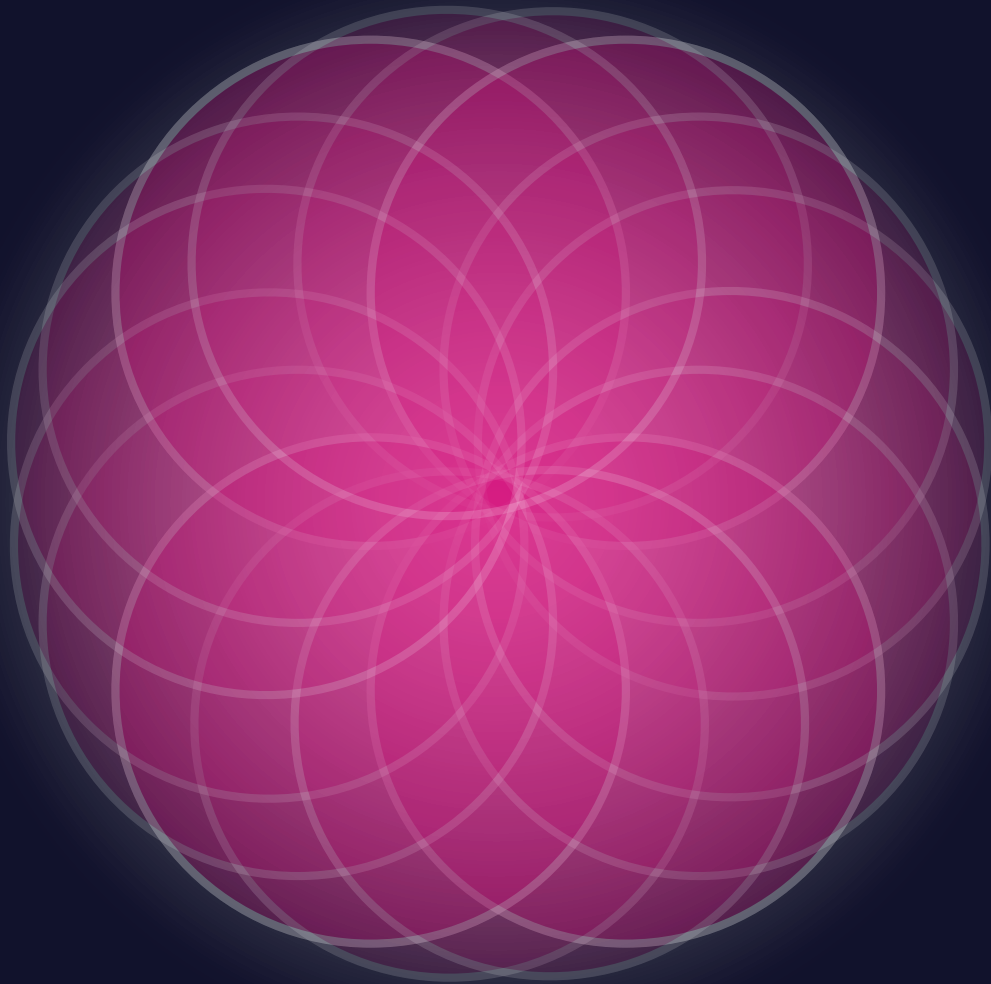


# Intersection



A History of Innovation  
50 Years of the Studieverzameling  
Towards a Connected Future  
An Energy Leader's Vision of Tomorrow  
Designing for a UAM Future  
A Journey through the Sky



**Stephan**  
Trainee

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# From the Board

## Commissioner of Education

*By Shea Haggerty*

When I heard I was to write a small piece on Joos, my fellow board member and additionally my vice-president, I didn't actually know where to start. Firstly, his name may confuse you at first. It is not the usual Dutch name 'Joost', as many would think. His surname is Vrijdag, which translates to Friday – you can imagine that this is a source for many friendly jokes as well.

His name is not the only special or unusual thing about him. He is the Commissioner of Education and spends a lot of his time trying to maintain and better the level of education in the curriculum of Electrical Engineering. Because of his enthusiastic and bubbly personality, he is the contact person for many students if they have complaints, questions or suggestions. He doesn't only listen to these students, but actively deals with the situation in such a way that the complaint or problem is eventually solved.

Next to his main task as Commissioner of Education, he is also the master of InDesign and Photoshop. If you ever have troubles with placing an image in InDesign or removing the background in photo shop, Joos' desk is the place to be. It must be noted that his workspace

is extremely messy, but he claims that there is a method to the madness. Because he is such a valuable board member, we tolerate his hazardous desk.

Joos has spent lots of his time here in Delft in 'de Toko' (Virgiel, student association) and has picked up the 'borrel' culture there, so if you ever feel the need for drinking a beer, Joos is probably already in the /Pub to accompany you. He is very sociable, and he is definitely present at every party, cobo (constitution drink) or of course Carnaval in Brabant. If you let Joos be in charge of the aux-cable, the terrible sound of Carnaval music is the most probable outcome.

All in all, Joos is an incredibly kind and helpful board member who always lights up the room when he walks through the door. I am very happy to have him in the board, and although he is not able to keep his desk clean for more than 5 minutes, all his positive traits compensate for that more than enough.

Ê

## Commissioner of External Affairs

*By Max Deutman*

Thomas Pouwels was born on the 8th of June 1999 in the Dutch town of Oss. Being born here makes Thomas an adamant lover of "Carnaval" and the music associated with this festivity. Thomas also enjoys playing Rugby in Delft at SCR Thor, where he can regularly be found.

