



PHD research

EAGLE study trip

Internship **abroad**

Wireless power week 2019

Connector

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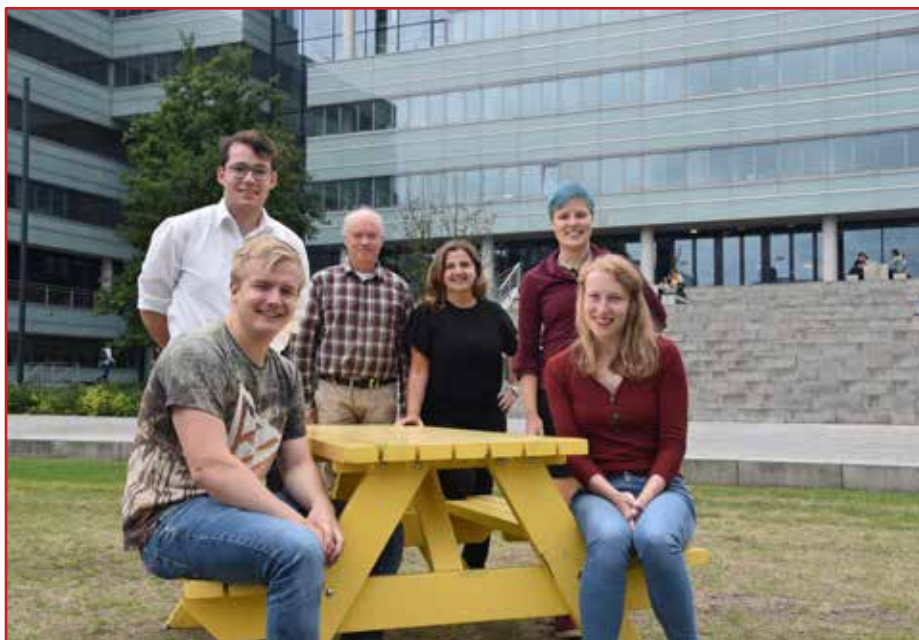
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Welcome back from your yearly summer leave. We hope you have found new inspiration for this academic year. Also a warm welcome to all new students, both native and from abroad. We hope you will feel at home soon.

As you may notice, our magazine cover is different from other September covers from the past. No photo of the introduction on the cover this time. We have decided to print the photo on the centerfold pages. First-year students can tear out the poster gently to hang it in their rooms to remember how wonderful the intro week was. Maybe it will inspire you to take a picture of where you hung the intro photo and send it to us. We will share a couple of your snapshots in the December issue.

This big September issue is filled with interesting articles from staff and students. This time we are sharing two promotion articles with you. Saskia Camps and Thijs van Laar each wrote an article about their PhD research. Earlier this year Peter van der Wielen did his inaugural lecture. In this September issue you will find a summary of this lecture with the topic 'The energy transition and power failures in the electricity grid'. Alumnus Lulu Chan graduated in 2014, she shares her life thus far after her graduation with you.

As you may expect from us by now, we have an Internship Abroad article. This time Anouk Hubrechtsen writes about her amazing time at NIST in Boulder.

Our students went on a study trip to Latvia and Estonia and on another study trip to Munich. Read about their experiences. And a September issue wouldn't be the same without the candidate board members of Thor who introduce themselves to us readers.

More interesting and fun to read articles can be found in this magazine. We hope you enjoy reading it as much as we have had making it.

The Connector editorial board

P.S.: The Connector editorial board has positions open for creative and enthusiastic employees of the Department of Electrical Engineering interested in joining us to make the Connector magazine. Up for a new challenge? Please contact us!! As always, we will be glad to receive your suggestions and nominations for the 'vlaai' and ideas for upcoming editions. You can contact us via connector@tue.nl. ■

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Life after EE

Read more about Lulu Chan her life after graduating on page 42

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EAGLE study trip

Read more about Thor's study trip to Estonia and Latvia on page 25

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Internship Abroad

Still wondering where to go for your internship? You can find a good example on page 32

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Wireless power week 2019

Read more about the wireless power conference that took place in London on page 38.

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A warm welcome to our new bachelor students

By: Sjoerd Hulshof



So, there you are! You have made the choice to study Electrical Engineering or Automotive Technology at our university. I would like to thank you for your confidence in our department and I can guarantee you we will support you the best we can during your educational and scientific journey. Furthermore, you can expect a solid engineering program which will open lots of doors for you after graduating as a Master of Science.

I would like to ask one favor in return (or like we say in The Netherlands: 'Voor wat hoort wat'). It may sound logical what I am about to ask from you, but please believe me when I say it's not so obvious for first-year students. I want you to realize that starting your studies here in Eindhoven is something completely different from when you started your secondary-school education. And why is that? Not only because studying at a

university requires a lot of self-discipline and perseverance. Not only because the required level of abstract thinking is higher than you're probably used to. The most important difference (in my opinion) is that you, and hopefully you alone have made the choice in this, start an academic study program. When you attended secondary school, you didn't have much of a choice. You just did what was expected from you. You probably didn't experience it that way at that time, but I sincerely hope you don't experience the choice you have made by joining our university as something 'that is expected from me'. After all, this choice has some serious implications. First of all: you are responsible for your own study progress. Of course we offer a lot of support, but still you need to ask for it in specific situations. Secondly, making the choice of studying with us also implies making the choice of becoming an engineer, which is not the same as just passing exams. You

are here to gain valuable knowledge and skills you will benefit from during the rest of your career.

I once read a nice quote on the site of a Swedish university: 'Being a student in Sweden can be somewhat challenging at first. You are expected to think independently, critically, analytically and to be responsible and plan your own work. Once you get the hang of it, you will see it all pays off in the end.' All of this is so true, except for the fact that this not only counts for studying in Sweden. This is true for academic studies in general. In other words: I know we ask a lot from you, but you will get a lot in return as well.

The most valuable tip I can give you at this moment, and what you probably have heard before during one of our webinars, the Information Days or your Study Choice Check: be pro-active and start working hard from day one. Don't just sit and wait, but take action! Once you get the hang of it, it will already pay off in the first year and it will give you a solid basis for the rest of your Bachelors' program.

Of course, life is not only about studying. My second tip is to find the right balance between studying and leisure time. You need both to finish your studies successfully.

Good luck and have fun!

Sjoerd Hulshof
Bachelor Program Director
Electrical Engineering and Automotive Technology ■





Martijn van Beurden appointed Full Professor

As per June 1st, 2019, Martijn van Beurden has been appointed full professor 'computational electromagnetics in complex high-tech systems' within the research group Electromagnetics at the department of Electrical Engineering.

Goodbye Connecthor Team

As of this edition, Lisa and Birgit have left the editorial board of the Connecthor after several years. Lisa always found exiting puzzles for our readers to solve, and Birgit took care of the looks of the Connecthor.

Thanks for all your hard work, Birgit and Lisa!



Goodbye Connecthor Team

As of this edition, Mariska has left the editorial board of the Connecthor.

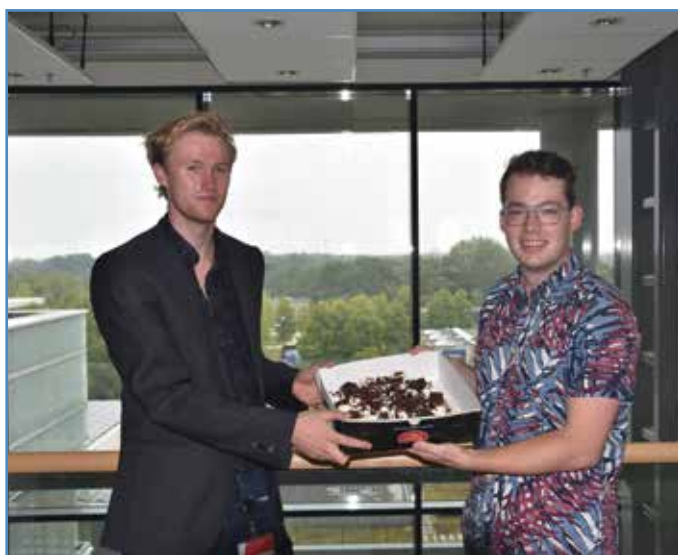
Thanks or all your hard work, Mariska!



Graduates June 18th 2019

Nick Peters
Willem Remie
Sebastiaan Goossens
Esmee Huismans
Linda Janssen
Bart Bokmans
Ruben Geurts
Alexandre König dos Santos
Sander Wasser
Yu Tian

Congratulations!



The winner of the pie for the previous puzzle is Steven Beumer, Congratulations Steven!



The Student Body of Electrical Engineering turned 50 this year! Congratulations!

From the President

By: Dana de Vreede



During my board year I have sometimes made the joke to my fellow board members that things would be so much easier without members. No one asking you questions when you're just trying to finish some last work before going to Het Walhalla to end your day, no one asking you to help find something in our storage (of which I am honestly still surprised that I know what to find where) or wanting to buy a bierkaart just before 16:30h.

But any time I make this joke I stop and think about what we as Thor as a whole, members and board, mean to me. I am constantly surprised at what we can achieve as active and spirited students. I can say with full confidence that I am proud of what our members have achieved this year. Not only has this year been full of all kinds of fun and interesting activities, these activities have been greatly visited as well. It was amazing to see how many students would visit our lunch lectures, exam trainings, and the Career Day.

So yeah, I am happy that we have members, but not only because of their presence and active membership of Thor the last year. I am also very happy with what they have given me, which is inspiration and creativity. I have learned to solve problems in ways I never would have dared before (like I said on the blog of our website, I can sometimes be a little bit of a "watje"). I have dared to open myself up to new experiences and have gotten to know a lot of new people, for instance the board members of our sister associations Scintilla (UTwente) and ETV (TU Delft), with whom we have already joked about a reunion next year.

But I made a promise to myself at the beginning of this year about these "From the president" parts of the Connector. I promised myself to not write these pieces about the standard "what is happening now within Thor" but I would write them in a way so that I would find them interesting to read. To do this I have often turned to members and talked with them about what they found interesting at that time or what they were up to. This never failed to give me inspiration for fun

stories about myself, my experiences or just creative new ideas. Something I have been thankful for a lot, since it helped me (for instance with writing for our blog or the Connector) but now I am here. It is the summer holiday and Thor has turned into what you could almost call a ghost town. During the day there are less than ten members on the sixth floor of Flux, we even went multiple days without having to make coffee (which I think we can actually call the 8th world wonder).

I can't wait until the new academic year starts and I can hear everyone's great stories about what they have done this summer. I hope everyone will have a wonderful academic year and to the next board, I wish you good luck, a lot of creative inspiration by our members and most of all a lot of fun. And to any future presidents reading this, don't you dare write standard pieces for the "from the president" sections because I want to like reading them!

Veel gedonder!
Dana de Vreede
President of Thor ■

Introducing Maarten Paulides – director of C3Te

By: Jan Vleeshouwers

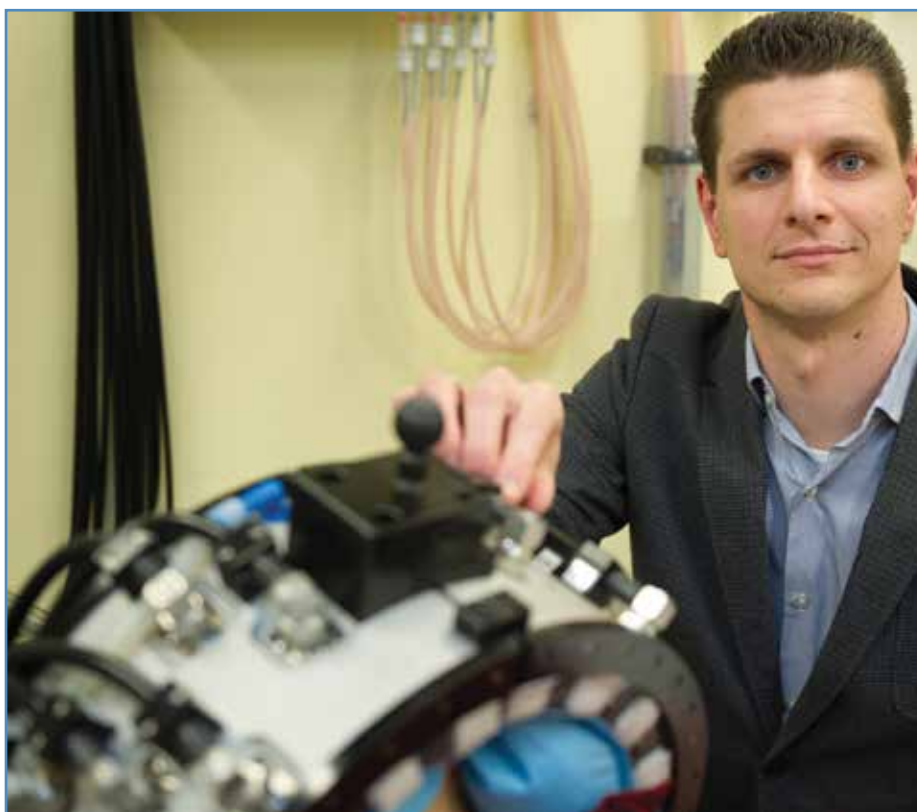
Last November, Maarten Paulides started his job as director of the Center for Care and Cure Technology Eindhoven (C3Te). Maarten and his small team of Noortje Bax and Danielle van der Hagen run a part of the faculty which is hard to overrate but also hard to explain to others, certainly since the university has a second center with a medical focus, the e/MTIC.

Why is C3Te important to the faculty of Electrical Engineering?

“C3Te is the link between university research, clinics and the clinical industry. Technology research always has half an eye on applications, but the organization of research at a faculty is simply too complex or too obscure for people from outside to find their way to research that may answer their needs. The center tries to do just that: elucidate and connect plain application needs, from companies and clinics all over the world, to medically oriented research carried out at our faculty. For the faculty, that is important in two ways: it makes sure that research does not go to waste, and doing research with industrial partners is a source of income the faculty cannot do without anymore.”

“Connecting to societal or industrial needs is easier said than done, because it is not just the research that is organized in a confusing way. More often than not, societal and industrial needs are not that clear either. That is why C3Te is composing roadmaps for important areas in the medical field, in particular in perinatology, cardiology, oncology, and neurology. Hereto, a talented group of researchers with a medical interest try to describe developments ten years ahead to identify what crucial results we will likely need. This makes it easier for companies to position and formulate what they need, and for research to address these needs in a coherent way.”

Maarten Paulides expected to be busy with the center, but is surprised to find out his activities are still very close to doing research. At Erasmus Medical Center, he led research to treat tumors inside the head and neck with heat. Sensius, a company he co-founded, is commercializing this research. The equipment heats tissue very locally, but that means that if a patient moves, the heat is going the wrong way. On top of that, the body counteracts the



Maarten Paulides behind a prototype of a collar for thermotherapy (Photo: Michelle Muus)

heating, but unfortunately in a rather inhomogeneous way. So some kind of control is indispensable to administer the heat in the right place. At Erasmus, he started working on MRI techniques to identify the heated area and obtain the feedback to direct the heat therapy. At TU/e, he continues this MRI research in his Electromagnetics for Care&Cure (EM4C&C)-lab, where Maarten cooperates with Rob Mestrom, Paul Boon, Ad Reniers and Huib Visser.

This idea is straightforward, but realization is still something else. For one, the room within a MRI machine is limited, and the high-power microwaves to heat and water too cool the skin can damage the scanner. What is even more demanding, is that temperature measurement is on the verge of what MRI is capable of doing. Paulides has developed the “MRcollar”

which is sufficiently small to fit in a MRI scanner, and is now trying to integrate the MRI-measuring coils into the collar. The reduced distance and array setup combined are expected to provide the measurement accuracy needed.

The world of MRI is still expanding. Although the past tended towards larger magnetic fields, there is renewed interest in low-field-strength MRI. New staff is being recruited at the department to support this development, and MRI will obtain a larger footprint in education as well. As a director of C3Te, Maarten would also like to contribute to education. So if students are in for a Bachelor or Master graduation project, he will certainly welcome them. ■

Introducing...

Hello everyone! My name is Charlotte van Kesteren and I have just started my new job as Education Coordinator EE for the ESA Team EE.

