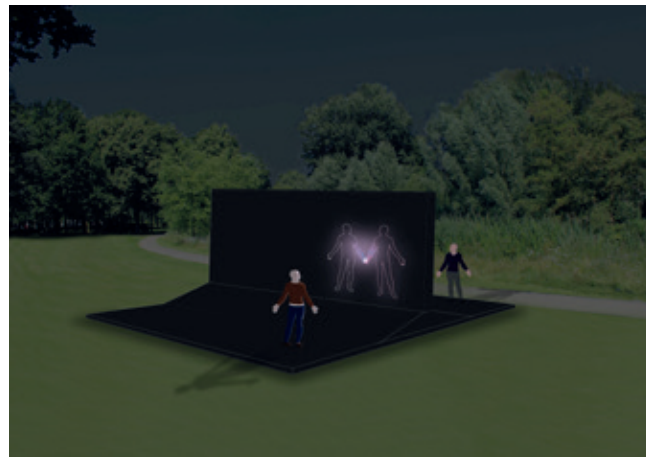
INFLUX is created by TU/e students Sam van Gaal, David van Gelder de Neufville, Bastiaan van Hout, Joep LeBlanc, Bert Maas, Jasper Meeusen, Daan Meister, and Tom van Rooij, Pinake Kumar, Colin Lambrechts, with supervision from Studio Philip Ross, Antal Haans (TU/e ILI), Alessandro Corbetta and Federico Toschi (TU/e TN and W&I), and with support by Aart van der Spank (TU/e HTI) and Mansveld Expotech.

Intermedia: highlighting social interaction through technology

Authors | Randi Nuij, Philip Ross

More and more communication between people happens through technologies such as social media. Some people praise the new ways in which we can engage in close contact over distance, e.g. through Facebook. Others warn about superficiality and volatility of contacts and fear loss of rich human-human interaction. Either way, the topic is very close to the everyday lives of all of us. With Intermedia, we aim to engage people in the discussion about social interaction through technology in a special way: through light art.

The work of philosopher of technology Peter-Paul Verbeek is an important inspiration behind Intermedia. In his framework of Technological Mediation, Verbeek describes how each technology we use invites specific behaviours, while at the same time inhibiting other behaviours. For example, communication apps on our cell phones invite us to interact with people instantly and spontaneously, while at the same time using these apps inhibits social contact with people in our physical vicinity. Intermedia is inspired by this ambiguity. Rather than spelling out answers about what is right or wrong, we created experiences that highlight different aspects of the influence of technology on social interaction.



So how does Intermedia work? The interactive installation of Intermedia consists of three large double sided projection screens, each flanked by two 6m x 2,5m stages. See the image for an impression of one of the screens. As a visitor, you take place on one side of a screen, not being able to directly see the visitors on the opposite side. Your silhouette is captured by Kinect cameras and projected on the screen in altered form. When your silhouette encounters someone else's, the two silhouettes respond to each other interactively. Soundscapes add to the atmosphere of the visualisations. The visual effect of the projections is enhanced by an 'Ambilight' effect that is rendered by RGB LED luminaires around the screens.

The way the silhouettes are visualised, and the way they respond to each other, bring different aspects of social interaction to the foreground. For example, one screen shows a visualisation that touches upon profiling and privacy, aspects that are relevant for social media that gradually build up knowledge about you. When you approach this screen, you are initially visualised as a fully abstract figure. You can engage with other silhouettes fully anonymously. But over time, a real camera feed fills up your silhouette, revealing more and more of yourself to the other people at the installation. Will this revelation change the way you interact with others?



At another screen, Intermedia focuses on virtual links between people. On social media, once a link is made, breaking it is difficult and its trace will always remain visible somewhere on the internet. Analogously, Intermedia couples your silhouette with another person's. If you collaborate with someone on the other side of the screen, you can create nice visual effects together. But the system does not allow you to choose who to pair up with...

At tests we did in preparation for GLOW, we already noticed that different visualisations invite totally different social behaviours from people. We hope that the GLOW visitor will enjoy engaging with Intermedia, and eventually reflect on the different ways technology can influence social interaction.

The project Intermedia stems from a student project within the TU/e bachelor college course 'Secret Life of Light'. It was initiated as a collaboration between ILI, the Van Abbe museum and artist Roland Schimmel, coached by Yvonne de Kort, Mariëlle Aarts and Philip Ross. Afterwards, a student team continued Intermedia's development for GLOW under Ross' supervision. The students that developed Intermedia are Niek Baltussen, Joren Broekema, Camiel de Bruin, Zeno Kapitein, Daan Meister, Randi Nuij, Maró Postema, Tom van Rooij, Sara Schippers, Arjen van Vastenhoven and Willem Zwagers.