Next to these adventures, Thomas is an active member of the ETV. He started studying here in 2017 and immediately showed his interest in many committees. One of the bigger committees that Thomas took part in was the EOW committee. In his second year Thomas was responsible for creating the ETV yearbook. After his 2 years of committee experience, Thomas was asked to join the 148th board of the ETV. He accepted and became the Commissioner of External Affairs. His main job is to keep in contact with companies with interest in Electrical Engineering, find sponsors, and organize the EEMCS Recruitment Days.

Thomas is a perfectionist who wants the best possible connection between the students and the companies active in the Electrical Engineering sector.

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# Colophon

Year 23, edition 1, November 2019

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## Advertisements

Page 2 TenneT  
page 27 Royal IHC  
page 32 Arcadis

## Printing

Quantes, Rijswijk, 1400 copies

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2628 CD Delft  
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# Editorial

Dear readers,

Welcome to the first issue of the 23<sup>rd</sup> year of the Maxwell. Like every year this magazine will tell you about everything related to Electrical Engineering. This field is more and more becoming involved with other fields: The fruits of our work can be seen in medical applications, as controllers for mechanical machines, and in our phones. But Electrical Engineering also heavily relies on Physics, Mathematics and Material Science to advance.

As stated above, there are a lot of intersections with different fields. That is why this issue and our underlying theme of this year will be "intersection". Where do we meet other sciences, and what do we learn from each other?

Finally, students find themselves on an intersection themselves: The first one is what study they want to do and where, later which master and if they want to do a PhD. Do they want to do some extracurricular activities like a board year, a dreamteam or a committee?

We set out on our journey to learn about all of this and more in this year of the Maxwell. We hope that our discoveries along the trip might inspire you to take a similar trip of your own.

Enjoy!

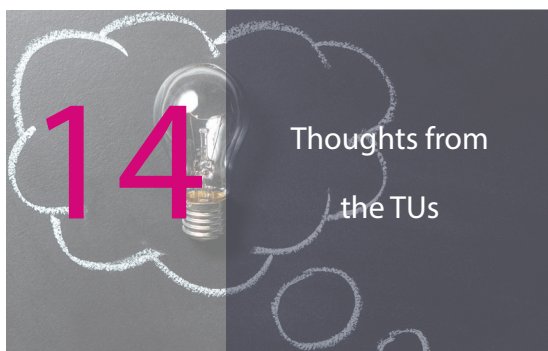
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*Koen Peelen*





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# A History of Innovation

## 50 Years of the EWI Studieverzameling

Han Geip

On Thursday the 28th of November, our EWI-Studieverzameling exists for exactly 50 years. A memorable day and a lovely opportunity to highlight the history of this special collection. This will be done by publishing a one-time-only edition of a magazine in full color; a jubilee magazine that contains the history of existence, special moments in history, and aspects of the collection described by volunteers.



A selection of illustrations (250 photos) gives an impression of what can be found in the Studieverzameling and which projects were worked on. Naturally, the 50-year-birthday of the Studieverzameling will be a festive moment in time, accompanied by an exhibition about "Projectmiddelen in het Onderwijs" (Project equipment used in education). The exhibition will be displayed in the lower building of EWI.

The opening of the faculty Electrical Engineering, on the Kanaalweg in 1905, was also celebrated with a four-day-long exhibition. History repeated itself when in 1969, when the faculty moved into a new building, on the Mekelweg. To celebrate this move, another exhibition was organized in the then almost empty basement. Collected items were displayed – mainly electron tubes and lecture models. This exhibition grew into the Studieverzameling as we know it now.

The basement in the lower building on the Mekelweg seemed an excellent location to continue with collecting objects related to technical subjects, which were sometimes used as demo materials for lectures. The professor of Electrical Engineering and 'build master' at the time, prof. dr. ir. R.M.M. Oberman has paved the way for creating an Electrical Engineering collection, which is not very different from what we have now. 'Ver-

zamelen oke, mits het maar elektrisch is' (Collecting is fine, as long as it is electrical) was his credo. Oberman and his team have made great efforts realizing the new building, which this year has also reached its 50th year of existence.

Now, fifty years along the road, we as managers of the Studieverzameling still have our hands full. At this moment, we have a group of volunteers who manage the location. Most of them are specialists and have worked at the TU Delft in the past. Every Monday, from 10:00 until 22:30, you can encounter this enthusiastic group of people in the basement of the lower building of EWI.

Their expertise from the past is extremely valuable. They are capable of maintaining the heritage, in order to give students new insights in the turbulence of the fields related to Electrical Engineering, Mathematics, and Computer Science. Visitors can observe the 'movement' which is deliberately shown in the showcasing of our objects, coming from the short but rich Electrical Engineering history.

The Studieverzameling knows a lot of interested and enthusiastic visitors: first-year students are quickly introduced to our Studieverzameling and are offered a short tour, traditionally organized by the ETV. Not that long ago, the Studieverzameling obtained national

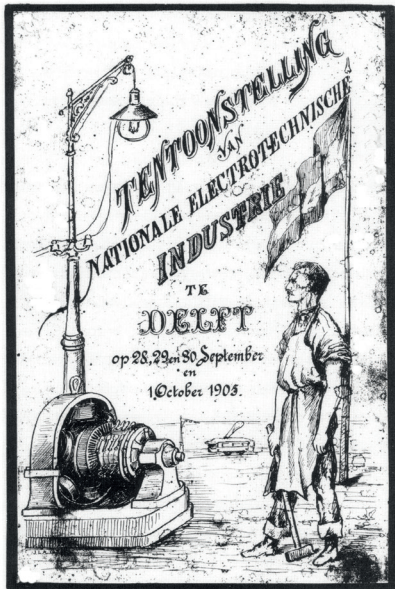
recognition by being broadcast on television on the NPO-rubriek EenVandaag, who visited Delft with their camera crew.

