Introduction week | TU/ecomotive | ACCI **Weekend** | Internship abroad | A bus that runs on **hydrozine**

Welcome back from your time off from work or study. We hope you have had a wonderful leave and that you have gained a lot of fresh energy for this new Academic Year that lays ahead of us. Also we welcome our new students from home and abroad. We hope you settle in and feel at home as soon as possible. If you have attended the introduction week, you may have noticed that it helped you blend in a lot easier.

We are proud to present to you this new Connecthor edition. Within this edition you will find a warm word of welcome to our new students from our Director of Education Bachelor Electrical Engineering, Sjoerd Hulshof. And as a handy to know feature, the new THOR board members introduce themselves to you as well as the different EE student associations.

Furthermore, you will read about the SPARK study tour to Russia and South Korea. About the experiences and adventures of Texas van Leeuwenstein during his internship in Japan. Also you will find articles about the successes of inter-faculty student teams such as TU/Ecomotive, who introduced their car Lina in May of this year, and Team FAST's invention on having a bus ride on formic acid, an article written by Jorn Madslien, a Technology of Business reporter for BBC News.

Finally, we would like to inform all of you that the Connecthor editorial board has positions open for creative and enthusiastic employees of the Department of Electrical Engineering interested in joining us to make the Connecthor 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 connecthor@tue.nl.

We hope you will enjoy reading this new edition of the Connecthor!

The Connecthor editorial board ∎

Amazement in Russia and Korea
On page 14 you can read about the recent studytour taking 28 students and 2 staff members to Russia and Korea

Introducing candidate board Thor
On page 8 you can read about the candidate board of thor.

Intership in Japan
Learn more about Texas his experience during his intership in Japan on page 28

Board Issues

By: drs. Jolie van Wevelingen

From the President

By: Lester Manders

We have been working on the development of the TU/e campus for a few years already. Our campus is gradually being transformed to an inspirational place to study, work, live, network and relax. It has asked a lot of effort from all parties, and has left us with positive and challenging consequences.

This also applies for the department of Electrical Engineering. Therefore, there is enough reason to highlight a few developments in this Connecthor!

First, there is the new building Flux, that houses the departments Applied Physics and Electrical Engineering. The advantage of the merge of the two departments is that the cooperation between the two departments can be enhanced in a natural way, for instance the Institute of Photonic Integration (IPI). Flux is built on the former N-Laag grounds and has been delivered in November 2014.

A park-like environment was created, with the Green Strip ('Groene Loper') and the Dommel-area, that have enhanced the campus. The Green Strip forms the central, car-free area of the campus, to which all University buildings are connected, Flux included, with places to sit, trees, and a pond.

Lastly, living on the campus was made possible by the buildings Aurora and Luna. Hundreds of students and staff of different nationalities live there now. Luna, with its 441 living units, was our former building Potentiaal, which we sometimes still think about. Now the campus has a movie theatre with grand café / restaurant, a sports center and a supermarket.

The enormous growth of the amount of students makes the investments in the campus and buildings very necessary. The interest to come study at our Department has been so grand (which is very nice, count your blessings!) that we are nearly crossing

the borders of Flux's capabilities. We have therefore analyzed the bottlenecks and the possibilities. We have created possibilities and have made the necessary steps to rearrange the rooms in a more effective way in our building, without giving in on quality. To be more specific, a part of the student rooms for design-based learning (OGO rooms) will move to the Cascade building. Thereby, a few of the rooms in Cascade will be used in a better way, and simultaneously more rooms in Flux are available to deal with the growth. Along the way, we are working to an optimum use of the building.

As the readers of the Connecthor may notice, we are and will always be a dynamic Department, a Department in motion and that will always thrive to excel. And that is, as I believe, a good thing!

Jolie van Wevelingen
Managing director EE ◼

Every year has opportunities. Every year there is a new world championship in almost every sport, every year new babies are born who will make the world a better place and every year a new can of freshmen will be opened who will start their student time in Eindhoven. Conquering the introduction week with hundreds at a time, these freshmen will try to make friends, get to know their new city and most of all have the time of their life. After all this fun they will have to start their study and face all the challenges that stand before them.

New academic years are not only for the freshmen, but also for the older generation of this university. A new year, a new chance to shine. After a long and well deserved vacation, all the students get the chance to redo courses that were too hard the year before and dive into new adventurous courses.

My Board year is almost coming to an end and so my study adventure continues. I am going back to my actual student life: studying.

Last year has gone by so fast I did not get the chance to follow courses. After a year of fun, organizing, meetings and participating in a lot of different activities within Thor the change back to the lecture halls will be hard.

In contrast to what people might think I am very excited for the coming year. I am looking forward to going back to studying and to making some real progress in my bachelor. I am even glad that my Board year is getting to an end. Not because I did not have fun during this past year, the opposite is even the case. This was one of the most fun years I've ever had. But the need of getting credits is growing inside of me and I am longing to start studying again.

Next year is a big year for Thor. The association is celebrating its 60th anniversary with a Lustrum month. In this month a lot of fun activities will take place. There will be a symposium, a gala, a big party and a lot of other fun activities! This year the association will also have a Board which consists of not

six, not seven, but eight people! Since they are with so many people I expect much from them. These eight people have a lot of ideas. Good ones, and of course a few not so great ideas, but overall Thor has a promising year coming up. I hope they will make it an unforgettable year for themselves and, most of all, for all our members.

As you all are reading here, I am going full study-nerd this year, and I want to give a tip to all students: do not take it lightly! Start the year at full speed to make it to the end. I want to wish everyone the best of luck next year! Do not look back and take every opportunity you can get your hands on.

Veel gedonder!

Lester Manders
President der e.t.s.v. Thor ◼

Introducing the new HR faces

In the last months the HR team in Flux has gone through quite some changes. Femke Verheggen has moved to the department of Built Environment and Karin Wels-Noordermeer (Applied Physics) started a new position at the central service Personnel & Organization. Karin has been succeeded by Wilma van Eck (Applied Physics), who of course is a well-known face in Flux since she was HR advisor for the department of Electrical Engineering. This left two vacant positions at EE which are filled by us: Ellen van der Mierden and Paul Hulsen. Hereby we like to introduce ourselves:

Hi everyone,

My name is Ellen van der Mierden, born and raised in Zeelst (a small village in Veldhoven) and now living there together with my boyfriend Tommy, our two children Bodi (5) and Flo (2), and our chocolate brown labrador Bumper.

In 2000 I graduated from the secondary school and then I moved to Maastricht to study at the Hotel Management School. After four wonderful and instructive years I received my bachelor degree of Business Administration. I started working as an intermediary at Randstad, an employment agency. In these four years my love for the HR business really grew. Because my prior study was very broad, I decided to follow an advanced study in HR and started working in HR at the departments of Mechanical Engineering and Biomedical Engineering of the TU/e in 2008. In 2010 I received my post bachelor degree in Human Resource Management and started working as an HR advisor at the IE&IS department. I enjoyed seven great years there with

talented people and gained a lot of experience in the HR business. After these seven years I felt it was time for a new challenge and I got the opportunity to switch departments. So, here I am at the Electrical Engineering department.

In my free time I love to do enjoyable things with my kids, i.e. going to the playground, going for a nice walk with our dog Bumper and jumping on the trampoline. Furthermore I like to play tennis, skate, meet with friends, cook and travel.

We'll meet you soon somewhere in Flux

Hi everyone,

My name is Paul Hulsen. On February 1st I started as HR advisor at the department of Electrical Engineering. Previously I've worked for four years at ASML as an HR advisor, for their departments Electronics Development and Opto-Mechanics. My career started at the Rabobank Group where I've worked five years in several HR roles.

I've studied Human Resources Management at Avans Hogeschool 's-Hertogenbosch and got my masters's degree in Work&Health at Maastricht University. For me, HR is all about understanding an organization and its people. I will always try to create ideal

circumstances, so employees can thrive and be(come) successful. Succeeding at this gives me a lot of energy.

I grew up in Sint-Oedenrode and currently live in Schijndel together with my girlfriend Loes and daughter Fleur. My daughter means the world to me and we spend as much time together as possible. In my spare time I enjoy (obstacle) running, fitness, reading and brewing my own beer.

My lifelong passion is archery, although I can't participate in competition any longer because of a permanent injury to my shoulder. I'm still involved through several volunteering roles such as trainer and board member.

We've been working here for a few months now and so far really enjoy it. We feel welcome since day one and believe Flux contains two great departments. For the future we want to contribute to the new successes of these departments and its people. We'll meet you soon somewhere in Flux. ∎

Presentation of Lina

On May 17th, Lina was presented in the Klokgebouw in Eindhoven. The car has been designed and built by TU/ecomotive, a student team of TU/e. Lina is built from bio-based materials made of flax fibers and 100% biological PLA-honeycomb. Lina will drastically reduce the carbon footprint compared to other lightweight materials used in the industry at the moment. Using the newest NFC technology Lina will be the car for all. She is able to recognize which user is driving making her perfect for car sharing purposes.

Lina: 4-people city car weighing only 310 kg! She can reach an efficiency of 51.2 Wh/km when driving in the city.

Sjoerd Hulshof has been appointed Head of ESA

Sjoerd Hulshof has been appointed Head of ESA (Education and Student Affairs) of the Department of Electrical Engineering, next to his job as Director of Education Bachelor as per July 1st. He will take up this new position per July 1st

Goodbye Esmee Huismans

As of the December 2012 issue, Esmee Huismans has been a very active member of the Connecthor team. Because of her bubbly character and enthusiasm she has persuaded many students and staff members to write an article for the Connecthor. After so many years of dedication to the Department's magazine, Esmee has decided to step down from the board. We thank her for all the hard work during this period of time.

A special word of welcome to our new students

by: Sjoerd Hulshof

Dear students,

It is a great honor for me to welcome you to the Department of Electrical Engineering. Every year it amazes me, knowing that some of you have traveled thousands of miles to study here in Eindhoven. It must feel as a great adventure you are starting, far away from home. But of course, also for students closer to home, a new study at a new university is an exciting adventure.

This year, around 250 students have enrolled in the Bachelor bachelor Electrical Engineering (including Automotive). Among these students, we have welcomed around 50 international students. For the Master's master's program in Electrical Engineering we have welcomed around 30 international

students and approximately 20 Dutch pre-master students, which gives us a very nice influx of 300 Electrical Engineering students!

By now, you will have attended your first classes already, and especially for the bachelor students I cannot emphasize the importance of a solid start enough. What I mean by this, is that you should consider your studies as a full-time job. Each quarter consists of ten weeks where you have to gain 15 credits to keep on track. 15 credits is equivalent to 420 study load hours, implying 42 hours of study per week. How you plan these 42 hours is of course up to you (at least partly). Since you have a maximum of 24 contact hours per week, this means that there are still at least 18 hours of self studyself-study and meetings with your fellow students to plan. But please remember, of course not everything is about

studying. This may sound a bit strange at this moment, but you should plan some free time for yourself as well. If you don't plan your activities, you might end up either studying all week or exactly the oppositenot at all…

Each one of you has come here with specific ideas about your future. Each one of you has dreams and ambitions to pursue. My advice is to remember these dreams and ambitions regularly, but also live, experience and enjoy the present day a lot. After all, you will only be a student for a limited amount of time.

Good luck!

Sjoerd Hulshof
Director of Education Bachelor Electrical Engineering ∎

Introducing candidate Board Thor

Hello, my name is Laurens Kok and I am the candidate President of e.t.s.v. Thor. Next year it will be my task to represent the best study association of them all. You will often find me and the rest of my Board members in the Board room, located in Flux 6.184. After 16:30 we will however probably be in the space opposite to our room, drinking some nice beverages in Het Walhalla.

I grew up in Deventer, a town located in Overijssel. After finishing high school I knew I wanted to do something technical and after visiting all universities of technology I knew I wanted to be in Eindhoven. During the tour we visited Thor and Het Walhalla (at that time still located in the basement) and I had such a good time that my decision was made.

This year I wanted to take my involvement with Thor to the next level, so I joined the group of people interested in becoming the Board. Since then that group has formed to the group it is now and I believe that with these eight people we can organize a great year for the members of Thor. I look forward to working together with some of you and I can't wait to start our year!

Geen gedonder! ◾

Hello everyone! I am Marrit Jen Hong Li and I would really like to be the next Secretary of Thor.

I decided to study Electrical Engineering after watching the movie Iron Man. Tony Stark also studied Electrical Engineering and he became really rich and really cool. My dream is to create an Iron Man suit, just like him.

After my own introduction week I quickly decided that I wanted to become an active member of Thor. I did a couple of committees during my first and second year and also joined the Tappersgilde. I have made a lot of friends these last two years and learned so much. To give something back to the association I decided to try and become part of this year's Board.

I am immensely lucky that I can call this amazing group of friends my fellow candidate Board members. We have already had so much fun together and I look forward to spend the next year with all of them and with all of you! It's going to be an amazing year!

Geen gedonder! ◾

Hi everyone, I am Meeuwis van den Hoek and I want to be the next Treasurer of Thor. I grew up in a small village in Zeeland called Kerkwerve.