The world of education is not new to me. For the past six years I've worked as a Coordinator of Educational Logistics at Avans University of Applied Sciences in Breda. I was responsible for the annual and periodic planning of personnel on teaching and non-teaching tasks and for producing schedules for students and teachers. I also assisted with the renewal of the curriculum, making sure the curriculum was designed within budget and manageable, and implemented a new planning tool.

Having studied Archaeology at Leiden University and Museum studies at the University of Amsterdam myself I have no background in technology. So there's lots for me to learn here!

I love spending my free time on my yoga mat, baking, hiking, and going to food and music festivals.

I'm very happy to start working at the TU/e and I'm looking forward to meeting new colleagues! Feel free to contact me if you have any questions. ■



Hello everybody! My name is Danielle van der Hagen and I am 46 years old. I was born and raised in Eindhoven where I still live, with my boyfriend and three girls (13, 17 and 17 years old). I have just started as a secretary at the Center for Care and Cure Technology Eindhoven (C3TE) at the Department of Electrical Engineering. I am also the secretary of the Eindhoven School of Education (ESoE) at the TU/e.

In my past, I have been working for twenty years as a commercial assistant at ABN AMRO Bank. With over nineteen

years of experience in the banking world, I have always held customer-oriented positions. Characteristic for me is my attitude towards both people and results. I am a team player and I am known as a committed and loyal employee with most of the time a big smile.

I like to meet up with friends and go out to restaurants, concerts and the theatre. I also like to do fun stuff with my kids, shopping is their favorite thing, of course, they are girls!! ■

Hello everyone! My name is Doga Ceylan, and I am from Turkey. I received my BSc and MSc degrees from the department of Electrical and Electronics Engineering at the Middle East Technical University, Ankara, Turkey in 2016 and 2018, respectively. During my master program, I was working on electromagnetic launchers as a research assistant at the university. Since May, I've been working in the EPE group as a PhD candidate. My current research interests include electrical machines, electric vehicles, electromagnetic launchers, pulsed-power sources, and renewable energy. At the TU/e, my PhD project is about the development of a multi-phase electrical drive for an unmanned vehicle for the agricultural sector. Specifically, I am working on the design of a flux-switching

machine using semi-analytical and finite element modeling methods. In addition to my academic life, the biggest passion in my personal life is definitely alpinism. I was part of two high-altitude expeditions, both higher than 7000m, together with a team of climbers. These experiences enabled me to improve my cooperation skills and taught me self-discipline, which I believe is a necessity to deal with the high levels of stress. I also love rock and ice climbing. Moreover, cycling and running are my other hobbies. I am very excited and ready for my new journey in the Netherlands. I enjoy living and working in such an international environment. I am really looking forward to meeting new friends and sharing experiences with them! ■





Hello, everybody! My name is Jiali Xie, and I come from Hangzhou, China. I am a first-year PhD candidate at the Signal Processing Systems group of the department of Electrical Engineering here at the TU/e. I received my Bachelor's degree in Electrical Engineering from Zhejiang University in China. After that, I worked in a company that designs, develops and markets CMOS image sensor devices for one year. During that period, I found out that I want to gain more knowledge and do more research. I then decided to start my Master's degree in Embedded Systems at the TU/e. I did my graduation project at Philips Research, working on the topic

of baby cry detection based on audio signals using deep neural networks. This experience aroused my interest in deep learning on time series data. Currently, my research topic is acoustic signal analysis for snoring and obstructive sleep apnea detection.

I have been in Eindhoven for more than two years. I enjoy living here with the nice environment and friendly neighborhoods. In my free time, I like watching anime, reading novels, traveling in different countries and cooking with friends. Looking forward to meeting new friends at the TU/e! ■

Hello everyone, my name is Stefan Eijsvogel and I'm 25 years old. I was born in Rosmalen but I'm currently living in Weert. In 2017, I got my Bachelor's degree in Electrical Engineering at the TU/e. I received my Master's degree, also in Electrical Engineering at the TU/e, in 2019 after finalizing my graduation project within the IC group. This graduation project was about time synchronization techniques for ensuring synchronized clocks in a network for nanosatellites located in deep-space.

I started as a PhD candidate at the Electromagnetics group of Electrical Engineering in April. To be a bit more specific, my project for the coming years is in the field of computational electromagnetics. I'm working on a fast-forward Maxwell solver and an inverse scattering solver for dielectric-layered media, which can be used for optical scatterometry applications.

I like to spend my spare time on things such as reading and watching series. Next to that, I really enjoy going to the cinema and hanging out with friends. See you around! ■



Hello everyone! My name is Noortje Bax and I'm 38 years old. I was born in Eindhoven and spent my childhood in Nuenen. I studied (Medical) Biology at the Radboud University in Nijmegen and for my final master project I moved to the Leiden University Medical Center (LUMC), where I was introduced in the world of cardiac regeneration. After I finished my PhD in the field of cardiac development, also at the LUMC, it was time to go back to the roots in the south. In September 2010, I started as a postdoc in the group of prof. Carlijn Bouten at the faculty of Biomedical Engineering of the TU/e, where I worked together with a PhD student on a project called "Building myocardium in a dish". During this postdoc I had the opportunity to spend four months in the city that never sleeps, New York. At Columbia University I had the privilege to work together with prof. Gordana Vunjak-Novakovic on developing innovative technologies for engineering and studying human myocardial tissues. In 2014, I was awarded with a

Junior Dekker Grant of the Dutch Heart Foundation for my project "Combining myocardial unloading and cardiac progenitor cells: the next step in endogenous cardiac repair". Although I love science and supervising master and PhD students, I realized that it was time for a change.

Since April 1st of 2019, I'm the project officer of the Center for Care & Cure Technology Eindhoven ((C3Te), www.tue.nl/c3te). The center plays a pivotal role in connecting electrical engineering-driven technology with clinics and the medical industry. Through my experience in both the hospital and the TU/e, I developed into an ideal mediator in the multidisciplinary research field and this combined with my life lesson "close collaborations are needed to expand collective knowledge leading to improve scientific outcomes". I hope that as C3Te we can create synergy between technology and medical science to induce progression in health care.

In my free time, I like cooking and baking for my husband and our friends, and have evenings filled with drinking wine with good food in good company. My husband and I like to travel and explore new countries and cultures. I enjoy playing the flute, reading books, do crocheting or just enjoy a good movie on the couch. ■



Introducing...



Hi Connecthor readers! My name is Steven Beumer and I just started as a doctorate student in the Electromagnetics group. After doing a beautiful internship for the SKA project in South Africa and a graduation project in the field of wireless charging of medical implants, it was time to decide on the future. Eventually, it was an obvious choice to continue in my hopeful quest to improve the world by doing fundamental research.

My research is focused on treating epilepsy using transcranial neurostimulation, which means that electrodes are placed on the head instead of in the

head. This project, PerStim, is supervised by prof.dr. Paul Boon en dr.ir. Rob Mestrom. Besides doing research for that project, I hope to see some of you as well during the instructions of several of the courses of our group!

In my spare time, I like to play/teach/coach water polo, dive, play guitar, complain about the weather and of course drink coffee at the coffee machine on floor 9. Maybe I will meet some of you there. ■

Whose desk is this...

The owner of this desk warned me that there would not be much personal stuff on his desk since he shares it with others, but nevertheless, it contains significant clues.

The image on both displays is a picture of a favorite holiday destination: a Meteora monastery, one of several built on top of rock pillars in the north-west of Thessaly, Greece. Some of these monasteries can only be reached by climbing the rock, with ropes as sole support. The owner of the desk managed this climb. That is now more than ten years ago, but the location still fascinates him.

You have to look more closely to see more personal details. At the far right corner of the desk is a small picture of his three children. It is last year's school photograph, being the first year all three of them went to primary school.

Then to the left there is a mug which reads Sensus. You can look it up (www.sensus.biz): it is a company which makes equipment to heat tumors inside a human body, specifically to help treating head and neck cancer. At the back of the mug, invisible to us, is the desk owner's

first name. The mug might become a collector's item: only the founders of Sensus have one.

Just in front of the mug is a shiny little box, a miniature first-aid kit. It is not there because the environment in this office is especially risky, but it is a gift gadget for relations of the C3Te-center (www.tue.nl/c3te). You can see the abbreviation printed on the box.

Another hint is hidden on the Doppler bottle at the right of the desk. It is from the Rotterdam School of Management, where he took several courses before starting his current job at TU/e.

Not too difficult to find out who owns this desk, right? But if you need a final clue: check the difference in height between his desk and the one behind it. ■

(see page 7 for the owner of this desk)



Education day 2019

By: Gijs Neerhof

With many changes happening in policies and education yearly, the education day brings everybody within the department that is concerned with education up to speed with current themes. The overall education day theme of 2019: '2030 #challenge-accepted', focused on the constantly changing students and the inclusion of more challenge-based elements in our curriculum. The organization tries to pick a special location every year in the Eindhoven area to have the education day. This year, we visited the NatLab on Strijp-S, where a lot of fundamental research for Philips was carried out.

A workshop on generation Z-students by the Youngworks organization gave students and teachers insight in how the new generations of students see the world. Generation Z, born after 2001, grew up with broadband internet and easy access to information and are digital natives. They (think they) can multitask and that does not always work out for the better. Through the easy access of information, it is much easier nowadays to look up a tutorial online than it is to read the book. While both sources are valid, Youngworks explained the generation gap and in what ways the new generation is different.

The other workshop was presented by the examination committee. They presented a 'new' grading rubric supported by explanations for graduation projects. We were invited to check it out and give feedback on the platform.

While the grading rubric stayed more or less the same, the explanations behind the checkboxes needed an update to support the given grades. This turned into an interesting discussion about the consistency of grading and this was one of the ways to improve that.

In the afternoon program, Aldert Kamp, the program director of Aerospace Engineering at TU Delft, was invited to give a talk. He is deeply involved in the rethinking of higher engineering education using his experience in both industry and university. With his presentation on 'Engineering education in a rapidly changing world', he explained that industry needs / will need different types of engineers and that universities should be able to support that and educate them. The inclusion of challenge-based 'courses', where students are given a real-life problem statement to solve, is a great example. This way of teaching gives each student their own learning path, the difficulty there is to make sure all students learn enough. This also connects to the changing mindset of generation Z students.

During the education day, also the best teacher awards were presented. Students could vote for their favorite teacher beforehand, which was organized by the StudentBody. I want to congratulate the winners of the education awards this year. For the first-year bachelor course, the award went to Dusan Milosevic for his course Electronic Circuits 1. The second-year award went to René Hoppe



for the course Electrical Power Systems, and the third-year to Ramiro Serra for Electromagnetics 2. Congratulations! Of course, there are many other great teachers within the department!

I think the most interesting takeaway of this year's education day is on the changing generation of students: how to line up expectations for both teachers and students, and how we should adapt our education system and the way courses are taught to convey the course material. And, on the other hand, how to inform new students that university brings a lot of freedom, but they have to keep up with the fast pace. ■



Electrical Engineering within Arcadis

By: Igor Bathouktine

Whoever thinks about electrical engineering, thinks about energy. And guess what, energy is radiating all over Arcadis. Why?

In this article I'll show you the variety of great projects and job activities within Arcadis as an Electrical Engineer, specifically for the infrastructure group. As an Electrical Engineer within infrastructure projects, you are a manager of everything with regard to electrical installations. But there are also plenty of opportunities to develop yourself in your own area of interest. To give you more insight, I will discuss two different projects and the accompanying work.

a small piece of an electrical installation, but that you gradually develop yourself within different aspects. Analysis of secondary installations; CCTV, signaling, lighting, but also primary installations for energy distribution, such as transformers and distribution installations at medium and high voltage levels, are part of the job activities for an electrical engineer. Designing and writing technical advice reports is part of the job, but also good customer contact and good customer relationships are very important.

Finally, I want to devote a small part to the possibilities for developing yourself in your own area of interest. I have been working at Arcadis for eight months



To answer the question from the first paragraph; 'Why is there so much energy within Arcadis?' It is the enormous variety of projects, but also the work within the projects that keeps me energetic. Furthermore, there are many young colleagues, regular drinks and professional working environments close to the Central Station all over the Netherlands. Together, this creates the perfect (work) environment for a young Electrical Engineer.

Igor Batoukhtine
Consultant electrical installations ■

"Energy is radiating all over Arcadis"

First, I have a consultant role for various tunnels in Belgium. In this role I work for various clients including government institutions to create the correct demand specification. I use a lot of Systems Engineering, analytical & critical thinking and reporting. As a consultant, you start by writing an advisory report. In this report you analyze the current electrical systems, but you also go beyond your own disciplines to deliver a complete and useful advice for the customer to improve quality.

However, for a container terminal in the port of Rotterdam, my design competencies are of big importance. I also use my Systems Engineering skills to implement questions from the customer into technically feasible solutions. The interesting thing about these big projects is that you are not only focused on designing

now, where I have developed myself in two areas of interest; Asset Management and Data Analysis (predictive models and self-learning algorithms). Both courses are closely intertwined with electrical engineering and with each other. For each subject a multi-day course and/or activity was organized.



ARCADIS

Design & Consultancy
for natural and
built assets

Automotive students win prize for their Innovation Space BEP

By: Jan Vleeshouwers

Horst Fietje and Michiel de Hoop, both Automotive students, and their partners Brandon Smith (Industrial Design) and Iza Linders (Psychology and Technology) have been awarded with the prize for the best Innovation Space Bachelor Project (ISBEP) 2018/2019, last June.

Their project, a study into safer ways of evacuating a building, was chosen from among eighteen projects as the one with the most convincing pitch and the best mix of interdisciplinary design and entrepreneurship.

For a couple of years, Innovation Space provides students with a way to carry out their BEP in an interdisciplinary team. That was exactly what Horst and Michiel had in mind. They wished to conclude their Automotive studies with a project in which they could explore their entrepreneurial talents. Without a concrete topic, but with this firm intention, they managed to collect a team at the ISBEP kick-off around the topic of 3D sensors. This topic is more or less a follow-up of work of (amongst others) Alessandro Corbetta and Federico Toschi of the Crowdflog group at the Physics Department, which for example resulted in the Influx project featuring at GLOW 2016.

At the start, the project seemed quite the opposite of potentially prize-winning. The project owners, to whom the team

was supposed to relate for feedback on their work, were difficult to reach, slow in reacting and finally they disconnected from the project altogether. A month after the team picked up the project with much enthusiasm, there was still no tangible progress, and even worse, there was little prospect of ever achieving something worthwhile.

According to Horst and Michiel, there were two factors which prevented them from giving up at that time. The first factor was that in their first project weeks, they invested seriously in teambuilding. They met three times a week to discuss project design and progress, and they took part in several of the Innovation Space workshops which Innovation Space organizes to develop personal and professional skills. The second factor was their determination to bring the project to a successful end.

After consultation with their faculty supervisors, they decided to take over the project ownership, which meant that after six weeks, they effectively started anew. Based on previous exploration of what could be possible with a 3D sensor, and inspired by Michiel's dad, they decided to use the sensor in a system for quick and safe evacuation of a building in case of an emergency. The 3D sensors would allow to monitor people during the evacuation and, most crucially, would have to detect situations needing attention, e.g. people who stay

behind, locations where people get stuck in narrow passages, or in front of locked doors. In cases of blocked paths, the system would guide people to alternative escape routes.

The 3VACUATE team continued at a high pace. In a way, they were helped by the Innovation Space deadline system, which asked each group to provide partial results at specific moments in the semester, a pattern which was not adjusted to the initial delays. Iza Linders designed an experiment to research ways of guiding crowds using lights, and found a perfect location in the corridor from MetaForum to Luna, where there are two paths around a large elevator shaft. Brandon Smith used the input to design a prototype luminous base-board for guiding people towards a safe exit. Horst and Michiel developed a prototype of a system to monitor the people evacuating the building. Michiel analyzed which type of sensor would be most appropriate, and Horst explored the data analysis process and a possible business case.