There are still challenges which await us, such as maintaining the Studieverzameling in the future and to showcase the exhibitions to a broader audience. In the preface of our Jubilee Magazine, our dean prof. dr. John Schmitz wrote: "Talking about the future. We have a couple of turbulent years behind us regarding the housing of the EWI-faculty. This was the same story for the Studieverzameling. But this gave it a positive twist, by introducing the thought of how we will continue with the Studieverzameling".

Next to a steering group, three workgroups have been set up, in which three activities will be set up, such as making an inventory and digitalizing the collection, but also describing the Dutch Electrical Engineering history (in the form of a Canon, which will be posted online) and lastly, there will be worked on improving our contacts and partnerships within the TU Delft, and outside of the university. We would like to see national relationships rise in the future.

Ê





*Figure 1.* 1969, The first exhibition in the Study Collection, from left to right Mrs. Tijne, Mr. J. Verwer, Prof. Dr. Ir. Oberman and Mr. Tijne. Photo Credit : J.C. van der Krogt.



# Towards a Connected Future

## An Energy Leader's vision of Tomorrow

*Arash Aazami*

Arash Aazami is a purpose-driven entrepreneur and innovator, half Persian, half Dutch and raised in Niger, West Africa. His initiatives merge energy, digital tech and finance. He first pursued careers in music and tech, until he became director of a Dutch energy supplier in 2006. In 2010 he founded the world's first energy company that earns more as it sells less energy. Arash is now founder and director of Universalright.org, developing a global energy exchange platform to support an "Internet of Energy", enabling users world-wide to "download as well as upload" energy from abundant renewable resources, democratizing access to clean, renewable energy. Besides his work for Universalright.org, Arash is a faculty member at the SingularityU, The Netherlands. He also is a mentor of social entrepreneurship at INSEAD Business School in Paris and he advises the European Commission and the Dutch government on long term strategies for energy and digitization. As part of the Delft Energy Initiative guest speaker series 'Meet the Energy Leaders', Arash visited the campus to share his thoughts on the energy crisis.

**How are the hurdles faced in creating a connected energy grid different in developing and developed nations?**

The transition in developed countries such as the Netherlands is a lot harder than it is in developing nations such as in Africa. When a country has areas with electricity scarcity, any development towards spreading energy access feels like a big improvement to the system. Because of this, it's easier to motivate people to understand the need for such changes. But what about a country that is already blessed with a reliable energy system? It becomes increasingly difficult to explain the need for a change to the citizens who have already become accustomed to readily available energy. It is far more difficult to find support in improving a robust system, than in improving one that is not.

**Your motto 'dream.develop.do' tells people to never give up on their ambitions. But you too went through several setbacks during your career. How did you manage to always remain positive?**

I didn't always stay positive, of course! I've had my fair share of challenges and hurdles. But it's normal to fall and it's normal to feel negative. But what's important is understanding that it was

never supposed to be easy in the first place. If it was, you would not learn as much. Pursuing an education at an institute such as TU Delft should already tell you how much you're capable of. The level of education and resources available to you is extraordinary, and there is so much knowledge to be gained. Wouldn't it be a shame, then, to simply choose the easier road? I would say that the students who pick the most difficult of paths are blessed because they are the ones who end up having the most impact on the world. So embrace the difficult times and celebrate your victories, one at a time. It might seem frustrating that there's always a higher peak than the one you achieved, but if you let your passion drive you forward, there's no stopping you from reaching success because a reasonable man never changed the world.

**In a world where specialization is important, what are your views on thinking outside one's field?**

Specialisations are not dangerous until they cause a lock-in. A surgeon who spent twelve years cutting knees would likely be opposed to a physiotherapist who finds a way to heal the knee without cutting it instead. What if our desire to continue using solar cells is holding

us back from finding a new technology that could work so much better? It is very important to keep an open mind, especially since we're moving towards a future where everything is interdependent. I believe that people are inspired by sources that don't belong to their field. There isn't any inspiration in a field that you are the frontrunner of yourself. Which is why, as a specialist, one must deepen themselves in art, nature, music, cooking, or anything else. Inspiration comes from all around us.

**What according to you could be an undiscovered or unutilized opportunity to spark the distributed revolution?**

As a generalist I do not have a clear vision on a specific field, meaning that I have a completely different perspective as compared to specialists. I think what we are missing is the integration of different fields. As of now, we are losing over 30% of our field energy during transportation, storage and conversion. By optimizing conversion, the main loss factor, we could close at least one coal plant, which is a significant effect. I don't know what the big next thing is. What I do know is that we only need to harness around 0,7% of the sun's energy projected unto the earth with as few steps as possible in between, we could



solve a lot of problems. The other big thing I want to mention is that I am a person of faith, and I believe in thermodynamics. And according to those laws, the earth can more or less be described as a closed system, with the earth gaining some energy from the sun and losing some to space. So we need to find a way to use the energy that is here to do the things we want. It sounds very “woken” but we need to look at nature to learn how to cope with a set amount of joules. I believe, through the level of technology that exists today, that we are reconnected to nature. We are not the owners of the earth but rather just one of the many organisms who dwell here.