In the 4th year of high school I came into contact with Electrical Engineering at the information days. I knew directly that this could probably be the right study for me and after an orientation day I knew it for sure.

From the introduction week onwards I knew that I wanted to be an active member of Thor. In the beginning of my first year I joined Ivaldi and at the end of the year the Lustrum committee and the 'Tapauto' committee.

And in my second year I joined a few other committees and the Tappersgilde.

These things have made me who I am now. In these two years I have already learned so much and had such a great time. I still want to learn much more and want to give the members of Thor the same amazing experiences I have had. This is why I decided that I wanted to be in the Board. I am really looking forward to next year. I hope the eight of us can make an amazing year that everybody will remember.

Geen gedonder! ◾

Hello readers, my name is Marjolijn Kleijer and I want to become the next Vice-President of e.t.s.v. Thor. I am 20 years old and I live in Eindhoven. I was born in Sittard, where I went to 'Trevianum' for my VWO. After graduating I decided to study Electrical Engineering at the TU/e.

After a great introduction week, I was very enthusiastic about Thor and wanted to become an active member. In my first year I joined the Ivaldi, where I organized the "BeF" and MLG party. Last year I joined the ACCI, FotoCo, Aegir and LuCo. The past two years I have learned a lot and had an amazing time. I want to become a Board member of our study association because I want to offer other Electrical Engineering students the same opportunities as I had in the past two years.

I hope to have an amazing year in which I learn and experience a lot of great things!

Geen gedonder! ◾

Hello, my name is Bram Lustenhouwer and I am the candidate Commissioner of Education of e.t.s.v. Thor. I am 20 years old and live in Eindhoven. I grew up in Breda where I attended the Graaf Engelbrecht-college. In Breda, I was more of the shy guy having just a couple of friends. But they are still friends for life! When I was young, I already knew that I wanted to follow a technical study. After joining the information days and orientation days, I found that Electrical Engineering at the TU/e suited all my interests.

After getting to know people during the introduction week, I wanted to become active with the association. In my first year, I joined the Ivaldi. I really liked the Ivaldi so much, that I joined ACCI, LuCo, Tillit, TaCo and BuEx in my second year. As I wanted to do more for the association, I decided to become a board member.

What I want to learn upcoming year is to be more organized and to get better in social contacts. I am really looking forward to coming year and hope that we will have a lot of fun!

Geen gedonder! ◾

Hi! My name is Arwin Verhoeven and I want to become the Commissioner of Het Walhalla next year. I was born in a small town called Sprang-Capelle in Noord-Brabant. Ever since I was young I wanted to know how electronics work, which is the reason I wanted to study Electrical Engineering.

In the first two quartiles of my first year I did little more than studying, which quickly became boring so I decided to join the Ivaldi. Soon after joining the Ivaldi I moved to Eindhoven and became an active member of Thor. Each Thursday I could be found in the Santé where I wasn't always very responsible.

Because I really like Het Walhalla I became a Tapper in my second year and will hopefully be the Commissioner of Het Walhalla next year.

I hope to see you in Het Walhalla next year!

Op Het Walhalla en geen gedonder! ◾

Hi! My name is Mariska and I want to become the commissioner of Public Relations. I was born in a small village not far from Eindhoven, called Boxtel. While writing this piece, I am on a study trip in Russia and South Korea. Here, we visit universities and companies, but we are also visiting tourist attractions. This combination of different activities is what I like from Thor.

Next year, I am going to organize different excursions and (lunch) lectures, with doing this I hope that you have the same good combination between serious and fun things, which I have enjoyed the last two years.

Geen gedonder! ◾

My goal is to get new students as enthusiastic about Thor as I am.

Hello, I am Bart Bas, the candidate Commissioner of Internal Relations. I grew up in Zeist, a town near Utrecht. Now I am living in Eindhoven. I have always done a lot of hobby projects. Since I started studying Electrical Engineering and joined the study association Thor I have made a lot of friends. So I totally feel at home now here in Eindhoven! I have learned a lot in the first year committee Ivaldi and even more in my second year by joining the ACCI and Volundr.

This year however, I want to contribute even more to Thor by joining the new Board! My goal is to get new students as enthusiastic about Thor as I am. I want to offer them the same opportunities Thor offered me.

Geen gedonder! ◾

Remarkable examination work

By: Jan Vleeshouwers

Examination work is a source of unused potential, insights and humor, currently only available to the privileged staff reviewing the work. This series shares some of the most remarkable work, with permission of the authors of the work.

In Siep Weiland's course on modeling dynamics, one of the recurring examination questions is on finding the stable region of a system. This is Ector's[1] answer to the question. Does his work look a little familiar to you? You would never jump into a derivation like this, would you? We certainly appreciate that you attribute some super-human powers to our staff, which allow them to deduce from a simple set of equations what you are doing and where you are heading. We really do. But for the more mediocre among us, let us check where the reviewer runs into issues.

To begin with: which question does this answer belong to? (No, we didn't accidentally omit any hint towards it when copying the work.)

The first equation looks like a differential equation for some dynamical system. The second equation introduces f(x,r) but apart from that doesn't do anything special. The third equation defines two new functions, f_1 and f_2, we suppose with reference to the 2nd equation but we're not sure. The fourth equation is not even an equation. We're confused: what is the use of this derivation, if you may call it that?
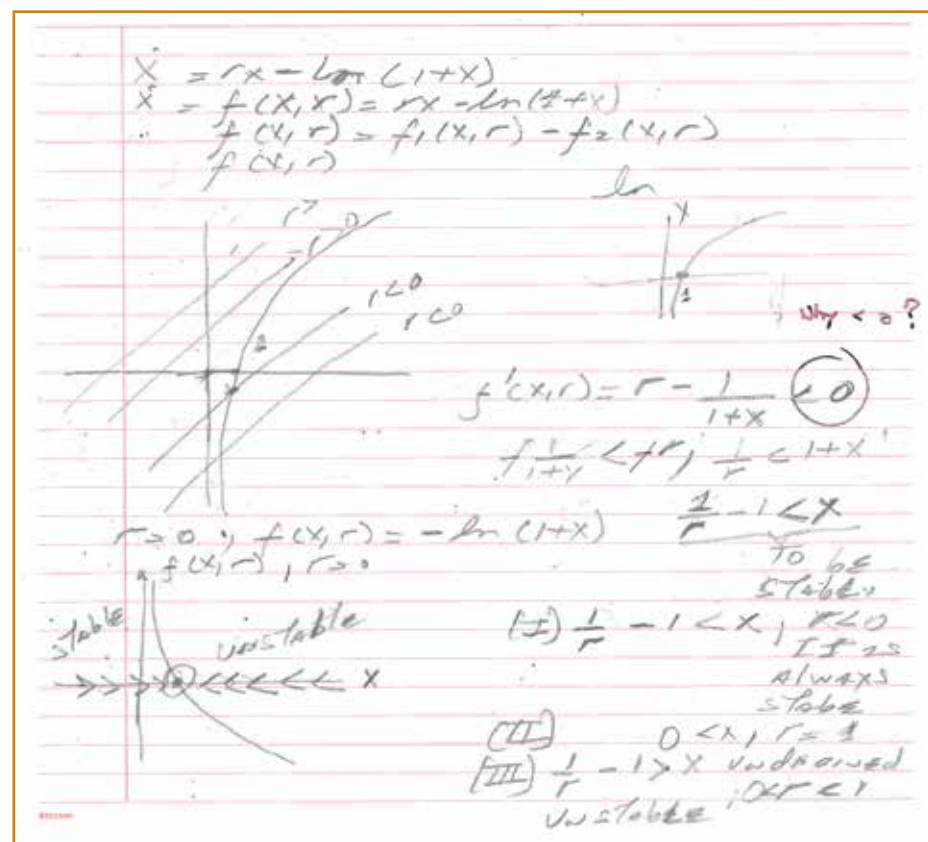
Ector draws three graphs. A small one, of the natural logarithm, looks like a side note made from scratch: it has no variable assigned to the x-axis, and the y-axis may well be labeled x but that is doubtful. The larger graph shows the same curve, although it intersects the y-axis at y = 2 for unclear reasons. There is an annotated hatch pattern with, probably, r as a parameter, twice < 0, once > 0, and once larger than something unspecified. The third graph inverts the curve – why? – and indicates regions which are associated with "stable" and "unstable". Unfortunately, the boundary between the two has no value.

Then there is a derivative of f. With respect to x, we find out when comparing to a couple of lines earlier, but this is not what you call mathematical rigor. There is an addition "< 0"

to the equation which we assume introduces a condition. What happens next is mathematical magic. We suddenly see a f to the power of r, a j, a c? And then there is an expression which must be satisfied for the system to be stable. Apparently, there are three cases to consider, which would have been logical if the second case would have had an = instead of the < and >, but it doesn't. Also, the qualification "undefined" must surely belong to the second case, but it is definitely listed under the third.

Having come this far, the amount of questions raised by the answer is blurring our minds. How to get out of this? We were expecting to find a more or less straight answer to a question, but we're blank. The single remark Siep

makes on this work is "why < 0 ?", but he might as well have asked the more existential question "why?".

Ector must have handed in this work with a lot of questions on the quality of his answers. And even if he did not expect his answers to pass, then still he must have had serious doubts on what he apparently missed while studying the course. Nevertheless, he didn't ask. We're sure he should have: for his own benefit, but also for keeping our staff sane. ∎

1. Not his real name

Introducing master associations

By: Stijn van Himste, Sjoerd van der Heiden, Lieneke Kusters

The department of Electrical Engineering has several associations to aid the students of Electrical Engineering and Automotive in different ways. There is the Study Association Thor for all bachelor and master students, and its three Master Associations especially for the master students. Next to that there is the IEEE Student Branch Eindhoven. Read below what each association does!

DSD Waldur
DSD Waldur, which means 'Draaistroomdispuut Waldur' in Dutch, is a study association for master students of the department of Electrical Engineering that specializes in power engineering, sustainability, smart grids, electric actuators and motors, automotive, and power conversion. As you might already know, these specializations are directly linked to the capacity groups of Electrical Energy Systems (EES) and Electromechanics and Power Electronics (EPE). Waldur has been founded in 1972 and its purpose is to link students to the capacity groups and companies in this unique field of specialization. The main goal of Waldur is to organize excursions, (lunch) lectures, drinks, study tours, and network events. To achieve this goal we organize a 'Waldur Wednesday' every quartile, and a biweekly coffee hour. Furthermore, Waldur has its own magazine 'Gjallar', which is published twice a year. More information about Waldur and how to join them can be found on www.waldur.nl

IEEE SBE
Meet IEEE Student Branch Eindhoven, a local dependency of the world's largest organization of technical professionals. As one of the largest student branches in the world, we participate in IEEE events such as global (programming) competitions and (student) conferences. Next to that, we also organize our own local activities, such as workshops and lectures from peer-nominated professionals, symposia and study trips. One of our main local events is the yearly Electrical Engineering Poster Competition for all Bachelor, Master, PDEng, and PhD students in our department. And of course, we organize some social events from time to time. Some examples are the new year's dinner, a barbecue, and the sailing weekend. The last thing that I want to highlight is the Women In Engineering (WIE), who organize activities by and for the female students in our department.

You can find us in Flux 6.184, or just drop us an email at ieee@tue.nl.

MA Eir
Eir is the newly formed master association which focuses on students who are interested in Care & Cure. By organising specific excursions and lunch lectures with healthcare-related companies, we hope to give students a better view of what they can do after their studies. Because healthcare surpasses the boundaries of one faculty we

also try to connect with other faculties such as BMT. Doing this you can also enjoy symposia organised by other students and see what their view on matter is. Want to know more about Eir or become a member? Just visit us on the website "Ma-eir.nl" or come to the drink we are organising in the first quartile!

ODIN
Masterdispuut ODIN is a master association for students interested in the research profile 'The Connected World'. We organize company visits, lunch lectures, study trips and various other activities to allow students to come into contact with companies in their field of interest. Make sure to join one of our activities if you are doing courses within 'The Connected World' as it is a valuable addition to your study. Also, if you are a third year Bachelor, joining our activities is a great way to discover your interests to make informed choice for your master track. Also, PhDs are welcome to join our activities. Feel free to contact us if you are interested. We are in the board room (Flux 6.184) on Monday mornings to give you more information. ∎

Je moet verliefd zijn op dit werk

By: Jerom de Haan

Jerom de Haan is begonnen als trainee bij TenneT in Nederland en heeft inmiddels zijn droombaan in Duitsland gevonden; cross-border balancing. Maar wat doe je dan en wat maakt jou een goede balancer? Jerom over techniek, energiepolitiek en passie.