Although there are still many technical and non-technical problems to solve, Horst and Michiel are convinced they have laid the basis for a design with commercial possibilities. And they are not the only ones, considering the Innovation Space prize. They intend to forward their concept as a new ISBEP-project for next year, and now they will be the project owners. New students may take up the assignment to improve the project, from concept (is nudging sufficient when people need to exit a building as fast as possible?) to technical implementation (is it possible to keep the sensors and lighting working, even at 400 or 500 degrees Celsius?).

Michiel's and Horst's study will continue in line with their ISBEP-experience: Michiel will enter the Innovation Management master and Horst is planning to do a business-oriented one-year master at Erasmus University Rotterdam. In the meantime, they will seriously consider founding their own business for 3VACUATE. ■



Prostate ultrasound imaging

By: Saskia Camps

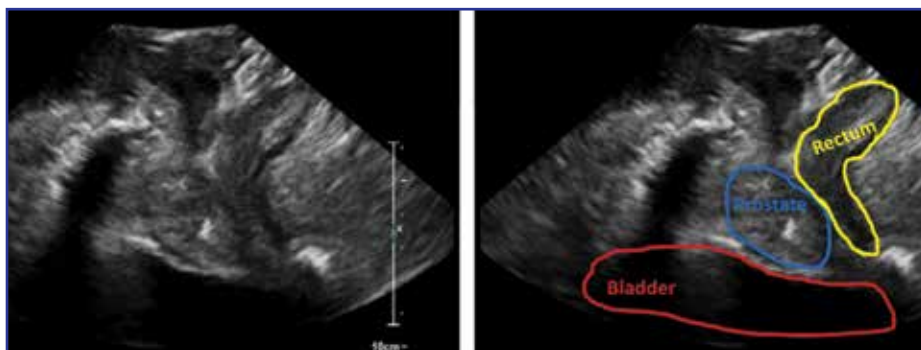
Prostate cancer is the most frequently diagnosed cancer in men worldwide; one in six men will develop prostate cancer in their lifetime. Several treatment options are available to treat this type of cancer including chemotherapy, surgery and radiotherapy treatment. In the past four years, I worked as a PhD student on the use of ultrasound imaging to improve the accuracy of radiation dose delivery during prostate cancer radiotherapy treatments. My project was part of a collaboration between the TU/e (professor Peter de With – VCA group), Philips Research and the MAASTRO clinic (professor Frank Verhaegen). This clinic is a nationally and internationally renowned radiotherapy center that treats patients with various types of cancer, including prostate cancer.

Radiotherapy treatment

Radiotherapy treatment makes use of ionizing radiation to treat the cancer. This type of radiation can destroy cancer cells, but also damage normal cells. For this reason, it is important to irradiate tumor tissue, while sparing normal tissue as much as possible. The first step of a prostate cancer radiotherapy workflow (Fig. 1) is the acquisition of a computed tomography (CT) scan to capture the patient's anatomy. Subsequently, a treatment plan is designed based on this scan and the planned radiation dose is delivered to the patient during daily treatment fractions for up to eight weeks.

Motion monitoring

Motion of the anatomical structures can result in radiation dose delivery to the wrong location. As the prostate is located in close proximity to the bladder and rectum, a different filling of the bladder and/or rectum can result in a different prostate location and shape. Muscle contraction or a sudden cough or sneeze during the radiation dose delivery can also result in motion of the anatomical structures. To ensure that the radiation dose is delivered to the correct location, monitoring of these types of motion is crucial.



Transperineal ultrasound images of the male pelvis

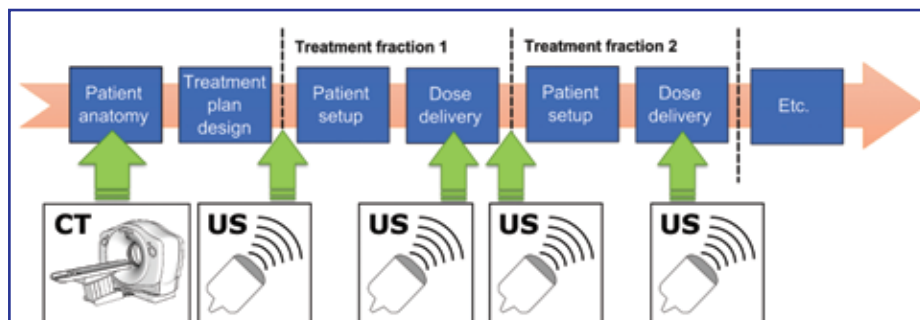
Ultrasound imaging

In my PhD work this motion monitoring was done using ultrasound imaging (Fig. 1). You probably know ultrasound imaging as the image modality that is used to image a fetus in the uterus of its mother. To create an ultrasound image, high-frequency ultrasound waves are sent into the body of the patient using an ultrasound probe. On their way through the body, these ultrasound waves are reflected at interfaces between tissues. These reflected waves are then received with the same ultrasound probe and used to reconstruct an image. Ultrasound imaging has several advantages: it allows for real-time volumetric imaging, it is harmless for the patient and in comparison with other image modalities it is cost-effective and fast. For these reasons, ultrasound imaging seems a good candidate for radiation dose guidance during prostate cancer radiotherapy workflows.

The ultrasound image in Fig. 2 gives you an idea of how an ultrasound image of the male pelvis looks like. This is one of the most beautiful ultrasound images that I came across during my PhD. Even when I would tell you what anatomical structures are visualized in this image, you most probably only see blurry white structures on a black background. I believe that this image and your inability to probably even guess where the anatomical structures of interest are located, nicely summarizes most of the challenges associated with ultrasound imaging.

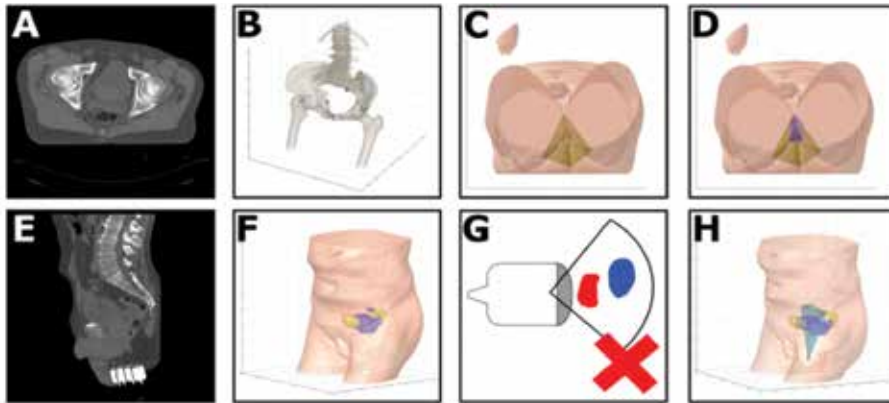
Ultrasound probe positioning

If an operator wants to acquire an ultrasound image, he or she needs to manually position the ultrasound probe on the skin of the patient. Subsequently, he or she needs to interpret the live ultrasound images to understand if the correct anatomical structures are visualized with sufficient quality. I hope you have realized from looking at Fig. 2 that interpreting an ultrasound image is rather difficult. For this reason, the ultrasound probe positioning needs to be done by a skilled operator, who is currently not involved in a typical radiotherapy workflow.



Typical radiotherapy workflow of a prostate cancer patient

As noted earlier, for every patient a CT scan is acquired before the radiotherapy treatment starts to understand the



Workflow to obtain patient-specific ultrasound probe setup

anatomy of the patient and to create a treatment plan. I used this information to propose a patient-specific ultrasound probe setup to the operator (Fig. 3). I did this by creating a model of the patient from the CT scan. In this model I identified which anatomical structures should be visualized using the ultrasound. Finally, I created a 3D model of the field of view of the ultrasound probe and virtually positioned this probe on the body of the patient. In this way, I could calculate what would be the optimal probe setup for this particular patient and propose that to the operator, so that he or she does not have to find a suitable probe setup manually anymore.

Ultrasound image quality assessment

To understand how the prostate and the other anatomical structures of interest move during the radiotherapy

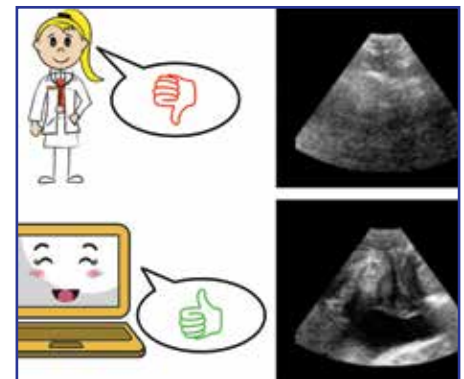
treatment, ultrasound images have to be acquired continuously during this treatment. However, during the treatment something can happen that causes a sudden degradation of the ultrasound image quality. For this reason, the skilled operator should stay in the control room during the whole treatment to check if the image quality is still good enough and very quickly take appropriate action if this is not the case anymore (Fig. 4). In the ideal case, the technician who is already there to execute the treatment, should also be able to keep an eye on the ultrasound image quality.

I made use of deep learning to teach a computer how a good ultrasound image looks like. If you then present this computer with an image that it has never seen before, it will tell you if the quality of the image is good or not. In the end the performance of the computer was

compared with the performance of three experts and I was able to show that the computer performed at least as good as the worst expert.

Conclusion

The aim of my PhD work was to improve the usability of ultrasound imaging during prostate cancer radiotherapy workflows. I investigated the first steps towards a fully automated workflow. In my opinion, future work should focus on further automation of the different radiotherapy workflow steps, such as automated detection of the anatomical structures in the ultrasound image. This could make the use of ultrasound imaging during prostate cancer radiotherapy workflows more appealing to hospitals and allow the patients to fully benefit from the unique characteristics of this image modality. ■



Ultrasound image quality assessment by operator and computer

ODIN and IEEE SBE study trip to Munich

By: Fer Radstake

On Thursday, June 13th, we left Eindhoven in the early morning with eleven people for a study trip to Munich. After driving for a couple of hours, we arrived at our first stop: ADVA

Optical Networking SE in Meiningen. ADVA develops and produces optical solutions for mid- to long-range networking. After two presentations detailing their products and R&D, we

were given a tour around their factory. This was especially interesting since it's a part that you rarely deal with at university. We witnessed the various logistics, production, repair and testing departments. At the latter, it was fun to see their setup: clients require thorough testing of an entire system, which can include thousands of kilometres of fiber, all of which have to be installed in the testing room.

We arrived in Munich in the evening, where we soon got our first taste of this beautiful city (literally). We ended up at a small restaurant, where we had a Maß (liter tankard) and two gigantic plates of food. The Schnitzel, Schweinhaxn, Sauerkraut and other local specialties





were a bit too much for us and we weren't able to finish it all, although we definitely tried!

The next morning, we continued our culinary exploration of the Bavarian capital, as we were welcomed at Technische Universität München (TUM) with a traditional Weißwurstfrühstück. Given the current political climate at TU/e, we were especially amazed that we were served a half liter of Weißbier along with it. Upon our inquiries our hosts said that in Bavaria it's considered perfectly normal to drink beer early in the morning, and that it's even acceptable to take a bottle of beer to lectures. Drinking beer was in no way seen to be undesirable or creating excessive problems. How different from our university and the playing with the idea of an alcohol-free campus by the Executive Board!

The presentations at TUM represented the state-of-the-art in optical networking and communications, such as probabilistic signal shaping and a possible vulnerability in an implementation of the post-quantum NTRU encryption algorithm. The presentations were very technical and in-depth and clearly showcased our focus on master students for this study trip.

The next stop was Infinera – which develops optical networking solutions for mainly long range communication – where we received some interesting presentations on both their systems and R&D in general. We were then given a tour around their labs, where we could see how measurements were performed on some of their latest developments. A visit to the testing labs was very interesting as well, and extra pleasant as its air conditioning gave some respite from the summer heat. Here too, customers required the testing of entire systems,

and to save fiber they used a 75 km fiber loop through which the signals went round a few times.

The last company visit of the study trip was Huawei, which has a large R&D department in Munich. They were especially proud of their huge spendings on research as well as development. Naturally the current US ban on Huawei products was discussed, although research at the Munich department remained relatively unaffected. Regardless of your opinions on Huawei and the Chinese and US governments, it was very interesting, and for me personally at least slightly disturbing, to see in first-person the huge role politics can play in science.

With the last of the company visits behind us, we decided to spend the evening at a Biergarten. The PhD students we had met at TUM had recommended the Taxisgarten because of its proximity to Huawei, so we had some Haxn and Maß here. The Taxisgarten is located in a quiet residential neighbourhood and few tourists visit it, which added to its authentic atmosphere. It was nice to sit outside among the trees during the beautiful but hot evening, and we spent a couple of hours there before we went to the city center to get a taste of the city nightlife.



The next morning was free time, which most of us (including me) used to take a historical guided tour through the city. We ended up in the city center, where the Stadtgründungsfest happened to be in progress, to celebrate the 861st anniversary of the city. The Marienplatz square was turned into a sort of ad-hoc Biergarten, and we made use of the opportunity by having lunch and some Weißbier. Our bellies filled, we went to the Deutsches Museum, which is one of the biggest technology museums in Germany. Naturally we visited the museum's highlights, such as an entire cut-open World War I submarine and some World War I aircraft, but we ended up at the communication technology section. It was amazing to see all the historical devices of our field of engineering, and we learned a couple of things about some ingenious communication solutions of the past, such as how the switching of telephone centers worked.

After the museum closed at 5 PM we hurried to our restaurant as heavy rain had been forecast. We had booked a table in the Augustiner Keller, a beer hall in a Biergarten owned by Augustiner-Bräu and once a storage hall of the famed brewery. By now we were used to ordering Maß, and to create some appetite we started with an Augustiner Edelstoff tapped from wooden casks. The Spanferkel, Knödel, Schnitzel, Sauerkraut, yet more Haxe and many more classical Bavarian dishes were as meat-heavy as they were delicious. Our bellies filled, we had another local beer speciality as dessert before we went back to the hostel. Although some of us spent a few more hours at the hostel bar, most went to bed early to prepare for the long drive home. ■

Icons of EE: Enrico Fermi

By: Matthijs van Oort

While the name Fermi will not ring any bells for most of us, it is a name we at least encountered once during our study or career in electrical engineering. Enrico Fermi is known for his research in the field of nuclear engineering and has dedicated his life to sub-atomic processes. He has had some serious impact in the field of electrical engineering and also the non-technical world around us. He has worked on the principles behind semiconductor physics, but was also one of the scientists behind the Manhattan project.

Enrico was born in the year of 1901, in the capital of Italy: Rome. He was the last child of Alberto Fermi and Ida de Gattis, and has spent most of his youth with his older brother Giulio. When playing together with his brother, they often used electrical and mechanical toys, which eventually resulted in the two brothers building electric motors. However, this ended when in the year 1915 a bad surgery led to the death of his brother. In order to cope with the loss of his brother, Enrico started dedicating all his time to his studies. He found an old book in the field of mathematics, classical mechanics, astronomy, optics and acoustics, and started studying it by heart.

After his high school, Fermi applied for the Scuola Normale Superiore in Pisa, which at that time was a school for highly intelligent people. After reading Enrico's application essay about solving a partial differential equation for a vibrating rod, Fermi was enrolled instantly to the school and was said to become an outstanding physicist. He soon fulfilled this prophecy, while during his first years he was such a quick learner that teachers often came to Fermi for help instead of the other way around. After two years of study, he was admitted to the Physics department in which he could study whatever he wanted with all the equipment he would need.

Three years after starting in Pisa, Fermi wrote his first scientific work, which was all about the behavior of electrical charges in a translational motion. In this work he described how the mass of electromagnetic charges would change

with its velocity. This work pointed out that there was a contradiction between the electrodynamic theory at that time and relativistic physics. In later work, he acknowledges this contradiction and showed how this contradiction was made possible by relativity. After reading the work of Einstein regarding the fundamentals of relativity, Fermi was the first one to point out the massive nuclear potential energy that was hidden in atomic materials, while he also stated that it was not yet possible to access it at that time.