ILI introduces new employees

■ Mahmoud Talebi

Mahmoud Talebi received his Master's degree in Software Engineering with a focus on Formal Methods from Sharif University of Technology, Tehran, Iran. He is a Ph.D. student in the Model-driven Software Engineering group in Eindhoven University of Technology under the supervision of Jan Friso Groote and Jean-Paul Linnartz. His interests are in topics related to verification and performance evaluation of wireless network protocols.

His past experience includes design and implementation of ad-hoc protocols and modeling protocols using Markov chains. His contributions are currently within project DEWI (dependable embedded wireless infrastructure), which aims to bring cutting edge wireless technologies together for solutions in smart home and smart public spaces. In this context, the scalability of wireless lighting networks is a main area of focus. The goal is to develop theoretical frameworks that allow the analysis of really large wireless sensor networks and to be able to extend the results to networks of arbitrary size, for which detailed simulations are no longer feasible. His research aims to combine results from several fields such as signal processing, distributed algorithms, and advanced topics in probability theory.

■ Thijs Kruisselbrink

Last year I finished my master Building Physics and Services, at the Eindhoven University of Technology. Before that, I completed my bachelor in Architecture, Building and Planning, also at this university. During my graduation project, I developed a practical luminance measurement device using a camera system. I really enjoyed this project, so I was glad to get the opportunity to start my professional career in the field of building lighting.

At September 1st, I started my PhD at the building lighting group. During this PhD I will extract useful features from sensor measurements from real environments and analyze these features in relation to relevant building performance indicators. Thereby I will explore how parallel streams of information can be used to reduce uncertainty in the observations of the sensors. This is all part of a wider STW research project called OptiLight conducted by multiple groups that collaborate in the Intelligent Lighting Institute.

■ Yike Pan

Yike Pan has acquired a bachelor degree of illumination engineering at Shanghai Fudan University, China (2008), a master degree of architectural lighting design at University of Wismar, Germany (2015), and is currently chasing a PhD title with the research topic "the chronic effect of light on human health in an office environment" at TU/e (expected graduation in 2020). Professionally speaking, Yike has worked as research assistant, lighting designer and project manager in Shanghai, China (2008-2012), New York City, USA (2013-2014) and Bonn, Germany (2014-2015).

Yike Pan perceives light as a medium of energy and information, harmonizing human body and its surrounding environment. By adopting holistic and preventative medical approach of traditional Chinese medicine (TCM), he uses mathematical and physical methods to quantify the impact of light on human health, thus benefiting the work of architectural lighting design.

Meanwhile Yike is working in a start-up "aralys" Adaptive Lighting Solutions, researching and developing a biologically and socially smart adaptive lighting system in Siegen, Germany.

■ Qingzhi Liu

I received the B.Sc. degree in telecommunication and M.Eng. degree in software engineering from Xidian University, Xi'an, China, in 2005 and 2008, respectively. I received the M.Sc. degree (with Cum Laude.) from Delft University of Technology, Delft, The Netherlands, in 2011. After that I pursued the Ph.D. degree at the Faculty of Electrical Engineering, Mathematics and Computer Science and at the Faculty of Technology, Policy and Management, Delft University of Technology, since 2012. My research interests include Internet of Things, wireless power transfer, self-adaptive self-organization systems, and wireless mobile networks. From September of 2016, I work as Post-Doc in the System Architecture and Networking group, department of Mathematics and Computer Science, Eindhoven University of Technology. My research is based on the OpenAIS project, which aims at setting the advanced standard for intelligent lighting architecture. This research will push forward intelligent lighting systems to an open and service oriented architecture.

■ Rajendra Dangol

Dr. Rajendra Dangol is a newly appointed postdoctoral researcher at the department of Built Environment, Eindhoven University of Technology. He is from Kathmandu, Nepal and will be working under the supervision of prof. Dr.-Ing. Alexander Rosemann. Before he joined TU/e, he worked in a similar role at Aalto University, Finland. There he also received his MSc (2011) and his PhD (2015, cum laude). The topic of his PhD dissertation was subjective preference of light colour and LED lighting. His research interests include colour quality of light sources, colorimetry, energy efficiency, and solid state lighting.