'Dat ik nu bij TenneT werk, is de schuld van een professor', grapt Jerom. Tijdens zijn studie Sustainable Energy Technology aan de Technische Universiteit van Eindhoven volgde hij colleges van prof. ir. W. Kling die bij TenneT heeft gewerkt. 'Deze man gaf inspirerende colleges, waardoor ik mij ging interesseren in de wereld van TenneT; het elektriciteitswezen op hoogspanningsniveau.' In eerste instantie werd Jerom gegrepen door alles rondom windenergie. Vooral de integratie van windenergie was interessant, waarbij het ook van belang is hoe landen samen werken om al die windenergie veilig te stellen. 'Wat betekent het als een Transmission System Operator (TSO) gaat samenwerken met een TSO uit een ander land? Daar ben ik mij toen echt in gaan verdiepen.'

Gelijk speelveld

Vol overgave vertelt Jerom waar je tegenaan loopt als twee landen elkaar gaan ondersteunen op de zogenoemde balanceringsmarkt. 'Elk land volgt zijn eigen gedetailleerde aanpak om het system te balanceren (vraag en aanbod continue in balans). Zodoende ontstaan er verschillen tussen reserve-inkoop, activatiestrategien en beloning. Grensoverschrijdende samenwerking heeft zijn voordelen (goedkoper en energie-efficiënter), echter, gebrek aan harmonisatie tussen de balanceringsphylosophien in Europa leidt niet tot de juiste optimalisatie.

Het leidt vooral tot bepaalde cash flows met bepaalde winnaars. Harmonisatie is essentieel voor een gelijk speelveld.

Na dit promotieonderzoek kwam het International Trainee Program in het vizier. Jerom vond dit een interessante vervolgstap, mede omdat de mogelijkheid bestond om naar Duitsland te gaan. 'Cultuurverschillen, wat betekent dat daadwerkelijk?'

De techniek verlaten

In eerste instantie begon Jerom zijn Trainee Program gewoon in Nederland op de afdeling Customer and Markets. Hij bouwde een intern netwerk op, leerde de organisatie kennen en bekeek het speelveld in Nederland. Hoe zorg ik ervoor dat ik een balanceringsmarkt heb met spelregels waardoor marktpartijen (e.g. Nuon, Essent, etc.) geprikkeld zijn om hun programmaverantwoordelijkheid na te komen. Dit betekent dat ze opwekken wat ze beloofd hadden op te wekken, ook tijdens onvoorspelbare weersomstandigheden. 'Ik bekeek niet alleen alles vanuit de techniek, maar ook financieel en strategisch. Je hebt te maken met verschillende partijen en belangen. Na deze nadere kennismaking met het werkveld van TenneT in Nederland vertrok Jerom naar Bayreuth in Duitsland. Hij werkte hier op dezelfde afdeling, maar de invulling van het werk werd heel anders. 'De Duitse markt steekt anders in elkaar. Ze hebben niet zoals in Nederland één TSO, maar vier. Dit geeft een totaal andere dynamiek. Daarnaast gaat er een wereld open, gezien de kleine interculturele verschillen.' Tijdens deze periode van zijn traineeprogram kwam zijn droomfunctie vrij: cross-border balancing. Hij solliciteerde en kreeg de functie. 'De steun vanuit TenneT Nederland was heel prettig. Als ze in je geloven dan denken ze heel erg met je mee. Nu vervul ik mijn droomfunctie en volg ik nog wel verder het development-programma van het International Trainee Program.'

Energiepolitiek

'Als balancer zijn mijn werkdagen gevuld met onderzoek, meetings en ik reis ook veel. Dit betekent dat ik veel met buitenlandse collega's discussieer en afstem om tot een Europese balanceringsmarkt te komen.' Om de Europese markt dezelfde kant op te bewegen

is Jerom internationaal veel onderweg om het TenneT-belang en zodoende het belang van de consument te behartigen. Elk land heeft zijn eigen zienswijze. 'Sommige TSO's werken nog steeds samen met grote elektriciteitsopwekkers en hebben vaak een dubbele/financiële agenda. Dit is allemaal gerechtvaardigd, maar TenneT staat voor een eerlijk speelveld, en dat is een grote uitdaging om dit Europees om te kunnen zetten. Het is een interessant spel, maar ook zeer intensief. Wat zijn de verbogen beweegredenen, wat is de strategie. Wordt de leveringszekerheid wel zeker gesteld, of zijn we alleen met geld bezig?' Aan Jerom de taak om intern af te stemmen en strategisch positie te kiezen om zo tot het gewenste resultaat te komen.

Social skills

'Ook al ligt de techniek nooit, er komt meer bij kijken om je gelijk te behalen', zegt Jerom op de vraag hoe hij alle neuzen dezelfde kant op krijgt. 'Ik ben constant op zoek naar medestanders, naar TSO's die hetzelfde einddoel voor ogen hebben. Zo zorg je ervoor dat je samen sterk staat en draagvlak vergroot.' Social skills zijn hierin enorm belangrijk. Jerom maakt duidelijk dat goed luisteren, een vertrouwensband opbouwen en geduld cruciale vaardigheden zijn. 'Dit heb ik althans geleerd nu ik in Duitsland woon en werk. Cultuurverschillen zijn een grote uitdaging, en alhoewel ik jaren alleen maar met de techniek bezig ben geweest, draait het uiteindelijk ook om de mens. En die krijg je helaas niet gesimuleerd. Je moet verliefd zijn op dit werk, anders is het niet vol te houden.' ∎


Icons of EE: Hendrik Wade Bode

By: Matthijs van Oort

Though he might not be as famous as Electrical Engineers like Nikola Tesla and James Maxwell, the name Hendrik Bode should ring some bells for most engineers. Every student or staff member in the field of Electrical Engineering will have drawn at least one of his famous plots during courses like Systems and Control Systems, or as a part of research. Hendrik's research can be used in nearly every field of engineering and has had some great impact on the world as we know it today.

Hendrik Bode was born in the year 1905 in the state Wisconsin of the United States. His father was a professor on the University of Illinois and stimulated the young Hendrik in the field of science. At the age of 14 he already graduated from high school. He even applied for the University of Illinois, but his application was declined because of his young age. He eventually ended up studying at Ohio State University in the field of Mathematics. At an age of 21, Hendrik received his master's degree in this same field.

After his graduation and an additional year of working as a teaching assistant, Bode started working for the – now famous – Bell Labs, which was founded just one year before Hendrik's graduation. He began here as a designer of electronic filters and equalizers, but after several years Hendrik specialized himself in electronic network theory and tele-communication systems. While working for Bell Labs, he even got the chance to complete a PhD in the field of physics in 1935.

After graduation, Hendrik started developing asymptotic phase and magnitude plots, better known as Bode plots, which can be used to display the response of systems to a range of frequencies. These plots where a new way for many engineers to design stable systems with a fast response in the time domain, using the Bode plots in the frequency domain. Along
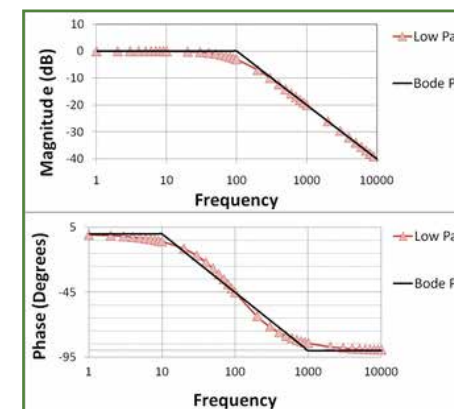
with Harry Nyquist, he also developed the conditions needed for a stable amplifier circuit, based on his Bode plots.

Hendrik's life changed with the start of World War II. He started putting his efforts in military applications which could be obtained from his prior research. He started working on the Director Project, which was a project led by his employer Bell Labs with the aim of anti-aircraft systems. In this project, Hendrik's goal was to design a system which could use the target location data from a radar, and feed this information to an artillery system to shoot the aircraft out of the air. This might look as a simple task, but because of the extremely high speeds of the aircrafts and their unpredictable direction, the system had to work very fast and very accurate.

While WWII brought a lot of bad stuff to the world, it also had some good sides. The necessity for new innovations brought some fields in science to whole new levels. Hendrik Bode himself explained this as a shotgun marriage, where the pressure of a problem generates a linkage between two completely different fields. This is why the war helped the field of control systems to obtain higher speeds, higher accuracy and better timing than was ever possible before.

To see the huge impact of Bode's work on nowadays life, we have to look at the impact of his inventions during crucial battles in WWII. The most used automated fire control system at that time (by the allied forces), was the Director T-10 designed by Bode's group. During D-day, around thirty units were deployed around Normandy to protect the allied forces from the Nazi's air forces. Another important example is the bombardment of London during the London Blitz. During this attack, around 100 Director T-10's where deployed around London. While they could not hold back every V-1 rocket launched by the Germans, the T-10's managed to shoot down nearly half of the total 1286 rockets.

After the war, Bode continued working for Bell Labs. He got several promotions and eventually ended up being the director of Bellcomm, which is a company who helped working at the Apollo program. Next to working as the director of Bellcomm, Hendrik took place in a committee called NACA (which is the predecessor of NASA) under the lead of Wernher

von Braun. The most ironic thing about this committee was that the man who designed anti-aircraft artillery to shoot down German V-1's (Hendrik bode) ended up sitting around the same table as the man who designed the V-1 (Wernher von Braun).

Looking back at the impact which Hendrik Wade Bode had on the history of engineering, and also nowadays engineering, we can conclude that Hendrik is one of the great engineers of the last centuries. ∎

Amazement in Russia and Korea

By: Martijn de Kok

Being a student is not only about studying, and there are many things you cannot learn from a textbook. This was made clear to me during my own introduction week in 2014, when the participants of the Prosperando study tour had just returned home from Brazil. The fantastic stories and valuable lessons they brought with them from the other side of the globe are unique to the student life. From that week onwards I knew I wanted to participate in such a study tour.

Fast forward to around one and a half years ago, when a small group of students including myself decided it was time to organize the next study tour for Electrical Engineering and Automotive students. Determined to organize an adventure that would amaze our participants with technological excursions and cultural shocks, we started our weekly meetings. The first order of business was, of course, to determine what country to visit.

Russia has been a forerunner in science and technology for a long time. Russian scientists and engineers have made numerous important contributions in nearly all fields, including physics, computing, electrical engineering and space technology. In South Korea, scientific research and engineering play a significant role in culture and politics. With several large manufacturers at their

Botanical garden in Moscow in front of Lomonosov Moscow State University

disposal, the South Koreans are often the first to experience innovations in consumer technology.

Although they could not be more different in size, alphabet or culture, both countries were very suitable destinations for our study tour. As a result, we had a hard time deciding between the two. In the end we elected not to choose at all and to simply visit both countries instead. Thus the name SPARK was born: Students Pursuing Amazement in Russia and Korea, combining both the goal and

destinations of our tour. Seventy weekly meetings, dozens of phone calls and hundreds of emails later, twenty-eight students and two supervisors from our department arrived at Schiphol airport in the morning of July 11th. Our four-week adventure was about to begin.

The first stop of the SPARK Study Tour was Saint Petersburg, the old capital of the Russian Empire. We visited two universities on the very first day: the Polytechnic University and ITMO. These two excursions served as a good reminder that the study tour would not be like any other holiday. The next day helped us retrieve our holiday vibes as we visited the Hermitage museum and went on a boat tour through the city's canals. In Saint Petersburg we also went to the University of Film and Television, where we were given an extensive overview of video, lighting and audio equipment used in cinematography. After one last day in which everyone was free to do what they chose, we boarded the night train to Moscow.

After a good night's sleep in the train (at least for some of us) we arrived in Moscow, where we dropped our bags off at the hostel and went straight to Gorky Park. Here, we and hundreds of Russians enjoyed a relaxed Sunday morning. In the afternoon we were free to explore the rest of the city, where we were amazed by the number of beautiful old buildings and lush parks. After an early night to catch up on some lost sleep, we suited up for our first company excursion. Mikron is

Boat tour in Saint Petersburg

Q&A session with North Korean refugees

Russia's leading manufacturer of semiconductor integrated devices. We were given a tour through the manufacturing facilities where all of Moscow's public transport RFID cards are produced. In Moscow we also visited the Lomonosov Moscow State University, Moscow Power Engineering Institute and Skoltech Institute of Science and Technology. Each showed us their research facilities and engineering specialities. We also organized a pub crawl and a dinner for all participants. At the latter activity we had a special visitor: professor Elena Lomonova happened to be in Moscow that day and joined us for dinner. This turned out to become one of the study tour's legendary evenings.

After one and a half week in Russia, we flew to Seoul via Novosibirsk. We immediately took the train to Busan, the harbor city at the southern end of the Korean peninsula. Here we visited the massive company Doosan, which constructs water desalination facilities and power plants. During this excursion we saw a 17.000-ton press slowly turn a glowing 410-ton rod of solid steel into the motor shaft of a ship's engine. If that wasn't impressive enough, we were also shown how Doosan produces generators and reactor vessels for nuclear power plants. On this day full of technology we also visited the Korea Electrotechnology Research Institute (KERI) and Changwon University.