After a couple of trips to other universities (at which he met a lot of the most well-known scientists like Albert Einstein, Hendrik Lorentz and Vito Volterra), Enrico applied as a professor in theoretical physics at the University of Rome at an age of 24. During his time as a professor at this university, Fermi did a lot of new discoveries with his fellow scientists and students. One of these discoveries is the idea behind the so called 'neutrino'. He figured out that if a neutron would decay into a proton, it would also have to emit an electron and a neutrino in order to keep the total energy in balance. In 1938 he received a Nobel prize, at the age of 37, for his demonstration of radioactive elements produced by neutron irradiation.

In the same year he got his Nobel prize, Fermi departed to the USA because of the instabilities in Europe. When arriving there, he was offered five different positions at American universities, including

the Columbia University, to which he would eventually go. Not long after arriving in the USA, Fermi got word of a discovery done by Niels Bohr about the splitting of uranium with the bombardment of neutrons. Words spread fast, and a mere month after the discovery a meeting was arranged in Washington about the possible implementation of the discovery as a source of nuclear power.

With the help of colleagues, and financed by the American government out of fear for a Nazi atomic bomb, Fermi started building the first nuclear reactor that could sustain its own nuclear reaction. This device is known as the Chicago Pile-1, and can be marked as the beginning of a nuclear age. A couple of iterations further, the process was known in such a depth that a reactor (known as the B Reactor) could be built to produce plutonium in large quantities. This eventually also led to Fermi joining the Manhattan project, which built the atomic bomb responsible for the Hiroshima bombings in 1945.

When looking at his whole career, there are not many scientists which have achieved so many discoveries and achieved so many awards as Fermi did in such a short time. Enrico was a very gifted student and has brought the world a lot of new inventions. Most of them have helped the world further, like the use of semiconductors and clean nuclear energy, while the scientific improvement that led to the invention of the atomic bomb will still remain debateable. ■





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Technology's status rising

By: Jan Vleeshouwers

The status of technology education and research in the Netherlands is on the rise. In 2017, the government decided to offer additional structural funding to technical disciplines, which is why we now have fifteen new vacancies in the department. Last May, the Committee Van Rijn (CVR) published its findings, with an urgent plea to support technical studies in universities and HBO (higher professional education). The proposed immediate funding shifts, which would amount to an extra 16 million euro for TU/e, have raised a lot of discussion because the money would have to be provided by already suffering departments in Humanities and Social Studies (HSS). But the plans proposed by the CVR are broader than that, and some of the recommendations made may have a much larger impact on university research and education than this funding shift.

Adverse effects of the university funding system

The CVR was assigned to solve adverse effects of the current way of funding universities and HBO (U&H), amongst which the large work and study stress. Most of the committee's results pertain to education and student numbers. The main conclusion is that above all, the current funding system is an incentive for U&H to increase student numbers. This causes useless competition and initiatives to attract foreign students merely to survive financially. For universities, the CVR proposes to neutralize this incentive, by reducing the amount of funding which depends on student numbers, from a current 72% to 60%.

Mismatch between education and job market

There is more. According to the Committee, the funding system is (at least partially) responsible for the large mismatch between education and job market. That does not only include technical professions, education and health care, where there are significantly more jobs than personnel, but also the economic sector and law, where the amount of graduates still far exceeds the number of jobs. The immediate funding shift is just one of the Committee's

recommendations; for the longer term, it hints at ways to adjust funding based on job market perspectives. That would be a radical move for sure.

In general, the CVR would prefer a demand-driven funding scheme. Current practices often put a financial penalty on helping students to correct an erroneous study choice and to get the most out of their talents. For example, U&H only get funding for a student for the nominal duration of a study program, and there is no funding for switching programs. The CVR sees this as serious obstacles. As a possible alternative, it mentions the system used in Flanders and Denmark where students choose for themselves where to spend their study credits, and how many. Of course students have to plan well in advance, but this system may take the pressure off students for achieving a nominal study pace. (And, I must add, off teachers.)

Taming competition and efficiency-thinking

The most remarkable recommendations of the CVR pertain to competition: the CVR moves away from the line of thought that has dominated university policy in the past decades. For research, the Committee stresses the huge inefficiency of the competition for funding, and the adverse effects of becoming more and more dependent in temporary projects

and researchers. The Committee wishes to see cooperation, not competition, and recommends to redistribute a substantial part of the NWO-budget to the universities.

Within this context, the CVR specifically urges the practical research on HBO-schools to mature, which should finally lead to close collaboration between HBO and university in research. In the not too distant past, this would have been unimaginable. But now the CVR even asks, rhetorically, what this might imply for the distinction between university and HBO.

To be continued

For the short term, the CVR-report is mainly about increasing the funding for beta and technology education and research. For the long term, the CVR suggests directions, but there is certainly no clear path ahead. Are we prepared to enter into the discussion? Do we have alternatives if we are asked for them, now that technology's status is rising?

"Wissels Om" Rapport Adviescommissie Bekostiging Hoger Onderwijs en Onderzoek, May 2019, with an English summary. Download from <https://www.commissievanrijn.nl/>. ■



Introducing candidate board of Thor



Hi everyone! My name is Sanne van den Aker, I am candidate President of e.t.s.v. Thor and I am very excited for the upcoming year. As someone who grew up in Mierlo, which is very close to Eindhoven, the “Brabantse gezelligheid” you get introduced to during the first weeks was not a new concept to me. However, with Thor, Eindhoven really became my new home.

At the start of my introduction week, I was rather shy. However, after only a few days here, most of that shyness went

away. Especially now, two years later, almost none of that is left. Especially joining Ivaldi in my first year really helped me, but next to that I also really enjoyed other committees and just hanging out with all the amazing people here, most of the time in Het Walhalla.

Hope to see you around this year and of course.

Geen gedonder! ■

Hi everyone! I’m Laura and I would really like to become the next Secretary of Thor. I am 20 years old and I live in Eindhoven. Like most people I started my first year by looking for a room since my parents live in Sittard. Shortly after the introduction week I found a nice house with many Thor members and eventually this turned into a real Thor women house. Because of their nice stories I joined Ivaldi during this time.

In the second year I decided to join Aegir (the party committee) together with some other housemates. Due to this, our

house is now filled with a lot of attributes of the parties. With another committee I organized an awesome study trip to Latvia and Estonia.

Since I have had all those amazing experiences I want all other students to have the same opportunities as I did. Upcoming year I hope to arrange this with all my fellow candidate Board members. It’s going to be an amazing year!

Geen gedonder! ■



Hello everyone, my name is Nicky Roijen and I would like to be the next Treasurer of Thor. I grew up in Geldrop, near Eindhoven, which is where I am currently still living.

Around my third year in high school I read an article about a new study at the Eindhoven University of Technology; Automotive Technology. Ever since I read this article I was interested in this study, and after attending an orientation day I knew for sure. So after graduating from secondary school, I enrolled and started my study of Automotive at the TU/e.

I had an awesome time in the introduction week with my “family” which led to my presence at some activities at Thor.

At my high school I have always been active in extracurricular activities and so I continued this within Thor. In my first year I joined the Ivaldi and organized a dropping. Last year I joined some other committees; Aegir, FoodCo, TOCo, BuEx, SportCo.

In these committees I learned a lot of different skills, made new friends and most important of all: had a lot of fun. I want to be able to share this with other students and am thus interested in joining the next board of Thor.

Geen gedonder! ■

Hello everyone, I am Roel Wijnands and I am the candidate Vice President and candidate Commissioner of Het Walhalla. Next year it will thus be my task to make sure Het Walhalla will be ready to be one big pile of 'gezelligheid'.

I became an active member of Thor after half a year into my studies, because I wanted to focus on my study and sports, since I was a national level athlete before I started studying here. It quickly became

clear that I didn't want to combine those two, so I joined the Ivaldi to develop myself in a different field.

In my second year I joined the SportCo, ACCI, WalLu and of course Het Tappersgilde!

I'm looking forward to have the most random yet awesome year during my board year and am really looking forward to all the 'memorable' times in and around Het Walhalla, see you there!

Geen gedonder! ■



Hi all, I am Jos Willems and I am the candidate Commissioner of Education. I grew up in the beautiful city of Maastricht in the far south, where I also attended the same high school as Noud. I have been interested in robotics and autonomous systems for a long time. I was mainly interested in the combination of Electrical Engineering, Mechanical Engineering, and Computer Science, so I thought Automotive Technology would fit great with my interests.

In high school, I was more of a shy guy. During my introduction week, my intro family immediately felt right and like a true family, and I decided to join the Ivaldi. In my second year I joined the ReisCo, FotoCo and ACCI. I really started to open up and Thor started to feel even more like a family. Therefore I decided that I wanted to be a Board member of the association that felt like a real family to me and gave me friends for life.

Geen gedonder! ■

Hello dear readers, my name is Ivo Kraayeveld and I want to become the next Commissioner of Public Relations for the 63rd board. I am 20 years old and was born in Helmond.

From an early age I was already certain to go to the TU/e. During my last years of secondary education I was busy repairing smartphones and this helped me realize I wanted to study Electrical Engineering. Like most first year students I joined the introduction week and had a good connection with the candidate board,

which made me become excited about Thor. During my first two years I became active in several committees and mostly Kvasir showed me that I liked being in contact with companies. It also made me realize I wanted to do more for the association by being part of the board.

I hope to support Thor as much as possible in the coming year and help the members feel welcome.

Geen gedonder! ■



Hi everyone, my name is Noud Jacobs and I want to become the next Walhalla Treasurer. I grew up in Eijsden, a town near Maastricht.

When I started studying in Eindhoven, I decided that I would like to have some fun during my studies and not be in the library all the time. So, I decided to join Ivaldi. During my first year I learned that Thor is an awesome association, so in my second year I joined the ACCI, SportCo, Thor band and became a Tapper as well.

I hope that next year my fellow board members and I will be able to show the new students that Thor is as awesome as I think it is.

Op Het Walhalla en Geen gedonder! ■



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NeuroStimulating The Future

By: Elles Raaijmakers

It was a very nice afternoon, Wednesday April 24th. The visitors of the symposium could enjoy a sunny view on the rooftop terrace and an interesting variety of talks right in front of them. After a short introductory speech about the goals of EIR, which can be summarized as organizing activities for students interested in medical electrical engineering, conference chair and Care&Cure director Maarten Paulides gave the first research-oriented talk. Maarten, a veteran in hyperthermia^[1] and MRI research, posed the question to whether elevating a patient's body temperature locally could aid other forms of brain stimulation. He demonstrated that the methods to apply localized heat as a support for other cures are available already, but he also pointed out that there is limited knowledge about how the brain responds to heat.

During his talk, Ghent University's professor Paul Boon demonstrated the wide variety of brain stimulation treatments that are on the market today. Professor Boon is an expert in the field of cognitive neuroscience, and took the discussion about the many variables in brain stimulation treatments to a new level. Positive effects of electrical brain stimulation have been demonstrated by many studies, but it is not always easy to point out where exactly these effects stem from, he concluded.

After a short break, Elles Raaijmakers gave an overview of the development of ideas surrounding the origin of thoughts. It turned out that over the scope of roughly 250 years, the models describing neurons evolved from "simple batteries" to "very complicated batteries". The lives of the scientists were described as well, like those of Hodgkin and Huxley. They struggled for seventeen years to prove their Nobel prize-winning theory. So if you ever feel your life is going slow, know there is always hope.

Dr. Jeannette Lorteije, an assistant professor at Amsterdam University in the field of cognitive systems and neuroscience, continued with an in-depth view of optogenetics^[2]. Her fascinating talk explained how neurons can be modified to respond to light in the lab. After modifying, neurons can be turned on or off with highly focused lasers. This method is used to answer questions related to how information is processed in the brain.

The day continued with associate professor Regina Luttge, who divided her time on her ERC-starting grant project working towards her first brain-on-a-chip devices between University of Twente and our own TU/e during the years 2013 and 2016. While since 2017 fulltime at TU/e, she keeps the noble goal in mind to decrease the number of lab animals used in research, she talked about the development of a system to grow organs by means of microfluidics interventions. Cell type, pressure, environment, nutrients – it all appeared to matter when creating such organ functions on a chip. The talk concluded with a very proud research result: a home-grown tissue consisting of

multiple cell types and networks which signaled a (yet) untranslatable message to the audience.

GTx Medical, a company developing implants to enable paraplegic people to walk again, organized the concluding talk. System engineer and part-time PDEng Edoardo Paoles showed the progress of a paraplegic relearning how to walk, while explaining the methods and challenges of the treatment that was developed. The results were impressive, and Edoardo concluded with the promise that more trials helping paraplegics would start soon.

The last activity of the symposium, the drink, was used to discuss the many views on brain or nerve stimulation with the speakers or with other students. While using the most popular brain stimulant in the world, new insights about the origin of thoughts were without doubt reached by many participants. ■



[1] Medical treatment strategy. The body temperature of a patient is elevated locally to amongst others stimulate the blood flow or activate the immune system.

[2] Research method in which cells are modified to be activated by light.







1. BAM Lunch lecturer
2. ACCI weekend
3. Aegir Mario party
4. Ivaldi Lasergamen
5. Tennet Lunch lecture
6. Active members day
7. Batavierenrace

Thor band: Watt?

By: Ronald Janssen

My name is Ronald and I play the drums. I've always been passionate about music. This year I wanted to make sure that Thor would get a band. After half a year of searching, we've managed to get enough members to start and we found a location to practice. Then we were told about our chance to perform during one of the activities of the ACCI, FesThorval, and we immediately decided to do just that! The resulting performance was something to never forget!

At the start of my year as a board member, I started searching for band members. There were a lot of people interested in joining the band, so we had some meetings to discuss the kind of music we would be playing where we would be practicing, and if we would make just one band or multiple as there were so many people. It took a while, but eventually we found the right practice spot for us, and enough people were no longer interested so we could actually form one band instead of multiple bands.

First practice sessions! We finally got our location. We got our musicians. The only thing left to do was to actually start playing. The first session was messy, since we never played with each other before. But it was enjoyable nonetheless. After a few sessions some of our members who were also organizing ACCI FesThorval told us about their plan to let our band play. That's when we got serious! But not really, we kept having fun and goofing around during our practice sessions.

During the rest of the practice sessions we mainly revised the stuff we already were able to play and kept adding on more and more songs. Eventually the date came so close that we stopped changing songs and picked our final list.



We kept practicing and even managed to get some extra time to practice. But then it was time.

Show time! The day had come and we got our setup ready, the crowd was coming in, and we were ready to start playing. We started playing and it was awful, no coherency, no rhythm. People were looking really confused and then we started to actually play music. Five songs later we took a break and talked for a bit with people from the crowd. They really enjoyed the show and were very enthusiastic to hear more. This made the experience very good for us. After a

few technical difficulties after the break and a new amplifier, we were able to start again.

Round two, we played the last of our songs. During one of the final ones we made a mistake and played the same part again. This threw the singer off, which gave the rest of the band the idea to do it again. The moment we did almost no-one could contain their laughter and people from the crowd were laughing as well. After the show, we talked with some people from the crowd and they loved it, we loved it and we're looking forward to performing again next year! ■



Reliability of Grid Components

By: Peter van der Wielen

Climate change pushes the energy transition toward sustainable energy. The main enabler for the energy transition is going to be an expanded and reliable electricity grid. The evolving penetration of renewable, distributed generation in the electricity grid as well as the changing load, together with the ageing of the present infrastructure stresses the reliability of the grid components. The dependency on the reliability will increase, while the transition will have impact on the reliability itself. The need for knowledge in degradation phenomena, failure modes, prediction models and diagnostic technologies is therefore large and increasing.

Climate change and the electricity grid

The climate change often dominates the news nowadays. The Paris 2015 agreement states to limit the temperature rise of earth to 2 degrees Celsius, with a clear vision on how to reach 1.5 degrees. In 2030 we should have a reduction of 40% of CO₂ emissions. The Dutch translation in the 2018 climate agreement states a 49% reduction of greenhouse gasses by 2030 (compared to 1990) and by 2050 a reduction of 95%. The European parliament made a (non-binding) agreement to becoming CO₂-neutral by 2050 and getting to a reduction of 55% by 2030; a level that was shown to be needed by the IPCC report of the UN to get to the earlier mentioned Paris 2015 targets.