■ Sangye Lungten

After receiving my MSc in pure mathematics in 2008 from the University of Madras, I worked as an assistant lecturer in Royal University of Bhutan. My curiosity and research interests in applied mathematics led me to obtain a PhD scholarship at Eindhoven University of Technology in 2012. I did my PhD research on the topic 'Solution methods for indefinite systems of linear equations in saddle-point form' which was successfully defended in June 2016.

My PhD promoter Prof. Wil H.A. Schilders introduced me about Delphi4LED project on multi-domain compact modeling of LEDs (light-emitting diodes). In the project I was fascinated to see a part in which the model-order-reduction techniques can be used for extracting the parameters of compact model. This made me interested to participate in the project. My primary role in this project is to lead a work package on defining end-user requirements and specifications for LEDs. To me this task is quite new and challenging. Nevertheless, learning new things inspires me and makes me more enthusiastic every day. We have experienced project partners from various industries and academic research institutes who help me to lead the task smoothly. At the stage of modeling and parameter extraction, I will use my numerical linear algebra techniques to contribute in this area.



A.R.T. | Attention Restoration Theory inspired transformation of an urban walkway using light and sound

Authors | Indre Kalisnauskaite, Philip Ross

In our daily lives, we are confronted with an ever growing stream of stimuli that fight for our attention. Our brains get little rest and we lose the ability to focus our attention and deeply engage in an experience.

Even at GLOW, the danger of over-stimulation lurks. Although we feast on the wealth of fascinating images, simultaneously we get fatigued from concentrating on them and searching for layers of meaning the artists might try to convey. In the end, we run the risk of getting numb to all the stimuli, however beautiful. Visiting an event like GLOW is as fun and interesting as it can be tiresome.

We set out to alleviate this issue using scientific theory as a foundation. For decades, psychologists have been exploring ways to restore our attentional

capacity to avoid mental exhaustion and help us open up our minds for new experiences. Natural environments, both designed by humans as well as naturally created by Mother Earth, seem to be one of the most powerful fuels for attention restoration. Attention Restoration Theory (A.R.T.), developed by Stephen and Rachel Kaplan, suggests that four core experiences that are evoked by natural views – soft fascination, extent, compatibility and being away – are responsible for the restoration of our attentional capacity. Staring at clouds, or taking in a wide forest vista are examples of restorative experiences.

We took inspiration from A.R.T. and set out to transform a 230m long stretch at the Zaale into a space for attention restoration. Trees bordering the street are subtly lit, creating a visual complexity in which people can lose themselves. A soundscape accompanies the lighted trees. The natural rhythm of the wind and the resulting movement in trees is picked

up by a sensor and translated into small modulations of light and sound. This way, we intend to incorporate the live dynamic qualities of nature into the light and soundscape. As the walk progresses, the light gradually becomes dimmer, making way for darkness, making it easier for the gaze to wander. The sound gets more abstract along the way, strengthening the feeling of immersion. The walk ends under the arch of the Atlas building. Here, we intend to smoothly bring visitor back into the busy GLOW atmosphere world by highlighting the presence of build environment and playing an energizing soundscape.

We hope visitors will leave the Zaale refreshed and open to new experiences. Since A.R.T. is made from a different viewpoint than usual, trying not to draw much focused attention, visitors will likely leave with questions: What was there? What did I experience? What was the message they were trying to convey?

We wish that this soft and contrasting GLOW experience will trigger people to eventually reflect on their daily life experiences and, perhaps, even contemplate about the qualities of the places where one finds comfort and restoration. Finally, we would like to show to the visitor how science can inspire design and how collaboration between these two disciplines can lead to designs that may positively influence our lives. A.R.T. is of course a greatly experimental installation. It is an attempt to learn how to translate theory about the qualities of the restorative environments into an urban setting using modern technologies such as dynamic lighting. A.R.T. is created by PhD student Indre Kalinauskaite, sound designer and Industrial Design student Joep LeBlanc, Industrial Design student Randi Nuij and designer Philip Ross. A.R.T. is an initiative of the TU/e Intelligent Lighting Institute.



Creating continuous smart city innovations

Authors | Kati Brock, Ralf Voncken & Elke den Ouden

The Netherlands, and especially Eindhoven, features in the top of most entrepreneurial, technology, and innovation rankings worldwide. Not only are its companies and universities successful in innovation, but also the municipality of Eindhoven can be seen as an exemplar for other cities. The Eindhoven public lighting tender provides an interesting leading case of how to use the public lighting infrastructure in a smarter way to go beyond illumination within an urban context.