After a few days of exploring Busan we took a bus to Seoul. Halfway we stopped for two excursions in the city of Daejeon. The first was KAIST, the Korea Advanced Institute of Science and Technology. Here we were received by Electrical Engineering students, visited several labs and enjoyed a good lunch. The second excursion was to ETRI, the Electronics and Telecommunications Research Institute, where we were shown some of the developments they had made in the fields of image processing.

On the first day in Seoul, we suited up again for our company visits to Green Power and Samsung. Green Power develops wireless charging solutions for electric vehicles and industrial applications. Samsung needs no further introduction: we visited their Innovation Museum where an entire timeline of electronics and telecommunication was on display. The following day we went to a Buddhist temple near Seoul where we experienced the temple life first-hand for one night. We participated in meditation sessions with the head monk and did a series of 108 prostrations. It was without a doubt an experience we will remember for a long time. Back in Seoul, we visited Sungkyunkwan University and Seoul National University. We also went to the Demilitarized Zone between North and South Korea. In this heavily militarized zone we visited an infiltration tunnel and an observation platform, and actually crossed the border within the Joint Security Area. During our last day in Seoul, we went to an organization called Teach North Korean Refugees. Here we heard the impressive stories of two North Korean defectors, and had a Q&A session with them.

SPARK's final destination was the island of Jeju. On this popular holiday destination we went on a bus tour, which brought us to several volcanic craters and the world's longest lava tunnel. As the tour's final excursion, some of us visited the thermal power plant that provides roughly a third of the islands entire power supply. After one last day of relaxing in the sun, we started our return trip home. After nearly a month of traveling and a day with twenty-three hours of sunlight we finally slept in our own beds again.

Our warmest gratitude goes out to the many parties that have supported our study tour. Without them, SPARK would not have become as successful as it has. The amount of memories that we have built up in only four weeks is staggering: we have travelled through two countries that are completely different from the Netherlands and each other in nearly every which way imaginable. Moreover, there was a unique and beautiful atmosphere present within our fellowship of travelers.

Next to being a fantastic and joyous adventure, a study tour is the perfect opportunity to experience other cultures and to visit technological institutes and high-tech industries in a completely different environment. This is the sort of experience that will hopefully trigger students to go one step further in becoming world-class engineers who look beyond the borders of culture.

Being a student is not only about studying, and there are many things you cannot learn from a textbook. Hopefully our stories might inspire a new generation of students to organize a study tour of their own and create amazing experiences and memories for themselves. ∎

SPARK Study Tour committee

Whose desk is this?

Introduction Week

By: Dirk Buijvoets

Unfortunately something went wrong while publishing this article in the previous edition; the final section was not published. Therefore we would like to correct our mistake by publishing this article completely in this edition. Enjoy! Did you forget who wrote it? Take a look at the page 38 of the previous edition (Volume 10, Issue 2, June 2017).

As Albert Einstein asked: "If a cluttered desk is a sign of a cluttered mind, of what, then, is an empty desk a sign?" My desk is usually occupied with piles of papers and piles of to-do lists. Periodically I just pick up those piles, and transfer them to their final resting place: the big waste-paper basket in the sky. However, since being invited to write this article I've cheated and kept my desk cleaner and emptier than usual. Now the photo's been taken, it'll probably quickly revert to its natural state.

Although being from Brabant I didn't study in Eindhoven, or indeed the Netherlands. Instead, on a foggy afternoon in 1984 I took the train and ferry to Britain to study at university. This was a great cultural experience, before the Internet existed, and before the British knew about coffee. I spent the following nine years in Wales, England, and Scotland, leading to a doctorate in computer science on formal verification of digital circuits.

After some wanderings I returned to the Netherlands in 1995, to work for the Philips Natlab and NXP Research for fourteen years. In 2010 I fully moved to academia as full professor, in the Electronic Systems Group of professor Otten.

As might be expected from anyone working at the university, I like innovation. Innovative research is carried out in my CompSOC (predictable and composable multi-processor
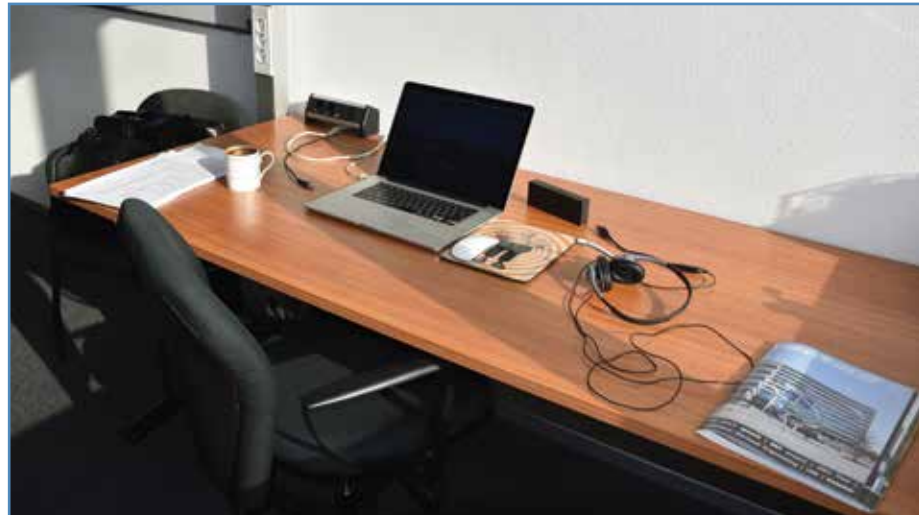
system on chip) team of bachelor and master students, PhD students, and staff. For me, working in a team is crucial to my enjoyment of work. I think we all have more fun, and are also more productive, when working together towards a shared long-term goal, working with a common platform and tools.

Innovation also takes place in teaching. To cope with growing student numbers in the EE/AU bachelor I have automated the examination and grading of my courses using Oncourse. To eliminate the substantial fraud that occurs during automated examinations on student computers (BYOD: Bring Your Own Device, not to be confused with Bring Your Own Drink) Martijn Koedam and I developed and deployed STEP (the Secure Test

Environment Protocol). In essence, students boot their computer off a USB stick that restricts access to only the exam. This method is being adopted by the TU/e as a whole.

The TU/e is rightly known for its excellent collaboration with industry in the Eindhoven region and beyond. Having spent years in industry I think it is important to spot trends and (future) problems in industry and society. Following this, we develop concepts and principles addressing those problems, which must then be proven to a sufficient degree, before being (hopefully) taken up by industry. Recently I joined Topic Products, a company in Best, as part-time system architect to ensure that my link with the "real world" remains sufficiently strong.

To finish, perhaps a last few words on Flux. Although I was sad to leave Potentiaal with its nineteen-fifties decor, I'm a fan of the open spaces in Flux. In general it's nice to see the hustle and bustle of the students. Climate control can, of course, be improved. However, creative hackers of the Electronic Systems group reverse-engineered the wireless protocol of the window blinds, such that they can now be controlled directly from my computer, without even having to reach for the up/down button one metre away. But the best improvement in Flux is rightly reserved for Walhalla, moving from the lowest world Helheim (previously on floor -1) to the highest world Asgard (now on floor 6). ∎

Before every academic year, the next generation of students is introduced to Eindhoven University of Technology and Eindhoven's student life. These so-called kiddos spend a week exploring the campus, celebrating parties and getting to know the many associations Eindhoven's student life has to offer. Many electrical engineering and automotive students have great memories of their own introduction week and were quick to join this year's edition as parents. Two parents guide a group of around 8 kiddos during the entire week, showing them around and making sure they have a great time.

Not completely certain of what awaits them the upcoming week, the kiddos were welcomed by the Thor Introduction week Committee and by Bart Smolders, the dean of the Department of Electrical Engineering. The freshmen were also united with their 'families' and the groups were given gadgets that would make them and their fellow kiddos unique and recognizable. Some kiddos would spend the rest of the week wearing police outfits, others would be dressed as dwarves and partying together with Snow White, her loving prince and the evil witch. For the freshmen from above the rivers, the introduction week offers a small taste of carnival and "Brabantse gezelligheid"!

Each group worked on an engineering case with small self-driving vehicles, played water games and had their pictures taken for the face book. The groups also did several bonding activities to get to know each other better. Speaking of bonding activities: there are none better than chasing a candidate board member and working together to relieve the unfortunate soul from their stifling neck garment.

Yes, kandies were present this year as well as all their undignified incompetence. Aspiring to become fully-fledged board members of Thor in the upcoming year, they set out to let their faces be known to all potential new members. They did this by entertaining the kiddos whenever and wherever they could, by making breakfast and by showing off their dance moves at every party. Truth be told, they have been a great help in making this introduction week as memorable as it was.

During the faculty tour, the upcoming first years were guided through the Flux building, getting to know the layout of the building, exploring several labs and becoming acquainted with Thor. After the Green Strip Market, where Thor and all the other study associations were also represented, the kandies proved their incapability yet again by losing all the important General Members

Meeting artefacts they were supposed to take care of. Luckily, with the help of parents and kiddos, the kandies were able to retrieve the artefacts and put everything in place before the board arrived. During the barbecue that followed, the new "tap auto" had its time to shine. Like every year, the car drew quite a lot of attention!

There was plenty of opportunity for partying. Thor had organized a party in the Tipsy Duck, there was a pub crawl and of course there was the Compositum party. After a week of drinking and dancing, the kandies had prepared a hangover breakfast to prepare everyone for the All TU/egether festival, which concluded a spectacular week.

Whether you have experienced the introduction week as a kiddo, as a parent, as a member of the Thor Intro Committee or as a volunteer, each year comes with its own great memories. All of these groups are essential in making the week as memorable as it was. For that, I would like to thank all of them. I hope all kiddos, parents and volunteers enjoyed it as much as I did, and I already look forward to seeing all of them again at the after-intro party in Het Walhalla! ∎
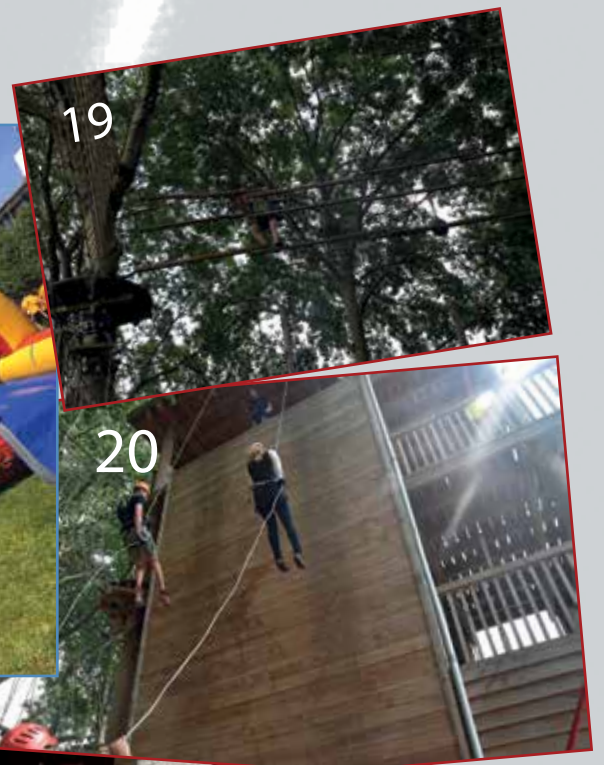
1. Tappersopdracht Arwin
2. ACCI retrogames
3&4. Faculteitbureau-uitje
5&6. Education day
7. 231st GMM
8. Donderdagploegfeest
9 till 12. ACCI weekend
13. Tappersopdracht Meeuwis
14&15. Sportsday
16&17. Alice in Donderland party
18. Tappersopdracht Marrit
19&20. Active members day
21&22. SPARK preparation

TU/ecomotive - Lina

By: Noud van de Gevel.

Since recent years, improving efficiency has been the focus in the automotive industry. While optimizing fuel efficiency to reduce emissions is a positive development, it is accompanied with negative side-effects. Car manufacturers opt for lightweight materials such as aluminum and carbon fibre to create lighter, more efficient cars. Processing of these materials however, requires more energy than steel, the material which they replace. Consequently, energy that is saved while driving the car is now spent during the production phase. In addition, recyclability of these lightweight materials is lacking significantly compared to steel.

TU/ecomotive utilizes a combination of bio-based composites and bio-based plastics to create their chassis. The bio-based composite is made from flax, a plant that can be grown in the any moderate climate. The bio-composite has a strength/weight ratio similar to glass fibre, but is manufactured in a sustainable manner. A honeycomb-shaped core produced from bio-plastic, known as PLA and made entirely from sugar beets, is placed in-between two flax composite sheets to provide stiffness to the strong composite.

This year the team built Lina. Unique to Lina is that her entire chassis, body and interior are made from bio-based materials. Thanks to a weight of just 310 kilograms, the car is extremely efficient while driven as well. Producing cars in this manner makes them sustainable in all their life phases.

Where carbon fibre and aluminum lack in their production and recycling phase, the bio composites will not. By using the bio composite materials wherever possible, the total sustainability will increase dramatically.

Lina is a light city car of only 1.3 meter wide,

Producing cars in this manner makes them sustainable in all their life phases.