Energy demand and carrier

This all will have tremendous impact on the way we generate and consume energy. In one of the more extensive studies, performed by the energy testing and consulting firm DNV GL and involving over 100 energy experts from around the world, it is forecasted that the demand for energy will peak around the year 2032 at approximately 450 ExaJoules (450·10¹⁸J) per year, see figure 1. It is expected not to just continue in growing, due to energy

efficiency and electrification – the energy intensity will at a certain point decrease faster than the world economy will grow.

When focussing on the energy carrier one can observe a greatly expanding role of electricity – more than doubling its share of the energy mix from 19% today to 45% by mid-century. This is highly related to the source of future energy. In the same study (but this corresponds to many others) it is forecasted that a massive change in the energy mix will occur. Solar

(PV) and wind will play an important role, increasing dramatically to supply 70% of the electricity demand by 2050, see figure 2. An important reason for this is also costs – for wind and solar these costs are expected to decline by 16% and 18% respectively for every doubling of installed capacity.

Electricity grid and outages

Although one often discusses this energy generation itself, the large (and challenging) enabler for this energy transition is the electricity grid. These grids will need signification expansion, while remaining reliable, to enable this renewable energy generation and change in use. As society gets more and more depending on electricity, the need for reliability also increases. This grid reliability is something not to forget – regularly one is reminded of that whenever another black-out is experienced. To name a few large ones during the past months: July 2019. New York City. June 2019: Argentina and Uruguay. June 2019: South of Saudi-Arabia. Also in the Netherlands some large black-outs were experienced in the recent years, with (in

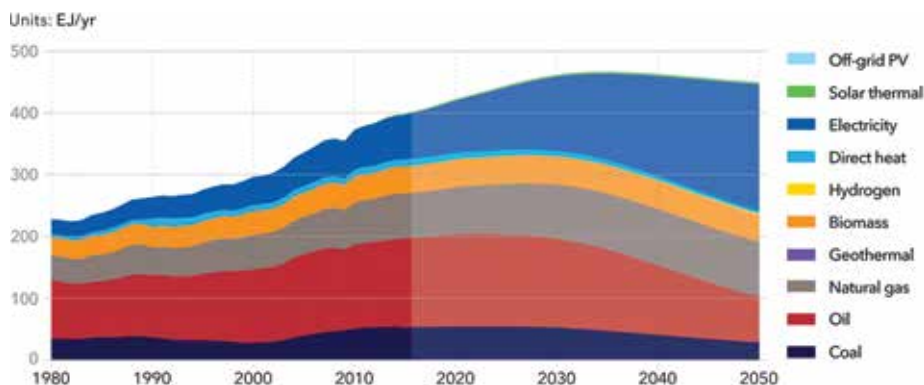


Figure 1: Forecasted energy demand and forecast over future years, split by carrier (source: DNV GL – Energy Transition Outlook 2018)

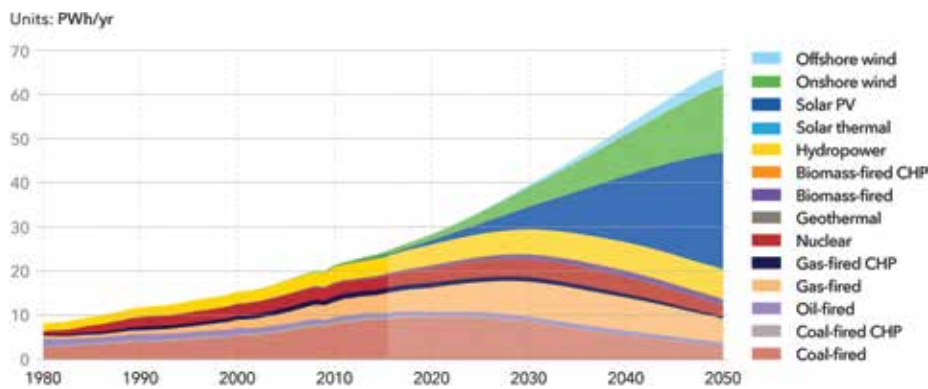


Figure 2: Forecasted electricity generation over future years (source: DNV GL – Energy Transition Outlook 2018)

2015) a disconnection up to one million households. Smaller outages occur daily. Once society experiences such outages, one realizes how depending our society is on electricity. If a large outage lasts only for a few hours or a day-part, it is mainly comfort and also (significant) economic damage that is suffered. People get stuck in elevators, subways, buildings. Traffic is jammed, industrial plants are (partly or fully) shut down, et cetera. If the outage lasts for a couple of days, more severe problems occur. Cash dispensers, gas stations, hospitals, crucial heating, protection systems, water distribution all do not function properly anymore, thereby severely affecting society and often introduce serious issues related to security, safety and health, often with fatal casualties.

Grid component reliably

Failing components in a power grid (often the root cause of power failures) also incorporate safety related issues (regularly also injuries or casualties) themselves due to the large amount of energy (often explosion) released during such a failure. The larger the consequences, the larger the need to perform a decent failure investigation to discover the root cause of the failure and with that the responsible party. Another (possibly more important) reason to discover the root cause is to learn from the incident in order to avoid reoccurrence. By analysing failure statistics, one can observe that, depending on the voltage level, about 55-75% of the causes are technical component or system related (non-human). One might think that power grid components are being used for many years now, so beyond all criteria reliable. But statistics reveal interesting opposing facts. Power cables, for example, are grid components that are

typically underestimated with respect to challenges in design, production and installation. Type tests, where new designs are being tested for suitability for reliable operation, on cable system components reveal a failure rate of up to 55%, depending on the exact type. This is just an example to demonstrate reliability of grid components is not without challenges. Figure 3 shows some examples of investigated degraded or failed power cable components from the field.

Trends

And these challenges are just increasing. Some trends with impact on reliability that can be observed already for a longer time, but still present and introducing new challenges:

- higher dependency on electricity;
- aging of installed grid components;
- increased need for investment justification;

- increased complications during replacement;
- increased juristic consequences in case of incidents;
- decreasing redundancy in the grid;
- more underground cables instead of overhead lines.

But besides these already present trends, the impact on reliability even further increases due to the energy transition, e.g.:

- rapid uptake of electric vehicles (expected to be 50% for light EVs by 2030);
- distributed solar (PV) generation;
- heat pumps;
- increased wind energy (on-shore and off-shore);
- increased energy used for computing (expectation 4x by 2050);
- more and long submarine cable connections (between countries and to wind parks);
- increased speed of project execution (e.g. wind parks);
- smart grids;
- power electronics in grids; ►

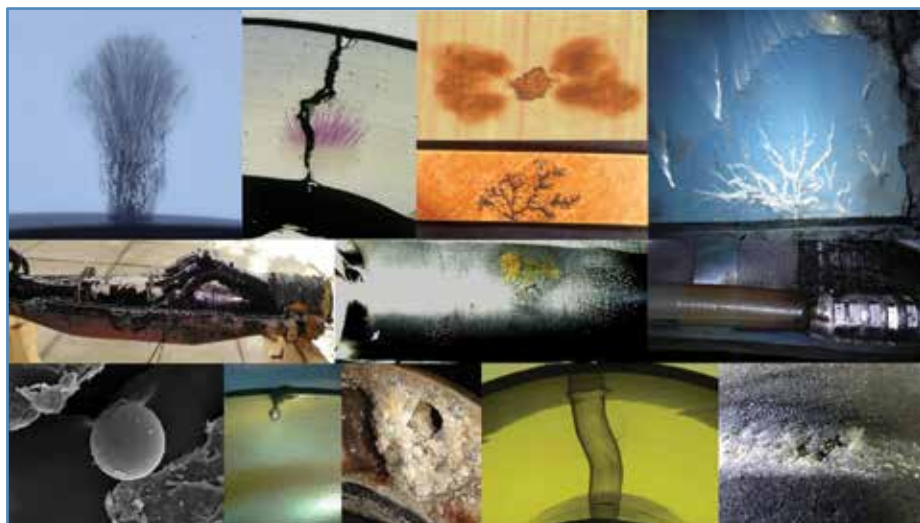


Figure 3: Impression of investigated failure or degraded power cable components from the field

- newer technologies that are at the start of the learning curve.

All these trends have severe challenges for the reliability of the grid components. Larger loads, larger load variations, power quality issues with impact on aging, installation issues, long connections, new technologies, new components with their own failure mechanisms, voltage issues, harmonics, et cetera.

Research

These newer and the earlier trends provide the need for more knowledge on the reliability of grid components, especially the impact of these trends on this reliability. This gives base to this research area, which can be grouped in categories:

- degradation mechanisms and models (influencing parameters);
- accuracy assessment of models (Health Indexing);
- laboratory tests for actual material degradation / condition and their interpretation;
- condition indicators in laboratory and in the field;
- development or advancing of diagnostics;

- degradation and failure modes of 'new' grid elements;

- assessment of test and diagnostic performance (laboratory tests, field statistics);

- repeatable, well defined defects;

- failure modes and post-failure evidence assessment;

- fault location techniques;

- statistical component reliability data assessment (low data sets).

These are research topics that are spread over the various voltage levels. The condition monitoring for low voltage (LV) is lagging developments for higher voltage levels. Though understandable from a historic perspective in terms of customer minutes lost (CML), present developments require increased attention for LV, especially cables. One of the subjects of the Electrical Energy Systems (EES) group (together with Dutch utilities and industry partners) is developing measurement equipment that can measure the quality of this part of the grid. Figure 4 shows a picture of the so called dry-band arcing that occurs in low-voltage cables in certain conditions.

One continuing research area is on-line partial discharge monitoring. In previous years, the EES group (together with

DNV GL and Dutch utilities) invented and developed an on-line monitoring system, called "Smart Cable Guard", which is now installed at over a 1000 locations around the globe. This system has various advanced technology items incorporated, varying from smart sensors solutions, pulse injection, data acquisition, signal processing, transmission line modelling towards diagnostic data interpretation and various aspects of the system controlling and managing the infrastructure.

For high-voltage grid components research topics vary from temperature monitoring of submarine cable connections, towards on-load tap changers for power transformers. Furthermore, HVDC is getting more and more important, with DC having its own degradation phenomena, like space charges, and degradation mechanisms as well as detection methods.

Conclusion

There is a need to make a transition to sustainable and smart energy supply. However, the currently needed attention to reliability of grid components should not be neglected, as challenges increase as well as the importance. An expanded and reliable grid is the crucial enabler for the energy transition. In the EES group, all voltage levels are being studied from fundamental degradation phenomena, via failure mechanisms and investigation techniques to practical implementation of diagnostic systems and health indexing. ■

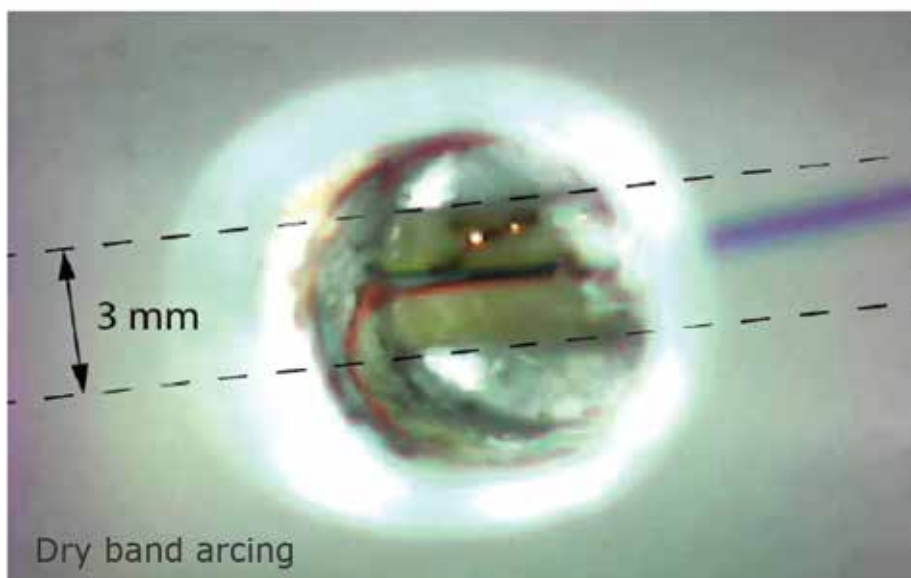


Figure 4 Photo of dry-band arcing in low-voltage cable (source: B. Kruizinga, TU/e - PhD work, Low voltage underground power cable systems: degradation mechanisms and the path to diagnostics)

ASML: A technical graduate's playground

By: Pieter Afslag

Pieter Afslag is a production engineer at ASML, working in vacuum systems in our EUV (Extreme Ultraviolet) factory in Veldhoven, the Netherlands. Pieter has studied Electromechanical Engineering at Group T at the Catholic University of Leuven, Belgium, before starting his career at ASML in September 2017.

"Someone from the ASML EUV factory came to my classroom one day and gave a presentation about ASML. It got me interested. I've always been interested in companies that design and build their own machines, but ASML does more than that. Their machines are so huge and complex that they exceed the limits of technology. You really have the feeling you're contributing to the future of technology."

"I really didn't know what to expect before I started working here. When I looked at the vacancy that the ASML contact had forwarded to me, I only recognized a few words in the job description. But when I came in for an interview, I saw the machine and started asking questions and was really intrigued by the answers I got and I started to think, 'Hey, this is something I could really get into. This might be the right job for me'. But in the end, you're never completely sure – it's always a bit of a guess. I think it's

to finish] in the factory. I guess you could call the production engineers like me the link between the factory itself and the Development and Engineering (D&E) department. We have to make sure that something that Development makes or fixes will also work in the factory. We're often sitting together with D&E and suppliers to see how we can make things work."

"Every day is different here, but that's what I like about my job. You never know what you're going to experience. But I learn something new every day. Really, the knowledge I gather on a daily basis is unbelievable. I really like that."

"As a graduate, you can pretty much start anywhere you like at ASML. There are so many departments to choose from. You can even change functions after a while or move to other departments. In some companies, you might get stuck doing one thing, but not here. You definitely won't get bored."



customer, you can work in our extensive Customer Support department, at locations all over the world. The list goes on...

Curious to experience first-hand how ASML makes new technologies a reality?

"Every day is different here, but that's what I like about my job. You never know what you're going to experience."

hard to find the right job immediately after university – I was a bit lucky in that, I guess."

"In my daily work, I focus on continuous improvement. We're always trying to look for solutions and improve processes. Currently, we're trying to decrease cycle time [the time it takes to manufacture a part, module, or (sub)system from start

There's something for everyone at ASML. If you want to become a designer or architect you can work in D&E. If you prefer interaction with the factory and like to solve problems, then Troubleshooting, Test or First Line support might be something for you. If you like to travel and focus on building a relationship with the

Join an excursion for Electrical Engineers on October 17 and discover how we change the world, one nanometer at a time. Learn all about our company, our culture, new technologies and meet the people who make this all possible. You can register before October 3 at workingatasml.com/students or via your study association. ■

ASML

#Shutdownstories in Boulder

By: Anouk Hubrechen

I've been dreaming for years to do my internship at the National Institute of Standards and Technology (NIST) in Boulder, Colorado. So far it has been quite the ride, including being here during the longest shutdown in US history.

NIST

My work at NIST consists of research on how to measure NarrowBand Internet-of-Things (NB-IoT) devices in reverberation chambers (RCs). These devices will be used a lot in 5G and beyond. In this field, NIST is heavily involved in determining the standards for accurately measuring these devices. Therefore, I wanted to go to this prestigious institute to become a better researcher. Demands are high and the words 'good enough' are not a part of their vocabulary, but I would not like it any other way. Originally, I only wanted to stay for three months for only my internship, but NIST wanted students to stay for at least six months, and preferably a year. Since working for NIST was one of my biggest dreams, I decided to move to Boulder for ten months, to do both my internship and graduation.