*Where do you draw most of your inspiration from?*

Music! One moment I am at my laptop and the next I am behind my guitar. There are two reasons. Firstly, music is about storytelling. If I would be just blurting out notes, no-one would listen to me because it wouldn't sound like a story. But it's only when there are dynamics involved, that people get

*“A reasonable man never changed the world.”*

interested and will listen. The second reason is more fundamental. Music has everything to do with the transmission and the harmonisation of frequencies, just like the fundamentals of energy systems. By learning about the math behind the music, I learned a lot about energy systems and algorithms. For me, it has been amazing to have learned a lot about both because it has provided me with a way of understanding which is far different from what is conventional.

*How did you manage to run a company that was built upon incentivizing companies to pay LESS for energy?*

The system was fairly simple. We sup-  




plied the energy and the resources to work more efficiently, and we would get a cut of the profits. So the more costs

2014, it went bankrupt in 2016. In 2018, I bought it back and now I am still wondering what to do with it. The one thing

*"We are scientists. We are never the owners of the truth."*

they spared, the more we and they would profit. Because in this business model we were working with the company, a country would only need a handful of energy experts instead of each company needing a team of them. It was hard to measure the amount of energy saved by each product you save, so at some point, we had to ask a flat tax. That worked quite well too. After I left the company in

I learned from that process is that if I ever am to develop intellectual property again with the intent to impact a lot of people positively; I do not want a company to own it. That is why, two years ago, I founded a foundation which even I do not own, and use the knowledge from there to make money from the impact we make using it, instead of the knowledge itself.

Is there any advice you would like to give to upcoming engineers?

You are always in beta. We are scientists, we are never the owners of the truth. Science for me is the perpetual seeking of the truth without ever claiming the truth. We only get closer. In a way, science is similar to faith: you always believe in something, a hypothesis. And upon that faith, you try to find new insights and reasoning to better explain the universe around you. Go knitting, bake pies, and go into nature. You never know what you will see and learn from it.

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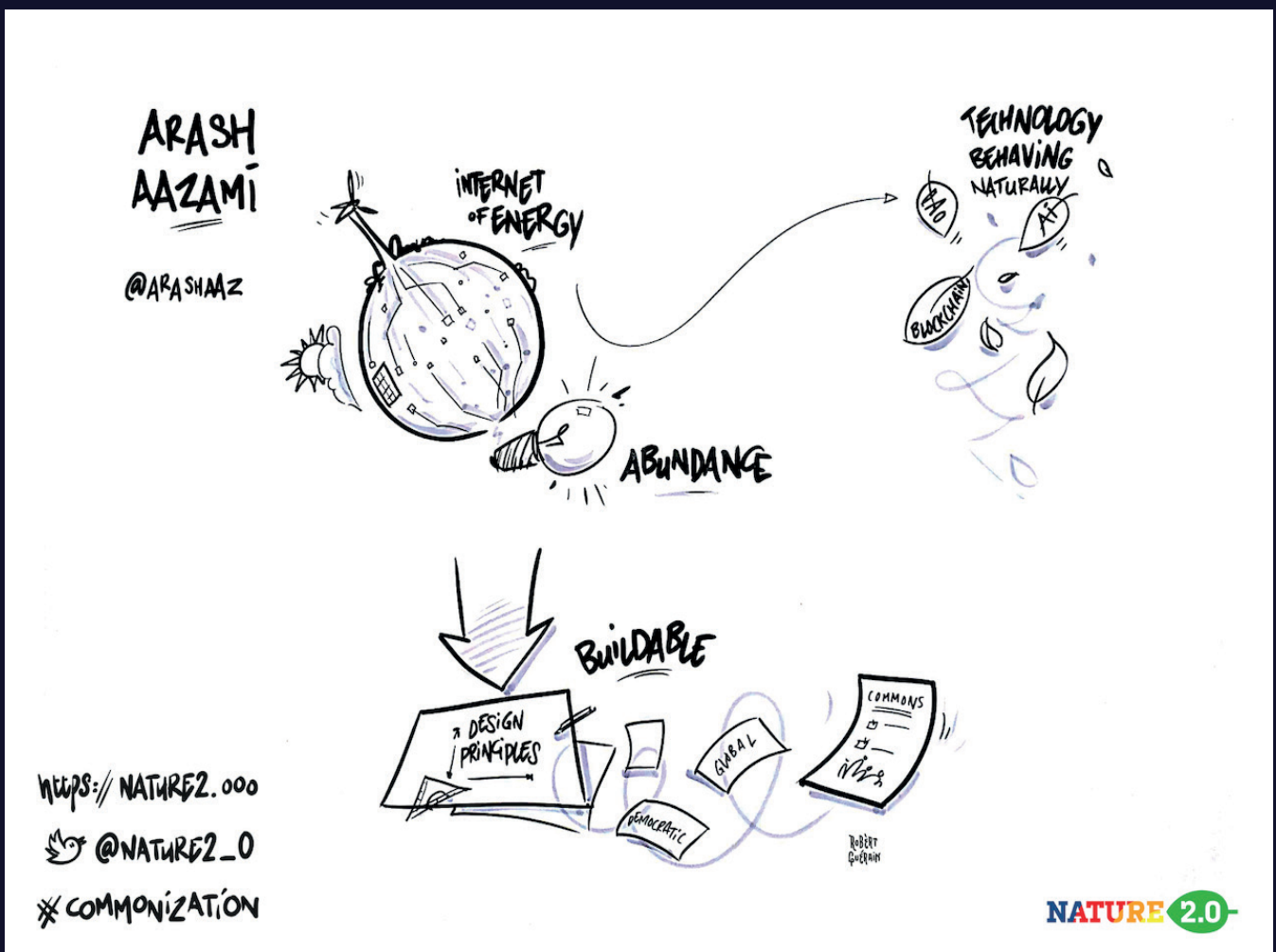