Most smart city initiatives hardly go beyond the pilot project phase and are only partly able to fulfill their promise of a better quality of life for a city's citizens and visitors. At the same time, we see that the traditional public lighting procurement approach does not consider the ongoing societal and technological evolution and its accompanying challenges. Traditionally, a public lighting procurement procedure would publish strict product and technology specifications for companies to follow. With this approach there is no room for collaboration and innovation. To be successful in smart cities both the procurement approach as well as the current business models need to change drastically.

The city of Eindhoven can be seen as an exemplar case of how to take a non-traditional public lighting procurement approach by leveraging the public lighting infrastructure to go beyond illumination moving towards smart cities. From the start, the

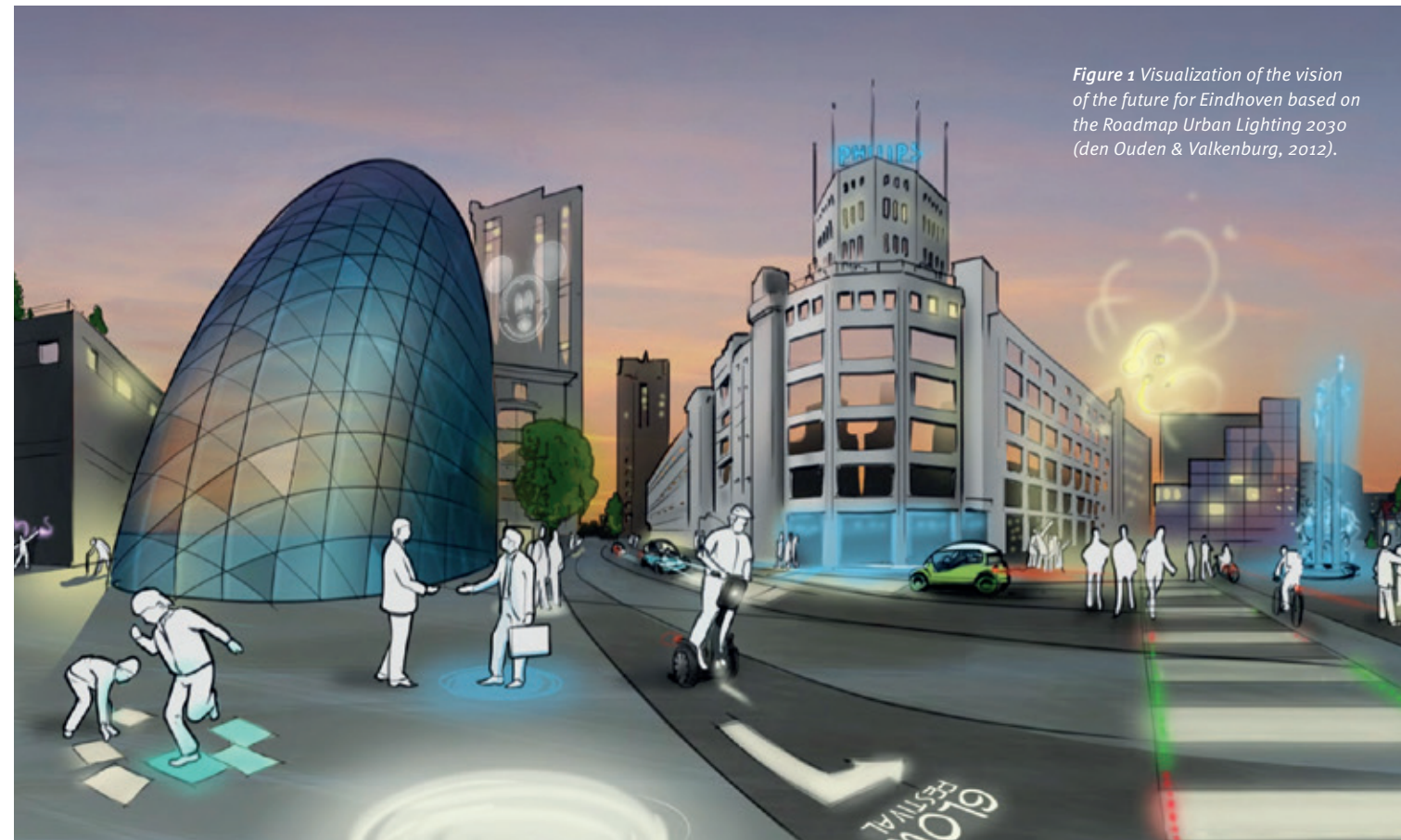
municipality stated that the ultimate goal is to improve the quality of life in their city through continuous innovation in lighting and smart city applications. Central to realizing this goal is connected lighting and a smart lighting grid, provided by Philips Lighting. Besides energy savings, connected lighting will provide the city infrastructure that makes it possible to create a dense network of sensors and actuators, i.e. a smart lighting grid, on which the