Shutdown

Only three weeks into my internship, the US government shut down due to a deadlock in financial negotiations on immigration policies. Since NIST is a federal institute, the whole campus shut down and no one could work. No one knew when it would open again, and it seemed that there was no progress at all at the end of the first week of the shutdown. This was a horrible time, since I did not know a lot of people yet and because it was the middle of winter, there was hardly any activity in town. I hated not knowing when it was going to end and all I wanted was to go home. So, after a

talk with my supervisors, we changed the subject of my internship to further investigate something I discovered by accident, so I could work on it in Eindhoven until the shutdown was over. Credit must be given to the people of NIST and the TU/e for helping me making this all work, since they went to great lengths to help me. Going back ended up being a good move because the shutdown ended up being the longest in US history, lasting 35(!) days, and it ended up being very valuable to have data from Eindhoven and NIST. I even got a conference publication out of it for EMC Europe. It is called "The Effect of Peripheral Equipment Loading on Reverberation Chamber Metrics", if you're interested. Also, I was not allowed back in the US due to bureaucratic shutdown problems, so after four weeks in Eindhoven, I worked in Canada for a week until I was. It was convenient to go through Canada since I had a vacation booked to Toronto, and I could get there for free through some old contacts I had at KLM by taking care of some horses on the plane. This way, I could cross the border by bus after, while still catching the flight back to Denver from Buffalo that I had originally booked for my vacation. What a ride!

Boulder

Boulder is an amazing city to live in. At 1.6 km altitude it is the gateway to the Rocky Mountains, and even after seven months, I still discover something new every week. There is plenty of opportunity for hiking, there are a lot of micro-breweries, and within an hour by bus, you can enjoy everything Denver has to offer. However, don't be surprised by snow at the end of May (or even the end of June in the mountains), or by pool parties in March. A famous saying about the climate is: "Colorado, where the weather is made up and the seasons don't matter", which should tell you enough about the randomness of the weather. I've made lots of great friends here since the shutdown, and during the weekends I was hardly at home, usually off to events,



Driving a snow mobile in the Rocky Mountains



national parks, or downtown Boulder and Denver for concerts, sports games, or just drinks. Besides the friends I've made here, a lot of other people have come to visit me too. My parents came by in February, and a few of my friends in December and in May. My boyfriend even came by three times, where we visited Toronto, Cuba and the majority of the big national parks in the west on a two-week roadtrip to San Francisco and back. And, I am traveling to Barcelona in September to present my work at EMC Europe. A few things remaining on my wish list are Yellowstone National Park, and a Seattle-to-San Francisco road trip.

Graduation

I am currently working on my graduation project, which is partially about something I discovered by accident too. It is about determining total isotropic sensitivity (TIS), total radiated power (TRP) and antenna efficiency for narrow-band devices in RCs. The antenna efficiency measurements I will compare with a measurement made in one of the most accurate anechoic chambers in the world. I have learned so much here, and I got to work with the most amazing equipment and people! It's amazing to work in a place where some of the best experts in my field are in the office next door. One of them being Kate Remley, who also happens to be my supervisor, and in my opinion a true role model for women in engineering. She has made me even more enthusiastic for research so after my graduation I will start as a PhD candidate on the topic of RCs at the EES group.

Fun facts

1. Cooking and baking is very different at altitude. Water boils at a lower temperature, so eggs need to cook longer!



2. Don't trust the weather forecast, ever. It can say it will be sunny and then you're stuck on a mountain road for an entire night due to inclement weather.

3. Every NIST Boulder paper must go through the Boulder Editorial Review Board (BERB). This consists of reviews from an expert at NIST, an expert in the industry, the group leader, the division reader (for grammar checks) and the division chief, and you have to show you have incorporated every (yes, every) comment they had on your paper. Although this can be a pain sometimes, the papers are much better after this process.

4. Most of the time you are allowed to drive through a red light if you're turning right. I wish we had this in the Netherlands too!

5. The NIST building is shaped like a Yagi antenna and it is built in Boulder since it was a very radio-silent environment at that time.

6. Sometimes people still think that Denmark = the Netherlands.

7. I joined the movement of going out to eat almost every day, which was not a fun fact of my weight scale.

8. There is a town near Boulder called Nederland! Unsurprisingly, it was founded by the Dutch.

9. We had an active-shooter training and reenactment on campus since incidents had happened in other government facilities. Apparently, elementary school children get a similar training. For good reasons, since one school shooting happened in Denver during my time here, and out of precaution, all schools were evacuated once due to a shooting threat near the anniversary of the Columbine shooting.

10. The people that live here are amazing, and anything unlike the people in the rest of the US. There is a lot of respect for each other at NIST, and it is one of the most comfortable environments I have ever worked in. Also, the nature that the US has to offer is unlike anything I've ever seen. As I'm writing this I still have three months left, but I'm already sad to leave. I've only covered a very small portion of all the great things I've experienced but I am always up for a coffee or a beer if you'd like to know more! Please visit this place, you won't regret it! ■



Watching the sunset from the top of the Flatirons



Arches National Park



Lots of concerts in Denver

Automated Design of Bayesian Signal Processing Algorithms

By: Thijs van de Laar

Design is a tricky process – not just because a design can be complex by itself, but mostly because the underlying problem is often unclear. For example, when the Wright brothers designed the first airplane, their biggest problem was not the construction of the airplane itself. Rather, the problem was that at first they did not yet fully understand the problem of flight. Therefore – instead of painstakingly mapping out their design first – they built a wind tunnel and scale airplane models to first try out multiple ideas. This way the Wright brothers could learn about their problem, before trying out their ideas on expensive full-scale models.

This fits well with the words of another great man: “trying is the first step towards failure” – Homer Simpson. The Wright brothers wouldn’t have had it any other way, because if one fails quickly, one can learn quickly and retry with new insights. This is how humans learn as well. Just think back to how you learned to ride a bike. You did not start by studying books on bicycle dynamics, wind resistance and tire profiles. Instead, you climbed on, fell off, and retried until you got it right.

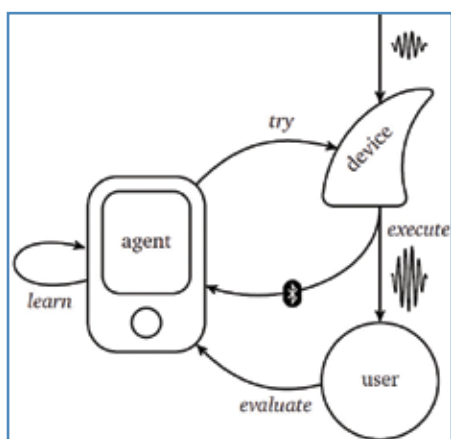


Fig. 1: The iterative design process. An initial trial setting is sent to the hearing aid, which executes the signal processing algorithm. A user then listens to the output audio and reports an appraisal back to the automated design agent. The agent then learns from the appraisal and fine-tunes its model about the user’s hearing loss. Based on the improved model, the design agent sends an improved trial setting. Figure from (van de Laar, 2019).

So, if fast feedback loops are so important for efficient design, then why are most signal processing systems still designed as monolithic structures? A hearing aid for example is comprised of circuits within circuits within circuits that are highly intertwined and not easily interchanged or modified. Moreover, these circuits implement a signal processing solution, but bear no formal link to any principled problem description. Then, once we learn more details about a specific user’s hearing loss or preferences, how are we supposed to adapt the hearing aid’s signal processing algorithm? The better approach seems to be to iterate on a problem statement by failing often, and failing fast.

The dissertation “Automated Design of Bayesian Signal Processing Algorithms” formalizes and details the iterative design process for signal processing applications, with a special interest in hearing aid personalization (Fig. 1). In the context of a hearing aid, “failure” relates to a user that reports dissatisfaction with current signal processing. The user’s appraisals may be signaled through the press of a button on her smartphone, or a flick of the wrist that gets registered by her smartwatch. An automated design agent might then learn from this feedback and instantly try a new hearing aid signal processing algorithm. Then with every new appraisal the problem statement grows clearer, and the proposed solutions will improve as well. Moreover, appraisals can be reported in the field at the moment that problems occur.

However, proposing quality hearing aid algorithms is not an easy task. The search space grows exponentially with the number of algorithm parameters. This means that if we would have just ten buttons with five settings each, then there are already just under ten million possible combinations. Now if it would take just three seconds to evaluate one setting, then it would take four years of full-time effort to try out all settings. Without any holidays. Clearly, if we require problem-based personalized design then we must think of a clever way to reduce the search space.

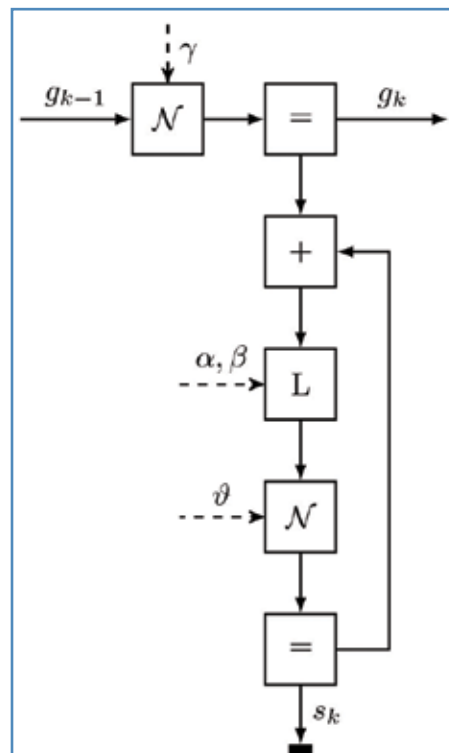


Fig. 2: Graphical representation of a probabilistic model for hearing loss compensation. Here, edges represent variables (e.g. input levels s , hearing aid gains g). Nodes represent constraints between variables (e.g. the latent hearing loss function L). Dashed edges indicate tuning parameters, and the edge terminated by a solid node is observed. Figure adapted from (van de Laar & de Vries, 2016).

Probability theory offers a principled framework for capturing our knowledge and uncertainties about the user’s hearing loss (the problem statement) in a model. For example, if the user underwent a hearing test at an audiologist, we already have detailed knowledge about her hearing threshold. This prior knowledge can significantly reduce the search space. Based on the model specification, probability theory (successive application of Bayes’ rule) then allows us to automatically derive the signal processing algorithm for the hearing aid that (under the current knowledge) best compensates for the patient’s personal hearing loss.

Iterative design requires us to iterate quickly on the problem statement, which mandates that the probabilistic model should be easily adaptable. Therefore, we represent the probabilistic model graphically (Fig. 2). Nodes in this graphical model can then be readily interchanged, and inference can be performed by passing messages between these nodes. Moreover, the graphical representation allows us to fully automate the inference procedure by probabilistic programming. Probabilistic programming extends standard programming languages with probabilistic reasoning. The dissertation describes a novel probabilistic programming framework called ForneyLab, which specializes in inference for time-series models.

Although clinical evaluations are still required to test the proposed ideas in practice, the dissertation offers a broad vision on the practice of iterative signal processing algorithm design. The main message is that for design of Bayesian algorithms it is imperative to search for the best problem statement instead of a direct solution. Once the problem statement is captured by a probabilistic model, new information can be readily incorporated. The solution will then follow from probabilistic inference on the problem statement. The probabilistic inference itself may be difficult, but it can be automated by message passing on a graphical description of the probabilistic model. This graphical representation allows for reuse of nodes and computations. As a result, more design cycles

can be afforded in less time, hopefully leading to the discovery of improved signal processing algorithms.

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Departmental Office Day-out

By: Renée Hendrikx

Every year, the department organizes the Departmental Office Day-out for all staff members within the department involved in educational support. This year, we spent the afternoon at Strijp-S. For the ones who are not familiar with this part of Eindhoven; it was previously known as 'the forbidden city', as this area was only accessible to employees of Philips. Nowadays, Strijp-S is hot and happening. The old factories are transformed into cool shops, pop-up stores, hipster food spots as well as flexible workplaces and lofts. Because of its diversity and the central location, we chose Strijp-S as the location for the yearly Departmental Office Day-out.

We started the afternoon at Natlab where everyone enjoyed a welcome drink and apple pie. As soon as the group was complete, we left Natlab and started a short walk around Strijp-S. The tour guides showed us surprising corners and shared interesting facts with us. We finished the guided tour at the Veemgebouw building, in which Enversed is located. Here, we entered the Virtual Reality rooms where we experienced making virtual hamburgers together, playing an archery contest and entering space. Both the activities and the hot weather made us hungry and

thirsty, so we concluded the afternoon at Blue Collar with a perfect barbecue and several drinks.

Below, you will find an impression of the afternoon with photos. ■



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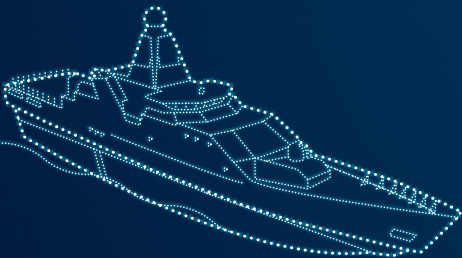


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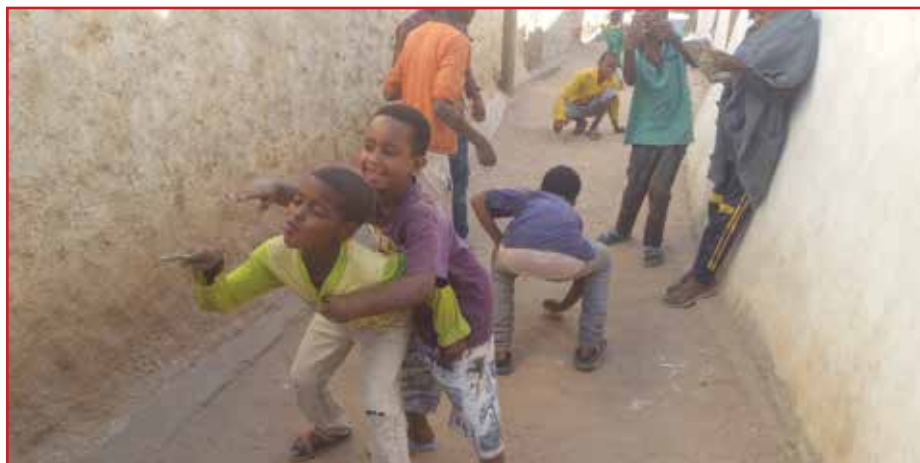
Discovering eastern Ethiopia

By: Sander Verdiesen

In the early evening of a December day, I am wandering fully caffeinated through the small streets of the Harar, a small city in the east of Ethiopia and, surprisingly, the fourth most important city to Muslims around the world, or so I have been told. The reason for my caffeine rush was that I was challenged by some elderly men to a game of dominos. I lost every single game, but they insisted that I stay and drink a few cups of Ethiopian coffee before I left. On my way back to the hotel I am approached by a man asking if I want to feed hyenas tonight. It is amazing what this small town, and Ethiopia in general, has to offer. Unfortunately, many visitors to Ethiopia do not visit the eastern part due to its close proximity to Somalia. I will tell you about my experiences there and you can decide whether or not their fear is justified.

Like most visitors to Ethiopia, I arrived in the city of Addis Ababa. A local man that runs a tourist agency invited me to stay at his place. This was a great introduction into local life and he helped me a lot planning the rest of my trip. He introduced me to Ethiopian cuisine, which you can try for yourself at the Ethiopian restaurant in Eindhoven. He was also very proud of his country and especially of the fact that Ethiopia is the only African country that has never been colonized.

On my first full day, I was planning to buy a bus ticket to the east of the country from where I would make my way to Somaliland. My host brought me to the office of the biggest bus company in the country. We quickly found out that they no longer operate any routes to the east of the country. Asking for clarification was met by a simple, but somewhat unsettling response, 'they burn our busses'. I knew the east of the country has had some unstable times in the past, but nowhere did I read that the busses stopped going. The ticket seller of the second biggest bus company gave us a similar response. Eventually we ended up in an office of another bus company that looked nowhere near as modern as the other two. This company did operate



routes to the east of the country! I bought a ticket for two days later and decided I would find out later why the busses stopped going.

The next day I found out what had happened. Ethiopia's economy has seen two-digit growth annually over the last several years. However, this wealth has concentrated in the capital and has not flown to the eastern provinces. The people were fed up by this and one group turned aggressive, burning down two busses owned by a bus company located in the capital. The violence was not aimed at the occupants of the bus. The bus company from where I bought a ticket is owned by people from the eastern provinces. This was a huge relief and I boarded the bus headed to Harar two days later.