Figure 1. An infographic of Arash's vision of a future in which users would be able to exchange energy seamlessly [1]

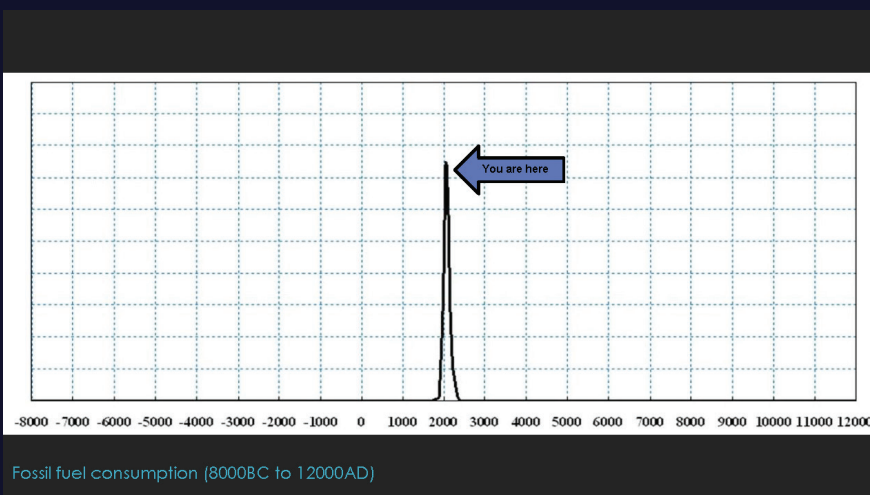




*Figure 2.* A photo from Arash's slides showing how solar energy is being utilized in Africa. Countries in Africa have been quick to implement solar technologies throughout the landscape. [2]



*Figure 3.* Another photo from Arash's slides showing the use solar energy to power streetlights in Africa. [2]



*Figure 5.* A graph shown during Arash's presentation, illustrating how small a time period fossil fuels have actually been used. Our current energy habits are under no definition "sustainable", and we will have to switch to more sustainable alternatives in the future. [2]

- [1] "Internet of Energy," Nature 2.0. [Online]. Available: <https://nature2.000/communities/internetofenergy/>.
- [2] "Meet the Energy Leader: Arash Aazami," TU Delft. [Online]. Available: <https://www.tudelft.nl/energy/meet-the-energy-leaders/meet-the-energy-leader-arash-aazami/>.

# Study Tour '20

Around the world in (almost) 20 days!

Ever wondered what the Electrical Engineering disciplines look like outside of the Netherlands? Ever wanted to experience a culture completely different to the one you are used to? In August 2020 the ETV will organise a study tour for students that are in their masters or the end of their bachelors to experience exactly this. Crossing boundaries and intersections students wouldn't have easily crossed otherwise.

In the first three weeks of August, the study tour will be going to South Korea and the United States of America. Since there's quite a bit of time difference between locations, you will of course also be given some time to relax during the trip, don't worry about it!

The first destination, Seoul will introduce high-tech companies, prominent universities, and on top of that also a new culture. Seoul has had a major rise in development the last decades and has booked huge successes, housing companies such as Samsung, LG electronics and Hyundai. When asked what the secret to their success is, almost all Koreans will answer "Kimchi", which is a tad spicy, fermented dish that is immensely popular over there.

After finally being fed up with Kimchi, a flight to San Francisco will be taken, which takes us to the otherside of the world. As you may already know, Americans are in general more fond of decently sized dishes. If you have lost some

weight because you didn't like the Kimchi in Korea, you can regain this in good ol' 'Murica. Of course, this is not the reason this is one of the tour's destinations. Only a couple intersections away of San Francisco lies Silicon Valley, the technological headquarters of many large companies like Tesla, Google and Nissan. Alongside the companies in silicon valley, there are the famous Stanford and Berkley in San Francisco and you could have a look at the majestic Golden Gate Bridge amongst others.

Lastly, Portland will be visited. Portland has more of a hardware industry going on, as Intel and ASML have a branch situated over there. Besides that, Portland as a town is extremely liberal and



Figure 1. The campus of University of California, Berkeley



the people are very friendly. Also, there reside quite a few beer brewing companies where you can drink a pint, not to mention that there is lots of beautiful nature around portland.

#### Why go on a study tour?

Because it is a lot of fun and also very educational! Don't believe me? It has even been proven: Studies have shown that a study tour is a good opportunity for a student to move away from their comfort zone and realise their potential towards independent project management, experience the local culture, and achieve a balance between academic and social life. [1]

In short, this tour is an awesome opportunity to visit awesome companies and universities. Want to know more about the tour? Check out [studytour.etv.tudelft.nl](http://studytour.etv.tudelft.nl) for more information!

£



*Figure 2.* Photos of the Seoul cityscape and its lively bustling streets



*Figure 3.* Nighttime cityscape of Silicon Valley, California



*Figure 4.* Nighttime cityscape of Portland, Oregon

[1] Polishetty, Ashwin & Chou, Lloyd & Patil, Arun & Littlefair, Guy. (2018). Student Learning Experiences During an International Study Tour.