1.4 meters high and 3.5 meters long. Its size makes it optimal for city transportation. By placing the wheels at the outermost positions the team is able to fit the driver along with three passengers in the car.

The chassis, or backbone, of Lina is completely made out of the earlier described sandwich panel. The layers of flax are laid out by hand,

thereafter it will be compressed by a machine. The end product is a thick sheet of flax fibres. These sheets are cut out in the desired dimensions. When all the core material is placed in between the flax sheets the chassis is assembled like a piece of furniture from Ikea, but then self-designed and more complex obviously.

The electrical energy is stored in three modular battery packs. Each pack weighs 10 kilograms and can be easily removed from the car to swap them. This enables the driver to choose how many batteries he or she want to bring along. The packs have a range of 35 kilometres.

Lina will use the newest NFC technology to be everybody's car. A device containing a NFC-chip can be granted a key to the car. When the door is unlocked, Lina will recognize which user is getting into the car. Personal settings like music playlists, phone contacts and recent destinations can be loaded in the system right away. Additionally, this technology can be used for future car sharing applications. The car keeps track of driven kilometers and battery usage to determine the costs per user. Car sharing is an upcoming trend in urban areas, which is supported by TU/ecomotive, as it reduces the number of cars needed per inhabitant, and therefore further reduce polluting emissions.

In May 2017 the team unveiled Lina during the Dutch Technology week in the Klokgebouw. Not only their partners, coworkers and friends were at this event, but attention from (foreign) media was drawn as well. Since this event many media featured an article about Lina. Some of them: the New York Times, BBC, Washington Post, Reuters, NOS and many local news agencies.

Most media show up during one of the team's many events. In May the team participated in the Shell Eco-marathon in London. Afterwards they went to the local Dutch embassy to host an event together with NXP. Two weeks later the team showed their creation to their own country. They went to the city hall to see the mayor of Eindhoven and drove up to The Hague to meet with members of the Second Chamber. They had a photoshoot in the exclusive Louwman museum and went to Copenhagen to present, and win, at the Gron Dyst at the local University. On top off all these activities the team has also managed to obtain a Dutch license plate during the summer. This means that Lina is now officially road legal! ∎

The bio composite Lina is made of: Flax

Werken bij Prodrive

Eigenzinnig waren Pieter Janssen en Hans Verhagen, de oprichters van elektronicafabrikant Prodrive Technologies, vanaf het begin in 1993. Ze wilden kosten-, product- én relatieleider zijn en bewijzen dat produceren in een hogelonenland loont. Met succes, want Prodrive Technologies is uitgegroeid tot een volwassen onderneming met een omzet die in 2015 naar verwachting 130 miljoen euro bedraagt. Vorig jaar groeide het met bijna 20 procent en voor de komende jaren wordt verdere groei voorzien. Het bedrijf is er helemaal klaar voor, dankzij investeringen in automatisering en nieuwe huisvesting.

Conceptueel denken

Prodrive Technologies ontwikkelt en fabriceert industriële- en consumentenelektronica voor uiteenlopende markten, van media en medisch tot industrie, automotive en energie. In de kern gaat het steeds om een elektronicaproduct of -platform en daar komen meer en meer software en mechanische onderdelen voor bijvoorbeeld behuizing of koeling bij. Zo ontwikkelt Prodrive Technologies zich tot system supplier. Het eigenzinnige van Prodrive Technologies begint ermee dat het vanaf het eerste moment samen met de klant de kosten onder de loep neemt. De fout is vaak dat men pas achteraf gaat kijken naar de kosten. Die
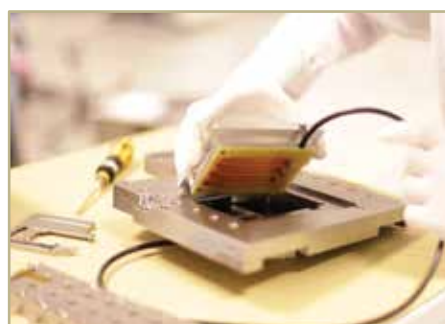
hele voortbrengingsproces van elektronische producten en systemen. Dat omvat ontwikkeling, engineering, testontwikkeling, productie, lifecycle management en service, en dat doen we allemaal in Nederland. We

zitten echter al in het concept van een nieuw product besloten. Met conceptueel denken focust Prodrive Technologies zich daarom in de beginfase op die kosten.

Maximaal automatiseren

De tweede winst valt te behalen in de productie. Verhagen: 'Als je in het begin focust op de kosten, dan word je kritisch op je eigen processen. Daarom is er veel interactie tussen engineering en productie en bemoeien wij ons als management intensief met wat wij als het primaire proces beschouwen, het

hebben hier daarom heel veel technologieruimtes, waaronder een kwalificatieruimte voor de vrijgave van producten. Dit is een soort High Tech Campus, heel compact in één gebouw.' Vanuit de focus op efficiënte productie kiest Prodrive Technologies ervoor om maximaal te automatiseren.

Technology

Prodrive Technologies onderhoudt nog steeds nauwe banden met de TU Eindhoven. Janssen studeerde er en Verhagen was er werkzaam. 'De samenwerking met de TU/e is

niet alleen belangrijk voor de nieuwste technologie, maar ook voor de aanwas van talentvolle medewerkers. Inmiddels is een van onze medewerkers van het eerste uur, Korneel Wijnands, benoemd tot research fellow in de afdeling Electromechanics and Power Electronics van de faculteit Elektrotechniek. Hiermee vloeit kennis en ervaring uit het bedrijfsleven ook weer terug in de universiteit en worden de banden verder versterkt', aldus Janssen. Verhagen: 'Technologie is de drager van ons succes en daarom intern de baas. Buiten is dat natuurlijk de klant, maar hier binnen staat de ingenieur centraal. De bereidheid om te investeren in technologie is hier ook gigantisch.' Zo is technologie leidend en bewijst Prodrive Technologies zich daarmee als kosten-, product- én relatieleider, stelt Verhagen: 'Met conceptueel denken zet je de juiste producten en processen neer, met operational excellence zorg je voor het juiste kwaliteitsniveau tegen de laagste kosten en met ons salesteam bereiken we customer intimacy. De klant behagen, dat staat steeds centraler, bijvoorbeeld door de complete verantwoordelijkheid voor elektronicasystemen te nemen.' ▪

Intimate technology

By: Jan Vleeshouwers

Why do technology and science seem unstoppable? Where does this relentless human drive come from? For some insight, I was advised to read "The techno-human condition" (THC), a book written by Braden Allenby and Daniel Sarewitz [1] during their Templeton fellowship in 2007 and 2008.
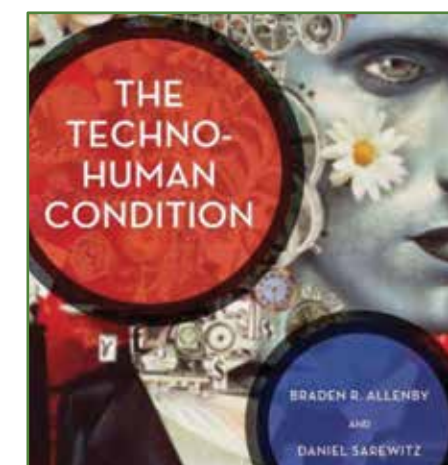
Although the authors set out to explore transhumanism, the essay is essentially on the complex and unpredictable effects of technology of the world we live in. It contains many interesting ideas and analyses on this topic, which I will review below. Rather disappointingly, however, the book comes nowhere near a synthesis or a conclusion.

Technology is in every vein of our society

To begin with an elementary but important idea: if you think current technological developments are in any way radically new, this book makes you forget about that quite quickly. At best, the pace of this development is not constant, but man has always tried to control and adapt his environment and himself, in every way possible, through activities we label technical.

Another disillusion perhaps: technology has nothing to do with progress. "It emerges from social systems and thus necessarily reflects, internalizes, and often changes power relations and cultural assumptions." Some are better off, others are not, let alone other life forms and the inanimate world. Technology imposes behavior on humans, not progress, and there is often little room for choice on the side of the individual.

THC explores in great detail how technology permeates human society. It usually starts with a simple tool which is nicely doing what it is intended to do. Then, when the tool spreads, side-effects start to become clear.

Understanding and addressing technological development

Already in the beginning of the book, the authors plea humility. Humanity may seem to have gathered a large amount of knowledge, but still it understands very little of the permanently changing world it is living in. Since we are not rationally able to predict the effects

Society needs to organize itself to enable the tool to be used. Additional infrastructure may be needed, laws may have to be adjusted, and society needs to adjust to a new power balance and to unforeseen behavior elicited by using the new technology. In a later stage, man will have incorporated the development into his culture, economy, ideology, religion and politics, each of which will have had its portion of change.

I'll give you an example from the book, one of the very many. In the 1960s, cochlear implants were first used to cure deafness, and they are currently used widely, also for very young children because being able to hear is a condition for learning to speak. The technological development made doctors and parents turn away from teaching children sign language, but that was strongly objected to by organizations of deaf people, because sign language is very important for the community of the deaf. The controversy continues until this day.

Another example from the book is railroads. Trains were built as a means to transport people and goods quicker than with horses. But the railroads had large effects on industry, on trade character and scale, on the contacts people were able to sustain, on warfare, and on occupations either emerging or declining. But it also had its effect on how humans handled time: railway stations needed to synchronize their clocks in order to schedule train arrivals and departures. This synchronizing process took over 50 years.

For most technological findings you will see related changes in society, like the examples above. In most cases, the way in which society embeds a technology is quite unpredictable. THC convincingly documents this process. But from this point forward, the book loses its grasp on the topic, although the questions addressed are still quite relevant.

of technology, THC proposes to give up and accept: the best we can do, the authors say, is to muddle forward, intelligently. Predictions are considered impossible, the best we can do is make scenarios.

This line of thought is extended to include most of the Enlightenment inheritance. Technological development cannot be connected to progress. Liberty and equality, Enlightenment ideals, appear to be continuously threatened by it. Technology is not a natural companion of human dignity. Free will is probably an illusion. In the age of globalism and opportunities for the individual, there is nothing more uncertain as what an individual is. These are all compelling observations, but there is nothing in THC to replace Enlightenment except for the muddling, and that does not sound as a very human-like response.

The human species survive and flourish in the evolution of life thanks to the control humans can exert on the environment, thanks to its ability to use tools. This technical behavior is evolution-based, so I think humanity will not give up trying to grasp and control the world it is living in, no matter how complex it becomes. In fact, this is the essence of being human.

For the same reason, the drivers for technological change are much more fundamental than the ones the authors mention. It is not economic efficiency, and competition for military and cultural dominance. Technology is just the way in which humanity survives in this world: it is innate behavior, strengthened by evolution.

So please go ahead, read the book, and supply me with more ideas on related topics. If technical behavior is innate, then why would we fear it? Is it because it is reducing our individuality? And more close to home: how are engineers involved in all this? Should we appeal to the little engineer which is in all of us?

[1] Allenby, B.R. and Sarewitz, D.: The Techno-Human Condition. MIT Press, 2011. ▪

Xplore Your Master 2.0

By: Huug de Waardt

The organization of the Master Information Days goes back a long time in the tradition of the Faculty of Electrical Engineering. Early records show traces back to 2000, most likely it was there already many years earlier. The intention was and is to prepare and assist third year students to make a well-balanced choice for their master program including electives, internship and the research chair they prefer to carry out their graduation project. In 2003 the so-called "Informatiedagen" were renamed to Explore Your Master (EYM) as suggested by emeritus professor Djan Khoe.

Over the last years both the education structure as well as the Electrical Engineering program changed considerably. University-wide, the Bachelor College was implemented introducing major changes in the curriculum, e.g. the USE-program, basic courses, and coherent elective packages. In addition, the master program was modified accordingly. This resulted in a very positive resonance on the influx of first year students. The number increased substantially over the last years, which now starts to yield a growing number of students entering the master phase yearly. Although very positive, it also reveals

the contours of the absorption capacity of master students for particular research chairs. This might affect the quality of the graduation projects. It is not unthinkable that some research chairs are forced to be restrictive in their admission policy of new graduate students in the future. Therefore it is our intention to make the third year bachelor students aware of the full scope of graduation options as offered by the various research chairs. It will not always be possible to match student preferences with the available capacity in the research chairs. For the students it is very important to realize that most likely another research chair offers a second best option.