On our way to Harar I did see the burnt-out busses at the side of the road, but people were mostly cheering as we drove past! Harar is a small city that used to have a rather odd problem. At night, hyenas would sneak into the city in search of food. Unfortunately, some accidents happened where people got mauled. One local butcher came up with a plan. In the evening he would go to a field next to the city with all his leftover meat and

feed the hyenas. No longer hungry, the hyenas did not feel the need to go into the city anymore. Nowadays, visitors can pay a small fee to see this daily event and also feed the hyenas, although this is not for the faint-hearted!

When I planned my trip to Ethiopia I was not sure what to expect. Growing up I mostly learned to associate Ethiopia with famine and war. I am not saying that this issue no longer exists at all, but I can say that Ethiopia is a wonderful place to visit. It is filled with proud people and you can do things that you cannot do anywhere else! ■



Wireless Power Week 2019

By: Huub Visser

The Wireless Power Week 2019 was held in London, UK, from June 17 till 21, 2019. This event, comprising a one-day school, the IEEE MTT-S Wireless Power Transfer Conference (WPTC) and the IEEE PELS Workshop on Emerging Technologies: Wireless Power (WoW) was hosted by Imperial College London and Eindhoven University of Technology. The event turned out to be a huge success. With Huib Visser being one of the two co-chairs, Bart Smolders being WPTC Technical Program Committee co-chair, Tom van Nunen being part of the Local Organization Committee (LOC), TU/e kicking off the WPW2019 school, TU/e being sponsor and further having six TU/e contributions in the conference, the presence of TU/e was prominent.

Wireless Power Transfer

Wireless Power Transfer (WPT) is the technology for contactless powering and/or charging devices. WPT comes in two flavors: inductive WPT and radiating or far-field WPT. Inductive WPT is quite mature and is entering the consumer market where it is best known for contactless charging toothbrushes and – recently – mobile phones. Radiating WPT is less mature and aims to power or charge devices at distances up to several meters. The latter is the field of expertise of the author, although we recently have started incorporating inductive WPT in our research.

History

This Wireless Power Week (WPW) was the second edition of WPW, starting the first edition last year in Montreal, Canada. The event was held in Savoy Place, the headquarters for the Institution of Engineering and Technology (IET), formed from the Institution of Electrical Engineers (IEE) and the Institution of Incorporated

Engineers (IIE). Savoy Place's history dates back to 1246. The buildings have served as palace, military barracks, hospital and prison. The current building was completed in 1889 and served as an examination hall for the Royal College of Physicians and the Royal College of Surgeons. In 1909, the IEE bought the lease. It offered accommodation to the BBC from 1923 to 1932.

WPW2019 School

The conference was preceded by the WPW2019 School, a one-day event on Monday, June 17th, held at the premises of Imperial College London, and was kicked-off by Ad Reniers and Tom van Nunen (TU/e) presenting how to use free-ware for designing rectifying antennas (rectennas). In this well-visited school (fifty pre-registrations and five on-spot registrations), ten leading experts in the field of near- and far-field WPT gave inspiring lectures to update PhD candidates and newcomers in the field.



Conference Statistics

All papers submitted to WPW2019 were thoroughly reviewed by the joint WPTC and WoW Technical program Committees. A total of 302 papers were submitted by 1012 authors from 41 countries. 146 were accepted for WPTC (acceptance rate 74.9%) and 85 were accepted for WoW (acceptance rate 82.5%). 49% of the authors had an academic affiliation, 34% were student, 21% were connected to industry, 3% to government and 1% to NGO. The papers were delivered on USB



Fig. 1: Impressions of the WPW2019 Welcome reception. Left: Dominique Schreurs (KU Leuven), president IEEE MTT-S with Bart Smolders (TU/e), co-chair WPTC-TPC and Alessandra Costanzo (University Bologna), co-chair WPTC-TPC. Middle: Huib Visser (TU/e), co-chair and Tom van Nunen (TU/e), member LOC. Right: Huib Visser (TU/e), co-chair and Paul Mitcheson (Imperial College London), co-chair.



Fig. 2: Audience in the Kelvin Lecture Theatre during the WPW2019 opening session.

stick for the delegates and will become available through IEEE Xplore later this year.

On the sunny evening of Monday June 17th, the WPW2019 welcome reception took place on the Roof Terrace of IET's Savoy Place, providing a magnificent view of old and new London, see Fig. 2.

The Conference

On opening of the conference, the next morning, many people were (rightfully) impressed by the grandeur of the Kelvin Lecture Theatre, see Fig. 2. As organizers we had specifically chosen for this location aiming for quality in the presentations as well as in the conference experience, being tired ourselves of attending conferences in shabby or sterile concrete 'conference bunkers'. If, as an organizer, you want conference delegates to experience a great conference, you will have to pay attention to the details. Choosing the right venue is just one of these details.

In the next four days, eight parallel WPTC and WoW sessions were held in the Kelvin Lecture Theatre and the Turing Lecture Theatre, as well as three plenary talks and two joint WPTC and WoW sessions. 46 oral presentations were given in the WPTC and WoW tracks. 91 posters were presented for WPTC, 41 for WoW.



Fig. 3: Industrial exhibition and poster session in the Maxwell Library of IET's Savoy Place.



Fig. 4: Nikola Tesla in characteristic pose and with the WPW2019 chairmen: Paul Mitcheson and Huib Visser.

Posters were presented in the Maxwell Library were also the industrial exhibition, with 14 exhibitors/sponsors, was situated, see Fig. 3. This helped in our goal to bridge the gap between academia and industry.

Attendees were free to visit WPTC or WoW presentations and frequently moved between the Kelvin and the Turing lecture theatre during the sessions.

For the plenary sessions we were able to engage CEOs/CTOs from industry. Outstanding presentations by Alex Gruzen (CEO of Witricity), Alexander Gerfer (CEO/CTO of Würth Elektronik), Mirko de Melis (Lead Scientist EMEA – Medtronic), Irina Khromova (Head S&T Metaboards Ltd), giving perspectives on WPT, further bridged the gap between academia and industry.

Our invited speakers certainly spiced up the sessions. We thank Paul Wiener (VP Strategic Marketing GaN Systems), Dinesh Kithany (Sr. principal Analyst, Wireless Power & Power Supplies IHS Markit), Jürgen Meins (University of Braunschweig), Hooman Kazemi (Raytheon), Burak Ozpineci (Oak Ridge National Laboratory) and Zoya Popovic (University of Colorado).

The panel session on Wednesday, entitled 'The Future of WBG Devices in Power Processing and Wireless Power' gave rise to ample discussion and participation of the public.

Conference Banquet

Before and throughout the conference, hints were given related to the Conference Banquet. This Banquet was to take place in 'Tesla's secret and only recently discovered London laboratory'. The expectations built up during

the conference and at the time of the Banquet a queue had formed at the venue. People were not disappointed as the Banquet was not only in the laboratory, even Nikola Tesla was present, see Fig. 4, announcing the banquet at 8:10 PM sharp, his usual time for supper. Many people took the opportunity to get photographed with Nikola Tesla.

Closure

The WPW2019 conference ended on Friday June 21st at midday. After two joint WPTC and WoW sessions, awards were given to the best and second-best overall paper, the best WPTC and WoW talks, student papers and posters, after which the podium was given to the WPW2020 chairmen.

WPW will held again in 2020, from May 5th till May 9th, in Seoul, Korea. The deadline for conference papers is December 31, 2019.

Acknowledgements

I would like to thank Ad Reniers and Tom van Nunen for their contribution to the WPW2019 School and the LOC. I also would like to thank Veselin Manev, Peter Baltus, Hao Gao, Diyang Gao, Rongpeng Zhai, Steven Beumer, Tom van Nunen, Rob Mestrom, Mark Bentum and Esmee Huismans for contributing with papers and posters. I thank Bart Smolders for being WPTC-TPC co-chair and for chairing many sessions during the conference. A special thank you goes to Jolie van Wevelingen for solving a nasty background financial problem during the conference. ■

EAGLE Study Trip

By: Mark Legters

Right after the last week of exams in July, the EAGLE study trip spread its wings to the Baltics for an eight-day trip to Riga and Tallinn. Seventeen students enjoyed a week filled with visits to companies and a university, but also with cultural highlights. We'll take you through our visit to Latvia and Estonia.

The name of our study trip, EAGLE, is an acronym for 'Exploring All Greatness of Latvia and Estonia', showing the interest in those Baltic states and the curiosity to what they have to offer. Curiosity in the technological and business aspects, but also interest in the cultural aspects of those countries. On the morning of Tuesday, July 9, our trip to feed this curiosity began, taking a two-hour flight from Eindhoven Airport to our first Baltic destination, Riga. Apart from settling ourselves in our hostel, this first day mainly consisted of exploring the city center. We indeed found out why Riga's city center is part of the UNESCO world heritage, discovering its squares, churches and other nice architecture.

On our first full day in Riga, we visited two Latvian companies: SAF Tehnika and Mass Portal. SAF Tehnika is a company that mainly designs and produces digital microwave data transmission equipment for point-to-point communication. Besides their main focus, they are also involved with Internet of things in horticulture. We got an interesting talk about their company and products (enriching our knowledge of the Intro Telecommunications and Electromagnetics courses), and a nice tour around their facilities as well. Our visit to Mass Portal was of a different kind. Mass Portal is a company that operates in the world of 3D printers, offering both 3D-printing services and 3D printers for



sale, but also they are working on the future of 3D printing. We were shown some great examples of how modern 3D printing can improve product design, and open up new applications for 3D printing as well. We ended the day program with a visit to the panoramic deck on top of the Latvian Academy of Sciences, where we had a great bird's-eye view on the city of Riga.

During our last day in Riga we brought a visit to Squad Robotics, a startup rooting from the Riga Technical University, focusing on making industrial cleaning machines autonomous. We were

received by one of the founders of the startup, in an office that was quite empty. The startup just had their major deadline and all engineers were having a well-deserved holiday. After an insightful talk on the history of robotics and the ins and outs of the startup, we got a live demonstration of an autonomous cleaning machine. Unfortunately, the cleaning robot refused to cooperate, but at least we got a glimpse of the implementation. After some good lunch at a nice burger restaurant, recommended by our host at Squad Robotics, we boarded the bus that would bring us to the next destination of our study trip: Estonia!



Riga's city centre is known for its blend of architectural styles



Group picture in front of Mass Portal's fully autonomous 24/7 3D printing system



Visit to the embassy of the Netherlands in Tallinn

A four-hour drive later, we arrived in the capital of Estonia, Tallinn. Like Riga, Tallinn's Old Town is listed as a UNESCO World Heritage Site; the city center is one of the best preserved medieval cities in Europe. You really feel the medieval vibe when strolling through the Old Town, and it was even more emphasized by the medieval market that was held on the main square during our stay.

Our first morning in Tallinn was all about a visit to TalTech, the Tallinn University of Technology. We were welcomed by the Vice-Dean for Academic Affairs, and given a small impression of the campus. He mentioned very enthusiastically that they have their own student-run bar at the campus, but we, thinking about our own campus, were not as impressed by that as he had hoped. Also, they are installing 5G across the entire campus for their autonomous vehicles. After a presentation on the structure of the university and offered studies, we were given a tour around some research labs, including an electrical machines lab, an EMC lab and a robotics lab. We also got to see the prototyping lab where they are

able to 3D print with an impressive range of materials, and the autonomous buses that drive around the TalTech campus.

We also found ourselves on some Dutch grounds in Tallinn, as in the afternoon we visited the Embassy of the Netherlands. We got a really insightful and interesting talk by the ambassador herself on the history of Estonia, the current diplomatic ties between Estonia and the Netherlands, and her work as an ambassador, both at her current position, as well as at previous ones. In fact, we had our own little episode of 'Floortje en de ambassadeurs'!

For the weekend in Tallinn, we had planned three cultural activities. First of all, we visited the KGB museum in the Viru hotel. This hotel was built during the Soviet era and had a secret top floor, where the KGB housed a radio center for communication with other KGB offices, but also for eavesdropping and spying on hotel guests. Because of this, the hotel was also said to be made out of micro-concrete: 50% concrete and 50% microphones! After the KGB museum we continued our cultural program with a

visit to the Kadriorg art museum, located in a Baroque palace. After some free time, we topped off our cultural day with experiencing the nightlife in Tallinn during a pub crawl.

On the Sunday everyone was as free as a bird, as there was no official program. While some people used the free time to sleep off their hangover, others used their time well exploring more of the city of Tallinn, testing the pancake restaurant or visiting another museum. One of the participants even ticked off a third country during the trip, taking the ferry for a city trip to Helsinki.

The last day of excursions had arrived. We visited two companies: Krakul and Artec Design. On our way we spotted some Starship Technologies delivery robots in the wild. Krakul is a startup on embedded system design, working products ranging from electronics design to Internet of Things-related projects. The company started off really small, but grew to a company with quite a few projects, which our host shortly discussed. It gave a nice insight in the startup life. At Artec Design, a company involved with product development, the engineer that received us showed us the variety of their products, including the public transport check-in poles, and point-to-point laser communication for skyscrapers in Japan. We also heard about a muscle tension device that they developed, which was actually used for tests in the International Space Station.

We closed off the last full day of our trip with a group dinner. We had a lot of fun and laughter looking back at our trip, but didn't make it too late, as we were going to be early birds the next day. We would have to get up at 5 o'clock to catch our flight. Time had flown by, we were going home again. ■



The baroque Kadriorg palace in Tallinn



The medieval city walls of Tallinn's Old Town

My life after EE

By: Lulu Chan

My life after studying Electrical Engineering at the TU/e so far has been filled with new knowledge, new friends, and new ideas. I started the Bachelor of Electrical Engineering before the official name changed from “Elektrotechniek” to “Electrical Engineering” and graduated from the Master of Electrical Engineering right after the entire department moved from the building “Potentiaal” (nowadays “Luna”) to “Flux”. After graduation I started a traineeship at NXP Semiconductors where I experienced different departments, functions, and mergers. The common theme here? Change.

Student life

Hi, I’m Lulu, a 29-year-old dancer, engineer, and Whovian. Eindhoven has been my home since I was five years old. Elementary school, high school, and university have all been in the same city. Though the location hasn’t changed, the city itself and my life inside it evolved over the years. I went from being curious about simple math in elementary school to being fascinated by, and at times absolutely frustrated with, time-sensitive networking standards in my professional life.

When I was studying EE at the TU/e (2008-2014), I was often actively part of an association, be it as member, board member, or committee member, at Footloose, BEST, or Thor. I also worked in the promo team of our department, and as a researcher for SURE Innovation. It was awesome to do all these different things, but it was also quite overwhelming to do everything in parallel. Something had to change. After my Bachelors, I took a step back from side activities to breathe, and to focus on my Masters program. It was a change that led to great things, because that was when I got a clearer introduction

to NXP Semiconductors as a company, rather than just as the logo on my T-shirt from introduction week.

In 2012 I was one of the lucky students to receive an Electrical Engineering Masters study grant from NXP. Through this, I got to know NXP as a huge international company with many diverse opportunities for an engineer. NXP is a world leader in secure connectivity solutions for embedded applications, enabling secure connections and infrastructure for a smarter world. I learned to recognize the products from NXP in my daily life, from Near Field Communication (NFC) in secure payments, to various chips within a car. Fun fact: there is an NXP chip in every new car, which I found cool to learn. How’s that for impact in our daily lives?

Graduating, and then what?

During my studies, I wasn’t sure what I wanted to do after I graduated. I knew that I like to work on a system level and knowing the applications I was doing my research for, because when I don’t know the purpose, it usually was going to be a struggle. But what function does that translate to? In hindsight, I knew exactly what I wanted to do, since I am currently a systems & applications engineer in an Automotive R&D department. Funny how that worked out.

The NXP grant led me to do my internship at NXP Nijmegen, where I had an awesome group of colleagues and learned about characterization, network analyzers, and how data sheets are created. Being in Nijmegen was quite a change for me, but I enjoyed it thoroughly. For my thesis I worked on modeling antenna arrays for near field focusing at the Holst Centre at the High Tech Campus back in Eindhoven. What



a wonderful environment to work in. Once they added a Starbucks, it became my dream work location. Right after my graduation, I started the Automotive Leadership Trainee Program (ALTP) at NXP.