# Thoughts from the TUs

## An insight into their study associations

Apart from the TU Delft, there are two more prestigious technical universities in the country: in Twente and in Eindhoven. Just like the the Elektrotechnische Vereeniging in Delft, these universities have their own study associations as well. To provide better context about the ongoing work in and culture of these groups, the Maxwell committee had asked them to submit a letter detailing their latest updates.

### E.T.S.V. Scintilla

#### The University of Twente

Hello from the far east of the country! We're honoured to write this piece for the Maxwell. Even though we are over 200 kilometres away, we've got more common grounds than anyone might think. Of course, we also share a passion for Electrical Engineering, but more on that later.

We are all students that are not only passionate to (try to) study hard, but we care about and support the study association and the student life. For example, from now on we can always meet each other for a nice constitutional drink and therapeutic 3-BVs. But ofcourse, we as a board are always busy with our board tasks. Not only for the regular tasks that (should) keep the associations alive, but only for exiting tasks such as preparing for our eleventh lustrum. But, fortunately, we had some spare time to go on an excursion to Enschede. This photo, Figure 1, was made on a hot summer day so we decided to take off our jackets.

But done with us, lets start with the content. With a wide topic such as 'Intersection', many crazy and cool ideas come to mind were we can tell something about. For real, such a nice discipline as Electrical Engineering is one large Intersection. Not only are the classical disciplines of mathematics, physics and chemistry considered, but the Electrical Engineering discipline also connects Mechanical Engineering, Control En-



Figure 1. The 90st board of E.T.S.V. Scintilla on some stones in Enschede. Yes, there are cities outside of the Randstad.



Figure 2. The Robird that has been developed at the University of Twente [1].

gineering, Aerodynamics, Computer Science, and many others. A good example of these intersections is Robird: Robird is a bionic robot that can imitate a real peregrine. The robotic peregrine can reach speeds up to 80 kilometres per hour at wind speeds up to five on the scale of Beaufort [2]. The Robird is commercially exploited by Clear Flight Solutions (CFS), a spin-off of the University of Twente. With millions of capital

investments, the business is starting off great. Meanwhile, airports can contract CFS to chase away birds in a animal-friendly fashion to prevent them from being eaten by the jet engines of the airplanes. This will prevent lots of delays and people can go hassle-free on their well-earned holidays!

É



## e.t.s.v. Thor

TU Eindhoven

If there is one thing that is certain during a year as an Electrical Engineering student, apart from struggling to attend 9AM lectures and passing exams, it's the fact that our lecturers try to make us conscious about the fact that we as future Electrical Engineers are the (people who will create the) future. Most of the time, you may see this as some generic lecturer's note and won't pay that much attention to the actual meaning behind this. But there is more behind it.

Whenever one of our master students or PhD candidates graduates, they get to give a small presentation about their research where they try to explain their findings in a clear and concise matter. We as Board members go to their presentation with our beautiful Viking helmets as can be seen in the picture. Usually we do not understand that much of the presentation because this gets real theoretical quite fast since they have worked on new mathematical models or even a whole new technology regarding a very small part of Electrical Engineering for years. This is something that defines Electrical Engineering: it is such a diverse field with so many topics to cover that no two Electrical Engineers will have learned or done exactly the same things during their career. Of course, before you start your career you need



Figure 3. The e.t.s.v. Board with Viking-helmets for a PhD-presentation

to do your bachelors and maybe masters. The end of your bachelor is the first major place where you will come into contact with the fact that Electrical Engineering is such a diverse topic since there are so many routes you can follow: you're basically standing at an intersection of your career. Are you going to follow the road to Integrated Circuits? Or will you focus more on Telecommunications? Or maybe even Nuclear Fusion? This may sound daunting at first, since choosing one road will mean that you won't be able to focus on other fields of Electrical Engineering, but you have to remember that whichever way you'll

choose, in the end you will be the one standing in front of an audience giving a speech about a subject and most of the crowd won't even understand the importance. Afterwards, you will probably continue down the road you have chosen earlier in your career. And maybe, just maybe, you will be the one who will give that presentation after your PhD knowing that you've just created a new road at the intersection of Electrical Engineering. Giving birth to amazing new technologies and a whole new future. Or as your lecturer told you: Your future.