It is our approach for the next academic year 2017-2018 to combine the successful elements from the current EYM procedure and the experiences from the recent Fluxcursions into one program in order to extend and enhance the information exchange to the third year students over the whole year. We will start with the BEP kick-off (end second quartile). By extending the BEP kick-off (which is the launch moment of the BEP projects), a first opportunity arises to reach the majority of the future master students and to present the basic lay-out of the master program. In the

fourth quartile, we will organize three larger Fluxcursions, each one aligned with one of the societal themes Care & Cure, Connected World and Smart Sustainable Society. Besides project demos, the corresponding chairs will supply project and course information. At the end, the students should have a clear picture about their research chair of preference and should be able make an educated selection of recommended core courses. The week preceding the first lecture week in Q1 is assigned to the so called Master Kick-off. We will exploit this opportunity to prepare the students for the master curriculum in full detail, as at the end of Q1, a choice has to be made for the specialization courses in Q2 and Q3 which in turn determines the research chair of choice. Moreover, we plan to initiate a Master Graduation Project Marketplace in the end phase of Q1. Well in advance of the start of the master graduation project, students can express their preference for the research chair of interest and discuss the required package of electives and specialization courses. With representatives of the research chair, they can also discuss the orientation/direction of their graduation assignment. ∎

Fluxcursions

The Fluxcursions were very interesting and a good source of extra information to make a balanced and well-considered choice, what master I will continue my study in Eindhoven. In general, first a presentation was given by a professor of a certain research group of half an hour to an hour. In this presentation a global overview was given to us on what the main subject of the research group is and what research they are currently

After going to the Explore Your Master days, I had several interesting options for my master's program. This, in combination with a rapidly advancing deadline at the end of my bachelor, forced me to make a choice with only factual information. The Fluxcursions allowed for something far more useful, an interactive tour of the research groups and their respective facilities. They allowed me, and several others, to ask questions about current and future projects and developments at each research group.

doing, but also in what kind of research you as a master student can participate. This was for me one of the main reasons I enrolled to two Fluxcursions, MsM and PhI. Also a link was always made to the industry and other universities that the research group was collaborating with. They also showed what the prosperities were for the future. After this presentation the labs are shown and often a master or PhD student is joining us to tell

They also allowed us to meet the people working on those developments in person. I think this is a great way to get a sense of what it would be like to end up working for the research groups, instead of just giving a general presentation. Personally, I find the gut feeling I get when participating in a tour more important than just the general information about the departments themselves. This became evident during my Fluxcursion with the department of ES. It convinced me to pick Electrical Engineering over Embedded

us about their experience. During the MsM Fluxcursion we had a tour through the labs on floor 8 and during the PhI Fluxcursion we first got a tour in the cleanroom, which was quite special because the cleanroom is normally not open for visitors.

Alain van den Bosch ∎

systems, because of its practical approach to learning. This is something that would be very hard to convey during a presentation. Overall I think the Fluxcursions were a great introduction into the possibilities of the master's programs of Electrical Engineering, and they have definitely helped me with making a better informed choice.

Indy van den Heuvel ∎

As a second year student with intentions of finishing my bachelor program of Electrical Engineering in the upcoming academic year, I wanted to orientate myself on some of the master's programs. There are a lot of research groups to choose from in the Electrical Engineering department and even more master's programs from other faculties. I personally am interested in multiple subjects in Electrical Engineering and therefore will have trouble choosing my master's program next year.

Kvasir, the committee that organizes multiple workshops, lunch lectures and excursions, organized multiple Fluxcursions. These Fluxcursions are small excursions inside the Flux building, where you will visit a research group. During these excursions you will have informal contact with researchers to whom you can ask questions freely. In these excursions you will get a presentation or a tour of the research group followed by several projects which they have finished or are working on. The Fluxcursions I attended were these of the Electromagnetics (EM) group and of the Electromechanics and Power Electronics (EPE) group.

During the Electromagnetics Fluxcursion one of the employees showed us around in the multiple laboratories where research was conducted. These laboratories are very different from the normal rooms in Flux since they are sealed by special windows and a special door, which keeps (atmospherical) electromagnetic radiation from entering the room. Several PhD-students as well as master students and researchers were working on their own projects at that time. These projects mainly included antenna design projects and healthcare applications. Some of the applications developed would also be brought to the market. After a glance at some of the projects there, we were shown around in their antenna measurement facility (anechoic chamber), of which I personally did not even know its existence inside Flux.

During the Eletromechanics and Power Electronics Fluxcursion, we were shown around in a part of Flux where mechanical machines were designed, tested and improved. They showed us several interesting projects, which included a movable platform that could levitate on the floor, and a moveable platform that hung from a ceiling

without touching it. These platforms were floating because of electromagnetics and were designed to reach accelerations up to several times the gravitational acceleration. These machines could be applicable in the production of microprocessors.

After these Fluxcursions I conclude that I have gained more insights into these research groups and that it hopefully will now be easier to choose my master's program.

Bart van Erp ∎

Vanderlande excursion

By: Bram Lustenhouwer

Vanderlande is most commonly known for its leading role in baggage handling systems on airports. With this fast and reliable system, the Vanderlande systems move more than 10.1 million pieces of luggage per day on 600 airports worldwide. But they are also well known for other systems, like parcel sorting and handling systems, and warehousing. With more than 5,000 employees worldwide, Vanderlande has established a global reputation as a highly reliable partner.

The day started in their new office in Veghel with a presentation about the company's history and market. Established in 1949, the company originally produced machines for the textile industry. Later they moved to cranes, conveyor belts and eventually it began producing the well-known transport systems. With their baggage handling systems, Vanderlande systems have a high efficiency and reliability in handling luggage to the right airplane. These systems can move luggage up to 50 kilometer per hour. For the parcel market, Vanderlande

systems move more than 300 packages per second. In addition, Vanderlande is producing more warehouse facilities, able to store products automatically, call products whenever needed and place them on pallets for shipping. This is used for baggage storing on airports, but also for store warehouses.

After the presentation, they showed us their testing area. In this part of the building, they have different test areas for the three market areas. This area is also used to show their products to potential customers. The most

impressing was the warehouse test area. The system starts unpacking the pallets that come into the warehouse. After scanning the products it sends them to a certain place in the warehouse, all fully automatic. When needed again, the system calls the product out of the warehouse and can eventually place them again on the right pallet.

Overall, it was great to have an insight in Vanderlande and their different markets, showing that they do more than just baggage handling systems. ∎

A bus that runs on Hydrozine

By: Jorn Madslien

The technology of business reporter, Jorn Madslien wrote the article below for BBC news about Team FAST's invention. The article can also be found on http://www.bbc.com/news/business-40403351.

A group of students has developed a way of storing energy that could be cheaper to make, more practical and more sustainable than alternative renewable fuels. They are young and clever, and they want to change the world - one bus at a time. "We've created the world's first bus that runs on Hydrozine, which is a much cheaper solution than hydrogen, yet it delivers the same environmental benefits," says Lucas van Cappellen from Team Fast, a spin-off company from Eindhoven University of Technology in the Netherlands. Hydrozine is the new brand name for formic acid. "We're building our own future."

Around 40 of his fellow students are endeavouring to develop emissions-free transport that will help in the global battle against climate change. And they're also trying to create careers for themselves. Formic acid is found in nature, delivered in the stings and bites of ants and other insects - the Latin word for ant is formica. And this simple carboxylic acid (chemical formula HCOOH) is already used in textiles and leather processing, as a livestock feed preservative, and is also found in some household limescale removers. But Team Fast has found a way the acid can efficiently carry the ingredients needed for hydrogen fuel cells, used to power electric vehicles. The fuel, which the team has

Picture taken by Bart van Overbeeke Photography

dubbed hydrozine (not to be confused with hydrazine), is a liquid, which means you can transport it easily and refill vehicles quickly, as with conventional fuels. The difference is that it is much cleaner.

"The tailpipe emissions are only CO_2 and water," explains Mr Van Cappellen. "No other harmful gases like nitric oxides, soot or sulphuric oxides are emitted. "To prove the concept in the real world, an electric bus is set to hit the road in the Netherlands later this year, where it will shuttle between running on conventional bus routes and appearing at promotional events and industry fairs. The bus has an electric drive system, developed by bus builder VDL, that receives additional power from the formic acid fuel cell system mounted in a range-extender trailer, towed behind. "Our tank is around 300 litres, so we will extend the range of the bus by 200km (180 miles). However, we could of course make the tank bigger very easily," says Mr Van Cappellen. Current hydrogen fuel cell buses have a range of up to 400km.

But why develop a bus rather than a car? "If we built a car, we would compete with electric cars, but we believe battery-powered cars are a good solution for a lot of people," says Mr Van Cappellen. "But if we prove that we can build a bus that meets the needs of bus companies, with a range of around 400km and quick refuelling, we will have shown the potential of hydrozine in a segment where there is no sustainable competition yet."

Hydrozine is created through a chemical reaction between water (H_2O) and carbon dioxide (CO_2). "In a reactor, water and CO_2 are bonded using sustainable electricity. This is a direct, sustainable electrochemical process," explains Mr van Cappellen. The hydrozine is then broken down by a catalyst

Picture taken by Bart van Overbeeke Photography

into hydrogen and carbon dioxide inside a piece of kit called a reformer that Team Fast is attempting to patent. Its newly designed reformer is a tenth of the size of reformers of the past, which is why "it is now applicable in transport applications for the first time". The hydrogen is then added to a fuel cell where it reacts with oxygen to generate the electricity that powers the electric motor. "We are continuously looking for new technologies that can extend the range of zero emissions traffic in a simple way," says Menno Kleingeld, managing director, VDL Enabling Transport Solutions. "The decomposition of formic acid into hydrogen gas is one of these new, promising technologies."

But does it really stand a chance of becoming commercially viable? "It costs about 35,000 euros (£30,000) to convert a conventional petrol filling station to a hydrozine filling station, a process that essentially involves replacing the pipes and coating the tanks," says Mr Van Cappellen. As such, it is "100 times cheaper" to roll out a fuelling network for hydrozine than for gaseous hydrogen, he maintains. "Hydrozine is currently cheaper than petrol and more expensive than diesel in the Netherlands, and in future we expect

prices to come down so it will be cheaper than both," he adds. Although the bus emits CO2, Team Fast argues that the original CO2 used to create the hydrozine is taken from existing sources, such as air or exhaust fumes, so that no additional CO2 is produced - it's a closed carbon cycle in the jargon.

Some experts believe the technology shows promise. "Team Fast has a very good project," says Professor Richard van de Sanden, head of the Dutch Institute for Fundamental Energy Research. "It works on a very important issue: the storing of renewable energy in a transportable form and in a form which can actually be used." And several companies are supporting the project. "What we're working on together is a version of renewable energy that can combine renewable energy with CO2 capture," says Martijn de Graaff, senior business development manager at TNO Industry. "If we achieve this it will give us a stable future." The students' own commitment is impressive, with 15 of the 40 working full time on the project, and the rest contributing at least 20-25 hours per week. "We don't get credits for it, but you can only learn so

Pictures taken by Bart van Overbeeke

much at university about the practical experience of things," Mr Van Cappellen says. "It's our own future we're making." ∎

SPS summer event 2017

By: Marieke van Riet

Friday June 30th was the SPS summer event. About 70 people gathered at the reception for the first part of the surprise trip. A bus was taking us to Wessem for a lunch on a boat. Coffee, tea, sandwiches and of course "kroketten" were part of the deal.

The sun did not show up yet for the summer event, but at least it was not raining, so the dare devils amongst us decided to go outside on the deck. We "touched" Belgium and continued our trip to Thorn.

In Thorn we were welcomed by three tour guides for a historic walk through the picturesque village. After the guided tour we had some free time which most of us spent on a terrace.

We gathered again for a boat ride back to Wessem, where the bus was waiting for us. We finished the day with even more colleagues at the PVOC building, where they organized a great BBQ for us. A perfect ending to a perfect day! ∎

Internship in Japan

By: Texas van Leeuwenstein

For the past few months I have been studying at the Doshisha University in the land of the rising sun: Japan. As an Automotive student, I completed my bachelor at Electrical Engineering and am currently halfway through my master's program Automotive Technology at the Mechanical Engineering department. As for most of the Graduate School programs, the internship is embedded within the master. It is tempting and heavily encouraged to go abroad, and in my case Japan was the ultimate destination. The country is of course famous for various automotive brands, gaming consoles and its distinct culture, making it a perfect opportunity to experience something different and new. My research group had strong connections to one of the professors at this university and, since the research subject looked really appealing, the choice was easily made.

Preparations for Japan were not really hard in terms of visa or regulations, but coincided in my case with preparing for my last exam, making them somehow limited. I booked my first intercontinental flight just one day after this exam, but what could go wrong travelling to one of the most advanced countries in the world? I packed my suitcase and installed several maps and translating apps on my smartphone and thought I was ready to go for what was going to be my longest journey so far.

How wrong I was became clearly visible on the morning I arrived facing my first challenge: getting from the airport to the university. After clearing customs with my freshly obtained visa, I just had some basic instructions on how to get there by bus and train. I obtained some foreign cash (yen), hopped on the correct bus with help of the airport's Wi-Fi and began my journey.

Immediately after leaving the airport, the Wi-Fi was gone and I couldn't find any for a long time. I got off the bus at the correct stop, as it was the first, and had to walk for 750m to the nearest train station. It wasn't that far, however, with no idea in what direction the station was, all instructions in Japanese and no person being able to speak English, it turned out much further than I expected. After an hour of walking in the wrong direction, the glowing 'M' of the world's famous burger restaurant with its free Wi-Fi pointed me to the train station eventually. It turned out to be really close to the bus stop after all and I learned that this part of Japan is not as familiar with the English language as I expected. I eventually made it to the dormitory at the end of the day which would be my home for the coming months.