Next experience: traineeship

ALTP is a two-year program at NXP that provides a job for graduates with the opportunity to get to know the entire company quickly, not only through your own eyes, but also through those of your fellow trainees. It brings you into contact



Demonstrating how you can recognize NXP products in your daily life during the Dutch Technology Week



Me and my fellow ALTP trainees of 2014

with various disciplines in the company, various functions a technical graduate can do, and colleagues who are eager to share their experience with you.

That is exactly what I experienced during my two years. When I started ALTP, seven others started alongside me on their own traineeship, starting their own career path. Even though some of our goals were different, technical versus marketing for example, we found a great kinship with each other as a group of people who were in the same phase in their careers. All trainees were situated in different departments, which made it rather easy to bridge the gap between departments whenever I had a question that one of them could either answer, or point me to someone they know. It was a great way to gather knowledge. The bond and comradery that ALTP trainees felt amongst each other was something we felt was really valuable. It made sense to extend that to the larger young professionals community within NXP. And thus, YOUNG! NXP was born in 2015.

During my assignments in ALTP, I got to do many cool things. In R&D, I performed technical experiments, but also looked at market intelligence and price forecasts to assess a potential business case. After a year, we changed functions, and I also learned first hand what it meant to be a Quality Safe Launch engineer, to safe guard the quality and reliability of a product before launch, and working together with people over the entire product development cycle. During my time at NXP, I have worked with colleagues all over the world and experienced different flavors of how I can contribute to discussions, deliverables, and developments in projects.



YOUNG! NXP during a Young Professionals Event at the Evoluon

Innovating the future

After ALTP I knew that working in an R&D department would make me the happiest, and I was fortunate to find my place in the team of System Innovations. Our team is aimed to explore innovative future automotive system solutions in which NXP's chips are integrated. By understanding application requirements, we can provide input for next-generation product development internally, and collaborate with our customers on a system level. Our projects span various business lines and collaborate with many parties internal and external to NXP. I find it a great team to work in, with great colleagues and many challenging and fun topics to work on. Working on innovation means there is no clear recipe for the path forward, which makes it very exciting. There is a lot of change involved, leading to territories unknown, but that's also where the potential lies.

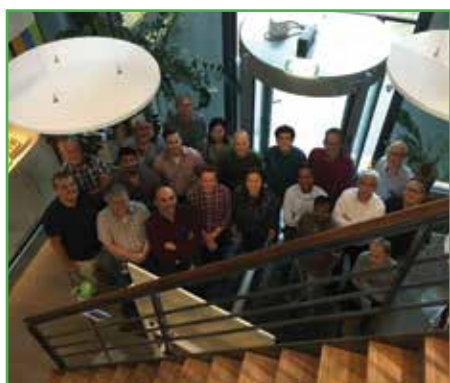
Personally, I work on studying how an in-vehicle network (IVN) inside a future car can be architected, and what it will

require from a technology point of view. Where in the past, for example, the data inside a car consisted of a few bits to signal a window to go up or down, a car nowadays may have a rearview camera for parking assist, leading to Megabytes of data traversing the in-vehicle network within a short span of time. My work focuses on Time Sensitive Networking standards, how they can be applied in an IVN for timing critical data traffic, and how it impacts or is impacted by the system architecture.

As a professional engineer working in a technology company, I feel strongly about spreading knowledge about technology to a wider audience, especially to the younger generations. For me, it isn't about more people choosing technology as their fields, but it's about them being able to make an informed choice, without restrictions caused by bias, be it their own or through their environment. This requires a change in perspective, not only with kids, but also with the adults. We start by opening up the "black box" that is technology, through demos, workshops, and micro:bit trainings.

Today, tomorrow

My life is constantly changing for better or worse. Within that change, there are fundamental constants that make up who I am and how I want to live. Change is often difficult, and I often don't like it, but it brings me closer to the person I am going to be tomorrow. Change is also what I want to bring to the world. That's my life after EE. A continuous journey of discovery, learnings, and change. ■



Our System Innovations team



Promoting technology during Girlsday @ NXP demolab

Mythology

By: Fer Radstake

Besides being named after the Norse god of thunder, e.t.s.v. Thor has much more to do with the Vikings. The names of committees like Ivaldi and Kvasir, our fileserv Mjølner and our pub Het Walhalla all come from Norse mythology. Our members like to behave like a bunch of Vikings too, loudly chanting the Thorlied on every occasion and cheerfully raiding the “constitutieb- orrels” of the other associations, never returning without some kind of loot. In short, we’re a real Viking association.

When hearing such names as above, most people immediately think about Scandinavia. To few it comes to mind that in the Netherlands we too once prayed to gods like Thor and Odin. It took until 734 for the last pagan king of Frisia to be defeated by the Christian Franks, and as late as 793 the Frisians are noted as reverting to Paganism en masse during a rebellion against Carolingian rule. When the Viking Hrœrekr reigned Dorestad (Wijk bij Duurstede near Utrecht) from 841 to 873, there were possibly still some pagans among the native population, and King Hrœrekr himself certainly was one when he arrived in our country (although he later converted, perhaps for the political benefits Christianity granted). Even the conversion of the Franks, from whom the Dutch population partly descends, only gained momentum

around 500 CE, before which our religion, culture and language didn’t differ much from our Scandinavian brethren.

There are still a few traces of those times visible today. Naturally in the names of our weekdays Dinsdag, Woensdag, Donderdag and Vrijdag (resp. Týr’s, Woden’s, Donar’s and Freyja’s day), but also in some village names: right here in Eindhoven the neighbourhood and former village of Woensel derives from Woden’s sel (Odin’s town). Even our national holiday of Sinterklaas is sometimes said to possibly derive in part from Pagan traditions (See Connecthor 32). Another trace can perhaps be found in the folktales told in the remote parts of our country, where the old Gods occasionally show up in half-forgotten legend.

Such is the case in my native Gelderland, where in the early 20th century the painter and writer Gustaaf van der Wall Perné collected the many sagas he had heard as a child growing up in the Veluwe area and combined them in the bundle *Veluwsche Sagen*. It should be said though that he freely admits the stories are not meant as an archaeological record; when the first edition was published in 1909, it had been 20 years since he last heard some of them as a child. Furthermore, he acknowledges the use of the Icelandic Edda stories to supplement some of the tales. Van der

Wall Perné didn’t get a chance to tell us exactly what he supplemented as he tragically died two years later, while writing his second bundle.

Whatever their archaeological value, the tales of Van der Wall Perné give an excellent insight into the surge of interest in our pre-Christian history that occurred in the late 19th-early 20th century. Numerous painters, illustrators and writers used the old Viking sagas for inspiration, and Van der Wall Perné’s stories are a prime example of that. Last but not least, his stories make for a good read, so enjoy!

The Great and Small Hill

Long ago, when giants still roamed these lands, it happened that the Giant of Uddel, who lived near the Uunnilo lake, was awakened by a huge lightning strike, followed by a massive thunder. Thunar, the great Thundergod and the arch-enemy of the race of giants, came riding past with the greatest noise. The thunder kept on for a moment, but it soon grew weaker and when the giant couldn’t hear it any more, he deduced that Thunar had only ridden past on his way to different lands. Soon he was fast asleep again.

When he woke up the next day, he noticed that his oven, which stood a hundred paces from his home, had been shattered by the Thundergod’s hammer. Only rubble remained of the once great



In Van de Wall Perne’s paintings, the influence of both Germanic/Norse mythology and the landscape and culture of the Veluwe can be seen.



Paintings such as the famous 1915 "Midwinterblot" by Carl Larsson reflect the increased interest in pre-Christian heritage of the late 19th and early 20th century.

oven. The giant burst out in a terrible rage against Thunar, and cursed the god so loud that his wife came out of the house to see what was going on. Together they looked at the pile of rubble, and the wife complained she had meant to bake bread the next day.

"Aye," the giant sighed. "It's very well impossible to rebuild the oven in a day."

"Why don't you," said the wife, "go to our neighbour on the Hardenberg hill and ask if we can use his oven tomorrow."

"That's a good idea," the giant answered, as he knew by experience that his wife was usually the smarter one. And that's how he took off to Elspeet where another giant lived. They were dear friends, and when the Giant of Uddel had told of his problems, the Giant of Elspeet said: "Well of course, just bring your bread to me. It's a perfect timing as well as I need to bake bread myself, and my oven is large enough for the both of us."

"Then I'll get the fire-wood," the Giant of Uddel spoke.

After both had uttered some more curses and threats at the mighty Thundergod, the Giant of Uddel went to the forest. He found some large pine trees and pulled them out of the ground. The sun was already setting when he returned to the

Hardenberg with a huge bunch of heavy pines, tied together with a young birch tree.

The Giant of Elspeet and his wife received him hospitably and invited him to join them at the hearth for dinner, which consisted of porridge that hung above the fire in a massive kettle.

After dinner, as the wife cleaned the dishes with an oak bush, the giants talked a bit, and raised a toast to a successful bread. They toasted many more times, in fact, than necessary for this success, and for a good night's rest. When the Giant of Uddel finally rose from his chair to go home, he promised his friend to arrive

with his dough the next morning at six. Whether it was because of the mead or because he was tired, he slept surprisingly well and he snored so loud, that you could hear it seven miles away.

The sun had already risen when the Giant of Uddel awoke, and with a shock remembered that he should be in Elspeet at six. He dragged his wife out of bed and shouted at her:

"Start kneading the dough, as I think I'm late already!"

The wife speeded to the trough and started kneading, as her husband went outside to see if the smoke was already rising from his neighbour's oven. There he was shocked to hear his neighbour's wife scraping clean the trough already. He ran inside, put the breads on a plank and went as quick as he could to Elspeet, straight across the heath. In his hurry his wooden shoes filled with sand, which bothered him immensely when walking.

About halfway between Uddel and Elspeet he stood still for a moment to shake the sand out of his shoes. First the right shoe, which was fullest, and then the left. There wasn't a lot of wind, and the sand remained piled there until the present day. Still, halfway between Uddel and Elspeet, you can see two hills, now covered in heath. These hills are called the Great and Small Hill.

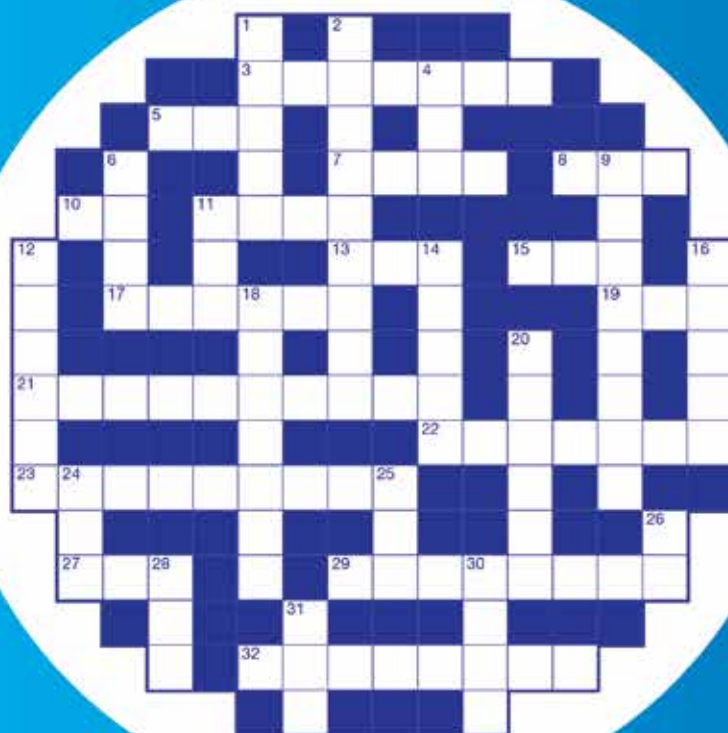
The giant arrived just in time at his neighbor, who was about to shut down his oven. ■



This 1908 drawing by W.G. Collingwood perfectly showcases how ancient mythological themes were often combined with turn-of-the-century art genres.

Puzzle

to win a Bluetooth speaker!



7	5	4	31	1	6	22	12	20	15	2
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Across

3. Second profession of the inventor of Morse code
5. Frozen water
7. Component considered to be ASML's heart of the DUV system
8. State of the ... technology
10. Japanese board game
11. Starting material for wafer production
13. Carpenter's tool
15. Chemical elements: Hydrogen + Iodine element + Sulfur
17. Transistor layout
19. Environment friendly
21. First person to win two Nobel prizes for Science
22. Part in ASML system that contains the customer's pattern for chip production
23. Location of ASML's headquarters
27. One of the partners in the 'Metropoolregio Brainport Eindhoven' sponsorship
29. Famous physicist who became a guitarist
32. Decade in which ASML was founded

Down

1. Type of web browser
2. ASML system to measure on-product overlay
4. Metal used in ASML's EUV light source
6. One of the two sports that has been played on the moon
9. Department that conceives ASML's future technologies
11. Star at the center of our solar system
12. Science fiction writer that invented the three laws of robotics
14. Chips are cut from a ...
16. The Law driving the semiconductor industry
18. Production facility to manufacture a complete ASML system
20. Program language developed in the Netherlands
24. ASML's latest lithography technology
25. Near-infrared
26. Internet country domain for Malaysia
28. Laboratory
30. ASML's biggest market
31. Device that makes you able to interact with a computer

Submit the correct answer by November 30 by e-mailing it to campuspromotion@asml.com
Out of the correct answers we will randomly select one winner to win a Bluetooth speaker.
The results are not open for discussion.



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Attention!

By: Tom van Nunen

The first thing I learned from my fellow PhD candidates, was not how to use LaTeX properly, how to find reliable sources, or how to perform an experiment correctly. Rather, it was way different: how to prevent distraction during my work. It has proven to be important, and I think many of you can benefit from some easy tips. The question is whether you are ready for them.

During the PhD kickoff event, which was great fun by the way, some people were discussing a simple tip to avoid being distracted: disable notifications in Outlook. Each of them was praising how it benefited their daily lives, so I decided to give it a try.

It makes perfect sense. As soon as you receive an email, a pop-up appears, and Outlook plays a sound. Your mind is distracted away from the topic you were focusing on, if just for a second. Somewhere in the back of your head, a process starts, keeping you eager to know who sent you the email and what its content is. Bye bye focus!

As soon as I disabled these digital screams for attention, I indeed realized that I was able to focus more during my work. Worry about emails waiting too long for a reply? Nah. Every few hours, I check my email. If something is really that important that it can't wait a few hours, they should call or drop by my office, easy as that.

Recently, I heard about a book on focus in a world full of distraction, which sparked my interest. It is called 'Focus AAN/UIT' by brain expert Mark Tigchelaar. Although I haven't yet bought it, the news item that came with it was already very interesting. It got me thinking.

Every now and then, I walk past students who are working on their studies. Their phones are lying next to their laptops, and sometimes WhatsApp is even open on their laptop screens. This is great! As soon as someone sends you a message, you can immediately answer, without him/her having to wait for you.



According to Gloria Mark, who studies digital distraction at the University of California, your brain needs about 23 minutes to regain focus after a distraction, backed up by multiple studies. 23 minutes! This adds up to a huge amount of time, considering the number of distractions one experiences on a daily basis. You replying to a WhatsApp message is not just the 20 seconds it takes you to read the message and type a reply, but more than 23 full minutes of decreased productivity. And what to think of your 5 minutes of Instagram during studying? Or the 10 posts on Reddit? Of course, this counts just as much for employees as it does for students.

The remedy is of course simple. It is not technically difficult to stop these distractions from keeping you off your work, but rather the perseverance of the user that needs to be strong. Ask yourself: do

I want to be distracted, yes or no? If not: mute your phone, place it somewhere where you can't see the screen lighting or your notification LED lighting up. Close WhatsApp, Telegram, whatever social media feeds, on your laptop, and disable the notifications from emails. That doesn't sound difficult at all. Beware you, it is.

But, you don't want to stay offline for a whole day. Of course not, I don't expect you to. Decide for yourself when you are allowed to use your phone and social media distractions. For example, two hours of work can be followed by twenty minutes of distraction time.

You see: if you really want to get things done, some simple preparation might make a huge difference. Try it! I'm curious whether you notice anything. ■

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