smart city services can be based. Meanwhile, public lighting is closely interwoven with Eindhoven's identity and character as the 'city of light'. Together with the Eindhoven University of Technology the municipality of Eindhoven created a roadmap for public lighting in Eindhoven for 2030 - a shared vision for the bright future of Eindhoven that provided the basis for the procurement process. Philips Lighting, together with its consortium partner Heijmans, went into an open dialogue with the municipality to define how to make the roadmap and vision reality. More specifically, Philips Lighting, Heijmans and the Eindhoven University of Technology, designed the Smart City Continuous Innovation Process (SCCIP), a long-term oriented process that will enable continuous innovation in Eindhoven. The people and citizens of Eindhoven are central to this innovation process and their needs form the starting point for any smart lighting or smart city application.

"All in all, we see that the Eindhoven case is not a one-of-a-kind case."

Within this process four key stakeholders: (1) municipality, (2) businesses, (3) citizens, and (4) knowledge institutions collaborate in creating, developing and realizing smart city opportunities. All in all, we see that the Eindhoven case is not a one-of-a-kind case. Many other municipalities worldwide feel limited by the current product-oriented procurement procedures and traditional product business models of companies. Municipalities are therefore challenging businesses and other stakeholders to go beyond products by leveraging their technological knowledge to create and deliver smart city services that will improve the quality of life in their respective city. The full length article is available upon request or visit the Lighthouse website.

<http://www.tue-lighthouse.nl/Publications.html>



Holst Memorial Lecture 2016 and Holst Symposium 'Quality of Light'

Author | Joep Huiskamp
Auditorium TU/e, Thursday, 17 November

The 2016 Holst Symposium 'Quality of Light' unites four excellent invited speakers to share their views on some of the many values light has to offer. Vision scientist dr. Andrew B. Watson will receive the Holst Memorial Lecture Award 2016 for his important contributions to vision research. The Holst event will be preceded by ILIAD 2016. For all those involved in lighting research and design, 17 November will be a day not to be missed.

Holst Memorial Lecture 2016 'The Windows of Visibility'

Holst Award recipient Dr. Watson recently started working as senior vision scientist at Apple. In his Holst Lecture however, he will reflect on his work as vision researcher at NASA Ames Research Center, Moffett Field. "We do not see the world as it is, but only the view that is admitted by the window of our visual sense." Dr. Watson will explore the many narrow Windows of Visibility through which we experience the visual world. Though these limitations, the eye reduces the infinitely complex physics of reality to a finite limited sample of information that our brain can manage. Remarkably, understanding these limitations is also

key to designing better visual display technology. Andrew B. Watson will illustrate this idea with examples from quality optimization of display and lighting systems.

Holst Symposium 'Quality of Light'

While the Holst Memorial Lecture by Andrew B. Watson will focus on achievements in vision research, the preceding Symposium will cover four varying topics. Four speakers, all leading academic or industrial professionals in their discipline, will address a specific aspect of light, ranging from consumer and entertainment lighting, horticulture, semantic lighting to virtual city planning and light rendering.

LED-revolution in horticultural plant production

Prof.dr.ir. Leo Marcelis (Wageningen University) will talk about lighting in horticulture. Strong urbanisation and the rapidly growing world population put new demands on the production of vegetables and flowers. Therefore, not only the production must increase strongly, but it should also be sustainable and the produce should be of high quality. To meet all the requirements we need a high level of control over the production process. Production in greenhouses or in buildings allows this precise control. Light is the driving force for growth of the plants. LEDs offer the growers many new opportunities.

Now not only intensity, but also the spectrum, timing and distribution of light can be controlled, while heat load is mainly separated from lighting. By the smart use of LED light growers can save more than 50% energy in greenhouses, while improving the growth of plants.

Internet of Light; towards semantic and cognitive Light

Prof.dr. Zary Segall (Royal Institute of Technology, Stockholm) addresses the Internet of Light. Conventional lighting devices deliver static light and are agnostic to the user, the subject or the environment. Thus, such lighting devices are designed to illuminate a predefined, average illumination scene for an average user. This completely overlooks the fact that the light is perceived differently by different people and that the lighting requirements are different for each particular task. Semantic and Cognitive Light – SLC- provides machine understanding and learning of an illuminated scene in order to transform conventional agnostic lighting into dynamic, intelligent lighting by digitally altering the quality, quantity and informational capacity of light based on awareness of the individual, his/her current context, the task at hand, location and mobility.