After several of those moments I must say I never expected Japan to be so similar and yet so different from my home country. On one hand, everything is as well organized as the Netherlands, but I never experienced being in a country where you can hardly read anything or listen to any conversation on the street. It makes it a lot harder to do simple things like going to the grocery store or taking the correct bus or train. Most of the time the only words I am able to read are the advertisements of stores listing somehow random French or English words, for example: bottled water was 'from France', stores are 'royal', and my shampoo is named 'Je l'aime'. Of course this happens in Europe too, but it immediately stands out when everything else cannot be read at all.

During my time in Japan, I spend most of my time at the Doshisha University Kyotanabe Campus, which is located just a little south of Kyoto, and its dormitory close to the campus. Nearly all other residents of the dorm are other exchange students from all over the world. The English language and similar experiences of living in Japan makes it easy to make new friends. The internship is within the Engineering department of the University. The research focusses on the Continuously Variable Transmission (CVT) and in my case the controls of it. The lab offers extensive material and setups to perform experiments, and I was linked to an English-speaking lab colleague to show me around. Working in the lab and talking to my lab colleagues showed me how this was done in Japan. Long hours are made by everyone mostly during the weekdays, however, continue working during the weekend is not an exception. Some colleagues take a powernap during the day on their desk, and looking within my department, almost every lab offers at least one bed or sofa to spend the night when approaching a deadline.

Nevertheless, the hard work was nicely compensated by visiting several places during the weekends. Being close to both the cultural capital (Kyoto) and one of the largest cities (Osaka) of the country, one could never be bored. Both cities offer a vast number of temples, castles, crowded shopping streets and other magnificent places. Furthermore, once you've visited all the brochure buildings, you really can start to explore more in rare other places in and around the city. With one of your English-speaking lab colleagues as a guide, or other exchange students as a buddy, I ended up in the most Japanese sushi bar, restaurant or karaoke bar I have ever been to. Since public transport is well organized within the country, other cities are just around the corner. During the weekends, I was able to visit the harbor city of Kobe, the deers of Nara, and climbe some of the many mountains nearby.

Going even further was possible with the world-famous bullet train, or 'Shinkansen'. It can bring you throughout Japan nearly as quickly as the plane, but without the hassle of going to the airport, limited luggage and long waiting times. Every ten minutes a bullet train leaves the station of Kyoto to bring you to the heart of Tokyo in just over two hours. I visited Tokyo once, together with a friend who was in the neighborhood and doing his internship in Seoul, South Korea. It was a unique moment to see one of the largest cities in the world, which really shows when we visited the 'Skytree' tower. The tower's 350 meters high deck offers a spectacular 360° view and shows that this city is widely spread as far as the eye can see.

Another great weekend was the trip to the Nagasaki region or 'Perfecture' in the south part of Japan. It is known for being one of the few places in Japan where Christianity is clearly visible and it has a strong connection with the Netherlands. For quite a large time, Japan was completely closed off from the western world and the only connection to the outside world was the Dutch island of 'Dejima' in the Nagasaki city. The island is reconstructed at the same location, which is now in the middle of this harbor city. Furthermore, throughout the city, hints to the connection to the Netherlands are shown in for example names of streets and buildings.

As I'm writing this, I just have a few weeks left before heading back to the Netherlands. Though nearly four months sounded like a long time to me, it really went by fast. I now have to choose my last trips carefully since there is no time to visit every spot I would like to. Only a last journey to Hiroshima and the beaches of Wakayama lie ahead before departing back home again.

I would really recommend everyone to do some part of their university program abroad. I never expected to learn so much within these months. Not only in the ability to do everything, including research truly individually, as well as looking from different perspectives to the world as you learn by talking to everyone around you. Furthermore, it's quite easy to arrange an exchange program or internship in another country and to do so will surely be worth your time. Of course you could go for something close at home, but non-surprisingly I would recommend Japan to be a great option. The country has beautiful landscape, kind and polite people, delicious food and so much more to offer. ∎
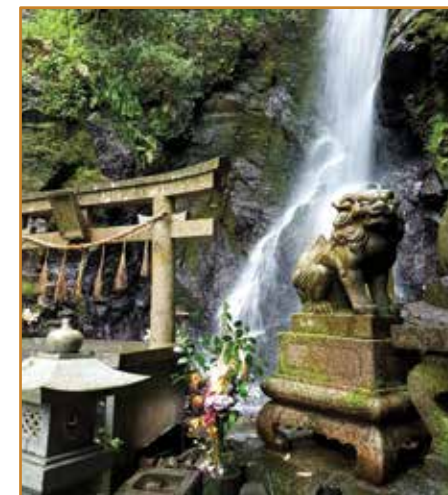
Amber - the full story

By: Steven Nelemans

It's been a few weeks since "the announcement" at the Hannover Messe, where Amber stated that it would be the first in the world to deploy self-driving cars on a large scale. Since then, the general image that people have of Amber has changed from "the new Dutch automotive OEM" to a self-driving car company. I can understand that you might be getting a bit confused about Amber's goal and vision, because we seem to be doing a lot of things at the same time. And although that last part is true, what we're doing is actually pretty simple.

Amber is a mobility provider. Just like Netflix gives you unlimited access to movies, and Spotify to your favorite music at any given moment, Amber will give you unlimited access to on-demand, guaranteed mobility. Because Amber will make sure that a car is available where and whenever you need it, you won't have to worry about the hassle of car ownership any more.

To achieve our end goal of providing unlimited on-demand mobility, we plan to develop in a series of four stages, or steps, which I'll explain below. Then I'll make a rough sketch of what the future will look like when our plan succeeds.

Step 1: B2B Platform

The first step towards reaching the end goal is the Amber Mobility platform in a business to business environment, where we provide mobility for companies. Currently, every company has its own mobility policy, and they are all individually looking for a solution for their over-crowded parking lots, their ridiculously high costs, and their ensuing impact on the environment. The Amber Mobility platform offers these companies a subscription on mobility, fully customized for each company's needs. With this subscription, the company joins a so-called "Amber Mobility hub", where the employee gets access to a fleet of fully electric BMW i3s with the guarantee that a car will always be available within walking distance.

The Amber Mobility app uses an intelligent software system based on predictive analytics. The system incorporates historical and real-time data to predict where and when users will need cars. This means that overall, fewer cars are needed to service a group of employees. In mobility provider terms, it means we can improve the user-to-car ratio, which is a key aspect of our business model.

Step 2: B2C Platform

The best part about the Amber Mobility hubs is their scalability. After the first hub is established, new hubs can be created around other facilities of participating companies. As more companies get involved, more potential hubs can be created. As individual hubs grow, we arrive at step two, where private users join the Amber Mobility platform and help the hubs to grow even further. Mixing private and business users together in the platform means that we can improve the user-to-car ratio even more – more people will be able to use a single car. In the end, we want to be able to use as few cars as possible for the largest possible group of people while still guaranteeing everyone mobility.

Because Amber owns all the cars in the platform, the cars are not only shared between employees, but also between neighboring companies. These Amber Mobility hubs demand fewer cars, which results in less environmental impact and a lower cost per employee. Even on a very small scale, let's say 40 employees, the benefits are huge, both for the customer and for the environment.

Step 3: Self-Driving Cars

While the hubs are growing and our service is expanding, a new logistical problem arises. Cars will need to be transferred between hubs or cities by human drivers, which obviously takes a lot of time and money. It's time for step three: Self-driving vehicles. The self-driving vehicles we are developing will be used for the distribution of cars to where the users need them. They won't be used for driving people around, which means it's a much simpler use case, and a smaller barrier for implementation. With an SAE level 4 vehicle, we can already take care of the entire distribution of cars in the Amber Mobility platform. At first, we will only use them at night and on roads without much traffic. This way, we can slowly grow towards a real-time balance between supply and demand. In practice, this means that your car will be driving towards you, whenever you need it. The first self-driving cars will already be operational in mid-2018, which means that Amber will be the first in the world to deploy self-driving cars on a large scale.

Step 4: Amber One

But we're not done yet. So far, the Amber Mobility platform is using BMW i3s, but we want to implement our own car. "Why are you building your own electric car?" That's the question I get the most. Allow me to tell

you. Car manufacturers need to make money to stay in business, and they are currently doing that in two ways. First, they sell a car to someone. Then after the sale, they make money on maintenance and repairs, right up until the owner gets rid of their car and buys a new one. To say that this is an outdated, environmentally unfriendly, and expensive business model would be an understatement. It's called "planned obsolescence". Cars today are designed to break down so that the manufacturer can make more money.

Amber's business model is different. We sell a service instead of a "product". Because we use cars to provide a service instead of selling the cars, it's in our own interest to make sure that that the cars work, last a long time, and require as little maintenance as possible. But like I stated above, cars today haven't been designed to be shared – they've been designed to be sold, and owned.

So to make our lives as a mobility provider easier, we are developing the Amber One, the first car specifically designed to be shared. With its lifespan of 1.5M km, its energy consumption of 12 km/kWh, and modular design with many interchangeable components, it's the ideal car for our platform. With this car, our running costs or "costs of operation" of the car are extremely low, allowing us to also offer our service for just € 33 per week.

Our solution is unique in a number of ways. First of all, it's unique because of the guarantee for on-demand mobility. Second of all, it's unique because of the fact that we're using our own car, the first car in the world designed to be shared.

The Amber One
"Just be normal!"

So that's it. Pretty simple, right? I know what you're thinking, though: "This is easier said than done". I know that. I have been accused multiple times of making complex things seem way too easy. But the thing is, we know what we want to achieve and we know how to achieve that. And still in the eyes of many people (especially the Dutch), we are crazy. But the fact is, I'm tired of hearing Dutch people make up excuses that prevent them from doing amazing things. In the Netherlands you often hear the phrase, "Just be normal, because then you're already crazy enough as it is". In this country and especially in Eindhoven, we keep looking to Silicon Valley as the model of innovation and success, but the truth is that those success stories could happen anywhere in the world. The only reason that they're coming from Silicon Valley is because excuses aren't tolerated there.

Amber is going to be one such "Silicon Valley success story".

Let's take a quick look into the future. What will it look like when everyone uses Amber? Well, first of all, direct CO2 emissions by cars will be non-existent, since everyone will be driving sustainable electric cars. We won't need as many parking lots, since there will be fewer cars on the road and those that are there will be driven instead of left to take up space for most of the day. Parking lots can be turned into parks or playgrounds, and street parking can be turned into bike lanes, sidewalks, or terraces. Traffic jams will be a thing of the past, and you won't have to worry about car repairs or unexpected costs.

But most importantly, people will have access to incredible freedom of mobility: Mobility beyond what you're used to with your own car or public transportation. In the end, we plan to provide users with something that's more convenient, affordable, and environmentally friendly than owning a car. Our tagline is "freedom far beyond car ownership", and we mean it.

So to summarize, we plan to accomplish all this in four steps:

- B2B mobility platform: Create mobility hubs for companies using existing electric cars

- B2C mobility platform: Include private users

- Make cars self-driving

- Implement the Amber One

Go ahead, you can tell people. ∎

Phone call

By: Jan Vleeshouwers

10:31 (sitting in my quiet office; mobile phone rings) "Hello. Hi. Yes. Just a moment, I cannot talk here, let me look for a place where I can."

10:32 (walking down hallway, meeting room appears to be occupied) "Still there? I'm sorry, the room I usually have is occupied. Just a second, OK?"

10:32 (walking further down hallway, other meeting room appears to be occupied as well)

10:33 (turning to the other side of the building) "Yes, yes, pretty busy here. I'm crossing the hall, always pretty noisy here." "You're still there?"

10:34 "OK, I found an empty meeting room. What is it you wanted to discuss?"

10:35 "Right, you will not be in time for the meeting next Thursday? What? Half an hour later? Well let me check. Let me get my laptop. I have to go back to my office for that, shall I call you back or do you rather wait? OK, I'll run."

10:37 "Right, I'm back. You've got another moment? I have to plug it in, the battery is almost dead."

10:38 "Let me check – what did you propose? Half an hour later? That seems to be OK. Let's start at 4:30 then. Fine. So I see you Thursday. Have a nice day. What?" "You'd like to prepare the analysis but you don't remember what contacts were suggested?" "No I don't know but it is in my notes."

10:39 "Just a minute, I'm sorry, some people standing outside, knocking at the door." "You reserved? Oh, from 10:30? I'm sorry, I was just looking for a quiet room to call in." "Are you in a hurry." "I see".

10:40: "Sorry for the interruption – I have to look for another place to call." "No, the room was reserved actually. I didn't notice, just took the first empty one. I have to move. Can I call you back in just a few moments?"