✎

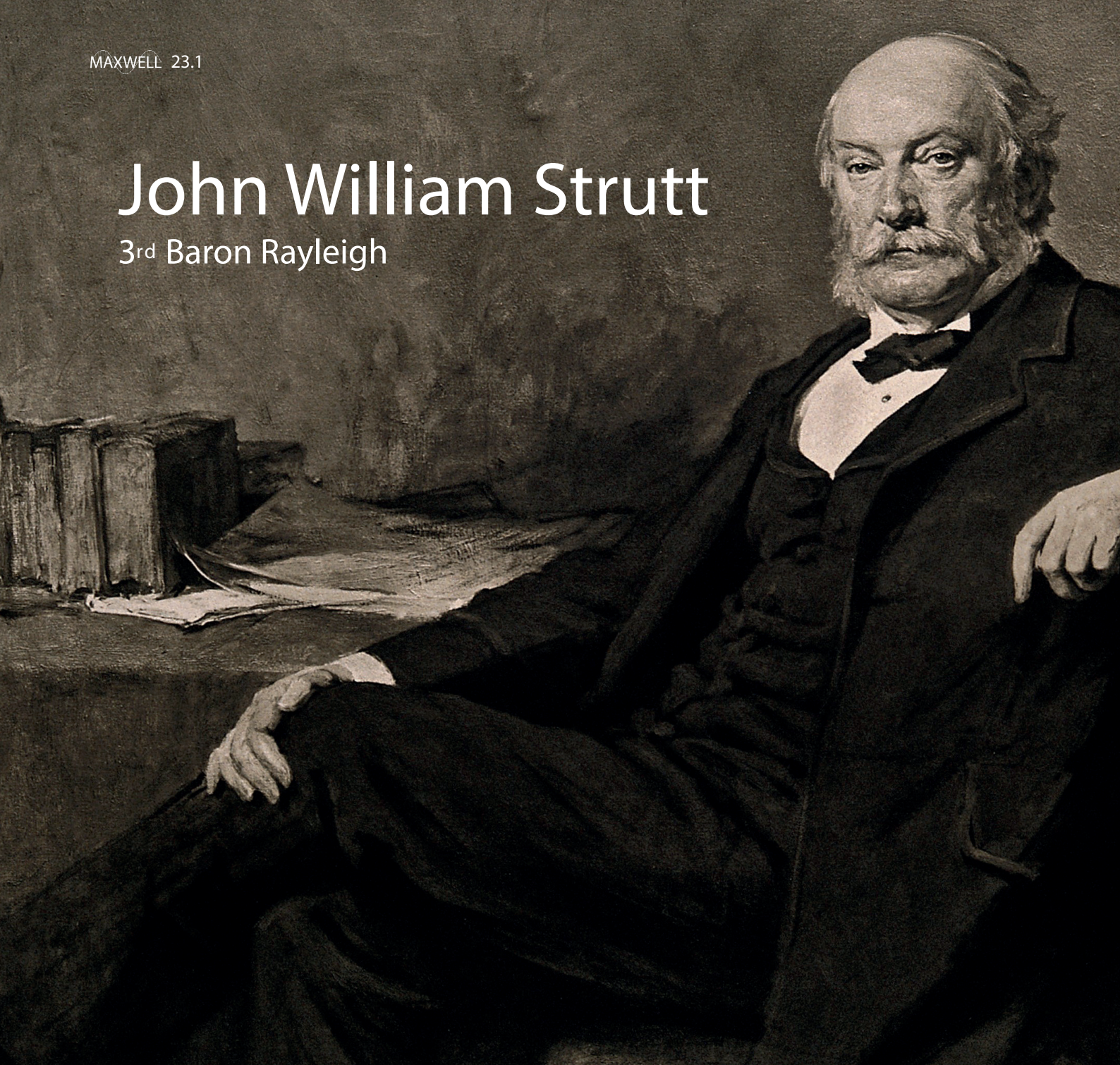
[1] "The Goal." [Online]. Available: <http://www.portwings.eu/>.

[2] Portwings | Robotics and Mechatronics. [Online]. Available: <https://www.ram.ewi.utwente.nl/research/projects/portwings>.



# John William Strutt

3<sup>rd</sup> Baron Rayleigh



## Contributions

- 1877 Published "The Theory of Sound"
- 1880 Rayleigh's Equation
- 1883 Rayleigh–Taylor Instability
- 1894 Discovered Argon
- 1900 Rayleigh–Jeans Law
- 1907 Duplex Theory
- 1917 Rayleigh–Plesset equation
- 1926 Rayleigh–Schrödinger Perturbation Theory

... among others.

## Awards

- 1865 Smith's Prize
- 1882 Royal Medal
- 1890 De Morgan Medal
- 1894 Matteucci Medal
- 1895 Faraday Lectureship Prize
- 1899 Copley Medal
- 1904 Nobel Prize in Physics
- 1905 Albert Medal
- 1913 Elliott Cresson Medal
- 1914 Rumford Medal

*"I have never thought the materialist view possible, and I look to a power beyond what we see, and to a life in which we may at least hope to take part."*

*John William Strutt  
Rayleigh*







# An Ode to Beers

## A /Pub Story

*Marcel Brouwer*

For the first time in the history of our faculty, our beloved pub is now being run by students. Since the start of this academic year six students started as the first board of the /Pub Foundation. They have taken over from the old PubCie comittee and with that comes a couple of changes.

You might have already seen that you can now pay by card in the /Pub and no longer need to go to the study associations to get some cash on you. We have also changed from supplier and with that from beer brand. Not only does this mean that we have a lot more variety in our assortment now, but it has also become cheaper. One of my favourite new things is that we now have a lot more different draft beers.

But we are not stopping there, the board has a lot more plans for the future of the pub. There will be new activities for example, organised by the pub. The first ever cantus sing-a-long will be held at

the end of November, there will be a special event at the end of 2019 and we have a couple more that we are working on and cannot wait to reveal to everyone.

The look of the pub will also receive some changes during the coming year. Most of the work will be done in the summer, but we are working on some small changes during the Christmas break as well. We want to replace our old 2 tap bar by one that can use 4 instead, just to give an example.

We also want to keep strengthening the ties with the study associations, by integrating the members of the ETV

with those of CH. Both are rather different associations of course, but we believe that the pub offers a nice neutral ground for both to enjoy their time at the TU Delft. I mean, what better time to enjoy a little casual conversation than right after your lecture, with the enjoyment of some refreshments?

If you ever want to learn more about the pub, or maybe get involved by becoming a barkeeper do not hesitate to drop by, one of us will always be at the /Pub.

Until then!