Filip Jan Depauw, (Co-Founder of Philips Hue and Entertainment Lead) will share his thoughts on lighting experiences with Philips Hue. Prof. Kent Larson (principal research scientist, MIT, Boston, USA) will talk about intelligent cities.

History of the Holst Memorial Lecture

The Holst Memorial Lecture, celebrating its 40th edition this year, is organized by Philips Lighting Research and TU/e. The first Holst Memorial Lecture was held in 1977 to commemorate the 21st anniversary of the university. The general theme chosen for these lectures reflects the important contribution of Dr. Gilles Holst (1886-1968), founding father of the famous Philips Natlab, to research and technology in the Netherlands.



ILI Top publications

April 2016 - October 2016

P. Khademagha, M.B.C. Aries, A.L.P. Rosemann, E.J. van Loenen
Implementing non-image-forming effects of light in the built environment: A review on what we need, *Journal of Building and Environment*, 108, 263-272 (2016)

Meerbeek, B. W., de Bakker, C., de Kort, Y. A. W., van Loenen, E. J., & Bergman, T. (2016)
Automated blinds with light feedback to increase occupant satisfaction and energy saving. *Building and Environment*, 103, 70-85

Chraibi, S., Lashina, T.A., Shrubsole, P., Aries, M.B.C., van Loenen, E.J. & Rosemann, A.L.P. (2016)
Satisfying light conditions: a field study on perception of consensus light in Dutch open office environments. *Building and Environment*, 105, 116-127.

Labeodan, T.M., de Bakker, C., Rosemann, A.L.P. & Zeiler, W. (2016).
On the application of wireless sensors and actuators network in existing buildings for occupancy detection and occupancy-driven lighting control. *Energy and Buildings*, 127, 75-83.

van Duijnhoven, J., Aarts, M.P.J., Aries, M.B.C., Böhmer, M.N. & Rosemann, A.L.P. (2016).
Recommendations for measuring non-image-forming effects of light. *Technology and Health Care*, in print

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Invloed daglicht in gebouwde omgeving op prestatie van gebruikers. *TVVL Magazine*, 45(6), 4-7.

de Bakker, C., van Duijnhoven, J., Aries, M.B.C., Kort, H.S.M. & Rosemann, A.L.P. (2016).
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Beute, F., de Kort, Y. A. W., & IJsselsteijn, W. A. (2016).
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Huiberts, L. M., Smolders, K. C. H. J. & de Kort, Y. A. W. (2016).
Non-image forming effects of illuminance level: exploring parallel effects on Physiological arousal and task performance. *Physiology & Behavior*, 164, 129-139. IF 2.46

Smolders, K. C. H. J., de Kort, Y. A. W. & Cluitmans, P. J. M. (2016).
Higher light intensity induces modulations in brain activity even during regular daytime working hours. *Lighting Research & Technology*, in press. IF 1.67

C. Filosa, J.H.M. ten Thije Boonkkamp, and W.L. IJzerman
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B.S. van Lith, J.H.M. ten Thije Boonkkamp, W.L. IJzerman, and T.W. Tukker
A novel scheme for Liouville's equation with a discontinuous Hamiltonian and applications to geometric optics, *Journal of Scientific Computing* 68, 739-771 (2016).

Pruteanu, A., van Driel, W., van Kooten, W. & Linnartz, J.P.M.G. (2016).
Tools and methods for testing and verification. In Z. Papp, P.A. Jaramillo Garcia & G. Exarchakos (Eds.), *Runtime reconfiguration in networked embedded systems : design and testing practices* (pp. 133-136). (Internet of things). Berlin: Springer.

Gopalakrishna A.K., Ozcelebi T., Lukkien J.J., Liotta A.
Relevance in cyber-physical systems with humans in the loop *Concurrency and Computation, Practice and Experience* (March 2016)

ILI in the Media

8-apr-16
TV & Radio
Omroep Brabant Nieuws
Interview on de-escalate/
Stratumseind Living Lab research [2]

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TV NOS Nieuws
Interview on de-escalate/
Stratumseind Living Lab research [2]

02-apr-16
Online magazine
Future of Light
Interview for "can light influence our behavior"

ALLICHT
04-2016
Jury Daylight Award 2016
Interview with Alexander Rosemann
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