10:41 (unplug my laptop, pick it up and check the other meeting rooms at this side of the building; no luck)

10:44 (two floors up, there is an empty project room; I'm lucky, my card allows me to get in; put down my laptop and plug it in) "Hi, here I am again." "No, I can wait." … "Yes. Someone at your desk? Well that happens. Where were we?" "Right, my notes"

10:46: "On my laptop? No, they are in my scrapbook." "No, not here, on my desk. Shall I get it?" "Are you sure? I can also email it to you?" "OK, let me get them. I hope I can leave my laptop here safely unattended for a short while. I'll run."

10:47 (walk to the stairs, two floors down, to my office, pick up the scrapbook, cross the hall again, run up the stairs, to the empty project room; relieved, laptop is still there)

10:50 "OK, there I am again. Yes, looking for it. Here are the contacts. I thought there were more, perhaps I didn't write down all of them." "What do you say?" "No, they are still drilling here sometimes, I cannot hear you anymore." "What?" "What?" "Let me call you back tomorrow, OK?" "OK?"

10:52 (back in my quiet office) ■

ACCI Weekend

By: Jules Hilkens

On Friday May 5, one of the most exciting weekends of the academic year was going to begin; the ACCI weekend. Around 12:15h everyone had gathered at Flux and was ready to cycle to the site where the weekend was going to take place this year. Some people decided to catch a healthy lunch first, while others decided to cycle to the site immediately. The cycle trip was around one hour if people took the asphalt route and one and a half hour if people took a more sightseeing route through the woods.

As soon as everyone arrived at the site, the first activity could start right away. As it was May 5th, this meant a visit to the liberation festival in Roermond. Featuring the lyrics of a future superstar "Lotte" and some head banging on the music of "Phoenix' Ashes", the festival was a success, especially in combination with the Crazy 88 that could be done throughout the city. Around 8 o'clock everyone travelled back to the sleeping site to have a nice analog gaming night. While some people enjoyed the questions of the "Hyves game", others preferred letting their electrical skills loose and tried to upgrade the Looping Louie (Stef Stuntpiloot) motor. Naturally, it was also possible to sit around the campfire and eventually go to sleep to be well rested for the days to come.

Saturday started with a nice breakfast where pancakes and eggs with bacon could be consumed. Around 1 o'clock everyone moved from the dining table to the meadow to play a little game of football or just to relax in the grass. This relaxing soon changed into a huge water fight where no-one was safe from getting drenched with water balloons.

The water fight raged on for some hours, but for people who wanted to escape the fight for a while it was possible to participate in a Looping Louie or a beer pong tournament. Some other people took the opportunity to light a fire to dry, however there was not enough wood available to fulfill the fire wishes of our fire makers. The only option left was to visit the farmers living around the camp site to ask for some wood. Luckily, a farmer was willing to supply us with some of his wood, in exchange for a nice cold beer.

The afternoon started with eating lots of wraps. When everyone had dried up and had eaten enough wraps, the program continued with a cycle trip to the forest for the evening activity. We first started with some games which mostly involved capturing balloons of the other groups, while trying not to lose your own balloons and making sure they would not break. The winning group of each round was

taken away in the bus and the 'dropping' was about to begin. While some would say that the 'dropping' was way too easy because they still knew the route from the last time, others would say that they were really struggling with coming back to the sleeping site because they did not know who their mole was. This mole had the mission to try to make the dropping for his/her group as long as possible. Due to the immediate chaos that occurred when it was announced that there would be a mole, the task of the mole was almost completed. After everyone had returned from the dropping at 1 o'clock, the camp fire could be lightened again and people evaluated the day around the camp fire.

The next day began early, some would say too early, at 9 o'clock. After everyone was roughly woken up by the organization, the breakfast could start, which again consisted of some delicious pancakes and eggs with bacon. Next, everyone went to the final activity of this weekend: a canoe trip over the Dommel. When everyone was ready to go, the cycling trip towards Valkenswaard could start where the canoe trip would begin. While this canoe trip could be done in 2 hours, some wanted to test the maximum time that it could take, in which they basically succeeded. After roughly 3.5 hours the last group had also finished their canoe trip. Finally, the cycling trip back to the TU/e could start and everyone arrived around 7 o'clock. Here a successful weekend was ended and a tired group of students went home. ■

Puzzle
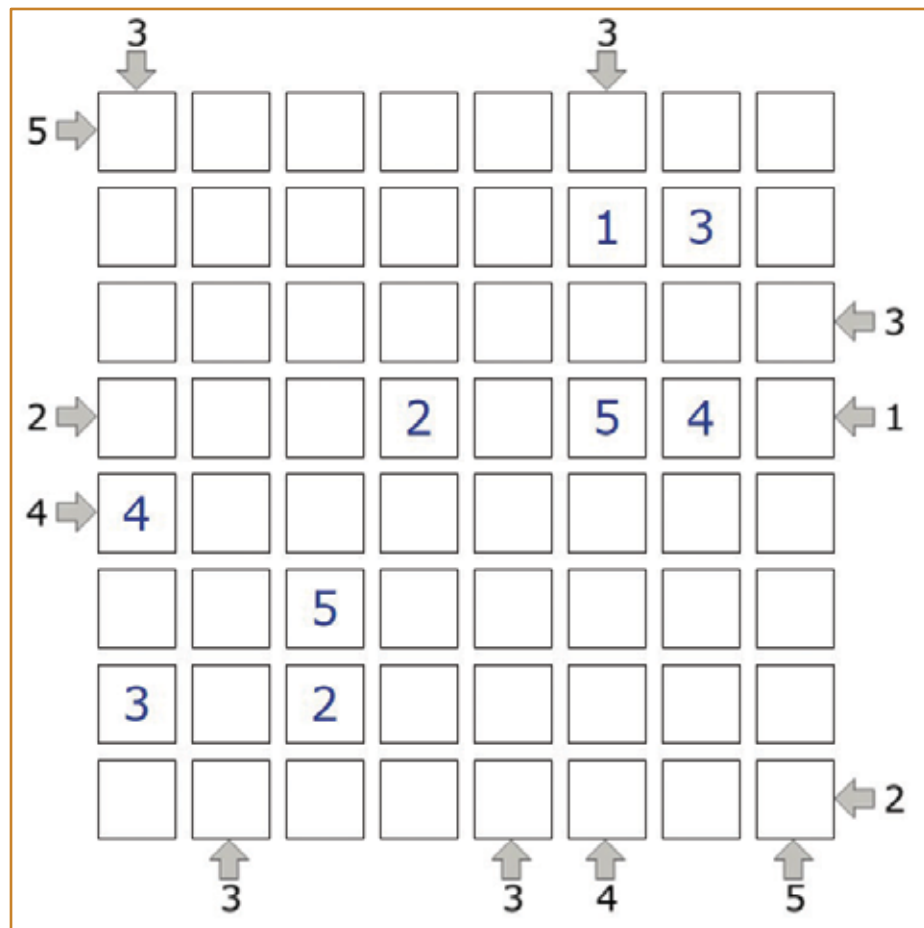
Objective/Rules

- Complete the grid such that every row and column contains the numbers 1 to the size of the grid.

- Each row and column contains each number only once.

- The rules around the outside tell you how many skyscrapers you can see

- You can't see a shorter skyscraper behind a taller one.

Please send your solution to connecthor@thor.edu before the 30th of September

Winner previous puzzle

The winner of the previous puzzle is Glenn Bergmans.

Puzzle solution June edition (Connecthor 38)

Glenn Bergmans with his prize

# Your degree is not for free

By: Tom van Nunen

It's that time of the year again: a new batch of students found their way to our university. Some are new to the Netherlands, some already did a bachelor's degree or equivalent somewhere else, but most of them only recently graduated secondary school. A few hundred students chose to start studying in the best field of engineering I can imagine, at the best university I can imagine. In a couple of years, they will be converted from naïve freshmen to critically thinking engineers of the highest level. But before they can call themselves 'MSc', there's a lot of work to be done.

I still remember the very first lecture I had as a freshman: Computation, back then a 9 ECTS course combining the current courses Computation I and Computation II. The lecturer, the late professor Ralph Otten, spoke his famous words: 'take a look at the person on your left, take a look at the person on your right. One of them will be gone within half a year.' Although I doubt whether he was completely right, the fact remains that a number of students decides to quit the study in their first year.

My first year wasn't one I'm particularly proud of. In secondary school, I wasn't used to doing a lot of homework, certainly not for the beta subjects. I didn't even study for my final math exam at all. At the university, it took me some time to realize that this attitude wouldn't get me very far. Unfortunately, this bright moment came too late for my first exams. I'm certain that a lot of freshmen experience a similar situation, realizing that they can't take passing a course for granted any more.

Then there is the freedom at a university: if you don't put sufficient effort in a course, you can do it next year, nobody cares. Okay, that's an exaggeration, but the truth is that, at a university, the student is expected to show initiative and have a decent planning. Follow the lectures, attend the instructions and prepare yourself for the exam. If you only start the week before the exam, you'll not make it. If you don't attend lectures and don't do the exercises, even though they might not be mandatory, you'll not make it. I must confess that the Bachelor College system guides the students into the right direction, for example with interim exams. Still, some students don't realize in time that they have to put effort into passing courses.
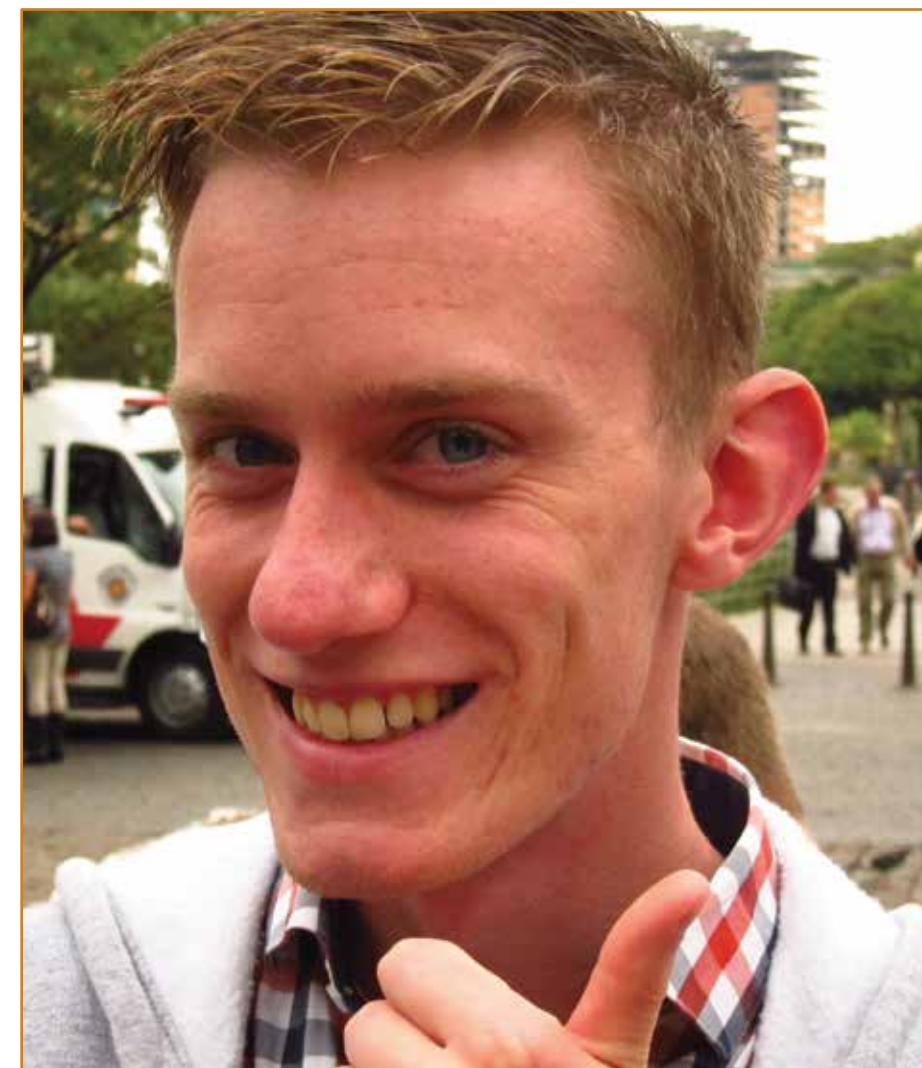
Besides the topics I just discussed, there is a pitfall that might sound silly, but which can be a serious issue. Everybody at the university gets a fast laptop that can run games like a charm, how tempting! Combine this with an environment full of like-minded fellow students and the freedom to choose how you spend your day, and there's your 'ideal' source of distraction. The choice between two hours of gaming and two hours of lecture is easily made.

Despite all this, I'm convinced that the vast majority of the students that starts at this faculty has the brains to successfully achieve the degree of Electrical Engineer. There might be some obstacles on the road towards this degree, but I'm certain that those can be overcome. This view is enforced by the fact that some of my fellow freshmen decided to quit Electrical Engineering, went to Fontys, came back through the pre-master program and are now graduated Electrical Engineers. Why the detour?

I encourage every student, especially the freshmen, to think wisely about how you spend your time. You won't get your diploma for free, keep that in mind, but don't forget to enjoy the great things that the TU/e and the rest of Eindhoven have to offer. Good luck! ∎