É



*Figure 1.* The board from left to right: David van Beelen (Commissioner Barkeepers), Rona Roovers (Commissioner Purchase), Marcel Brouwers (Secretary), Bastiaan Bakker (Chairman), Frederiek Backers (Treasurer), Joris van Breukelen (Commissioner Internal Affairs)



# Bachelor Column

## A peek into the world of Electrical Engineering students

Philip Groet

Hi! I'm a 4th year Electrical Engineering Student at the TU Delft and am currently busy with the minor Finance at the EEMCS faculty. Although 4 years have passed since I started my studies, I'm still doing second and third year bachelor courses. This is mostly because I have been busy with some stuff next to my studies.

**What did you find most challenging about your studies?**

First off, I had a bit of a different start than most students. I did middle and high school in Belgium, which has a slightly different focus than the Dutch school system. In Belgium I did the high school track "Industrial Sciences" or "Industriële Wetenschappen" in Dutch. This track had 8 hours of math per week and included electronics, mechanics, and electricity in the weekly classes, kind of like an Electrical Engineering Lite. This gave me a head start starting at the TU Delft and allowed me to be active at my student association in the first year. After my head start had faded towards the end of the first year I did have to study more consistently and that was quite the challenge back then.

**What did you do besides studying?**

So, as a lot of people do in Delft, I'm part of one of the big student associations in Delft. I became a member there in my first year and it was (and still is) a lot of fun. Although combining studying with a student association had its issues planning-wise, it all worked out fine. After having studied for 2 years I was asked to do a board year for the study association ETV. There I had a fulltime responsibility to represent the students of Electrical Engineering and organise all kinds of career, educational and social activities for these students. Doing this board year required a completely

different mind-set than I was used to. I was used to studying and going to lectures, but that changed to organising activities and being in a bunch of meet-

*"I had a full-time responsibility to represent the students of Electrical Engineering."*

ings every week. All in all, the board year was really insightful and I recommend everyone to take the opportunity to do something similar.

**What minor are you doing now?**

At the moment I am doing the minor Finance. This minor is about financial markets, models, and getting familiar with mathematics relating to finance. It is quite different from Electrical Engineering, but I think that makes it all the more interesting.

**Do you have any advice for the new students?**

As I said earlier, doing stuff next to your studies is educative and fun and all, but it can cost you your study if you get distracted too much. I've seen quite a bit of students getting engulfed by the student culture and losing sight of why they are in Delft: Studying! So my advice would be: keep your studies on number ONE and don't be afraid to do some extracurricular activities.



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# Designing for a UAM Future

## A Journey through the Sky

Swier Garst

In the envisioned future, the standard transportation mode in or between cities might very well be through the air. This is called Urban Air Mobility: UAM. These urban aircrafts should be electric and able to land vertically. At the moment, concept vehicles and rotor designs are made. Of course, to obtain success, high safety requirements are needed which are equal or better than traditional aviation.

### Introduction

Talaria began with a call to a challenge sponsored by Boeing in November 2017 for the design, build, and test of a personal flying vehicle. The main requirements outlined by the competition are that it should not be larger than 2.6m on all dimensions and not be louder than 87 dBA. With the fly-off set to take place in February 2020, the team is currently in the final production and testing process

before the first hover test in December of this year. As the project has progressed, flight control has always been at the core of design decisions and safety considerations.

Since the first demonstration of an auto-pilot in 1912 and a self-driving car in 1939, we have strived to perfect the technology. Why, then, do we still have piloted flights today? One answer you will hear from the aerospace industry

is that the general public is simply not comfortable enough with these systems performing on their own, with no physical human intervention.

The inception of Talaria just 2 years ago coincided with what seemed to be the beginning of a shift in development and belief in automated mobility. Much of this development has taken place in ground transport with self-driving Teslas and Daimler's automated trucks,





which have been tested as early as 2014 [1]. This puts Talaria at the forefront of control technology for a UAM future. With its smaller size and range than many competitors in the market, it is likely that these types of devices will be performing missions in more object-crowded areas; making system safety and redundancy of utmost importance if we are to see this future come to fruition in our lifetime.

### Method

When putting this automation into practice, one word comes to mind: Redundancy. Whether it is due to software bugs in early development, interference on sensors, or fatigue after intensive use, a control system is prone to lots of failures. When failure happens in self-driving automotives, it could have catastrophic consequences. Up in the

air, this is almost guaranteed. Hence, it is important to generate as much redundancy as possible.

Another challenge on top of this is the given timeframe. Starting from scratch, with lack of knowledge, funding and manpower, 2,5 years to build a complete flying vehicle suddenly becomes a sprint. This means that there is little time to develop and/or implement algorithms that make redundant components effective.

The intersection between the desire of a fully redundant system and the constraining resource limits, lies somewhere in the middle. The most critical components were identified. These were components whose failure would not only cause immediate device failure, but whose function could also easily be taken over by a redundant component

without the need of complicated software. Besides, during this phase of development, a manual link will always be present while testing. This means that if any of the non-redundant systems fail some (simple) sanity checks, the pilot will be urged to take over.

As time moves on, more and more systems can be made redundant. Combined with extensive testing campaigns, the need of a human-controlled backup link will eventually be eliminated from a technical perspective. In the meantime, a cultural shift is expected where society will become more comfortable with automation in mobility, as well as with the concept of urban air mobility itself. All working towards a future of not only self-driving cars and flying cars, but also the intersection between the two: The self-flying car.

É



- [1] "Driving autonomously through Nevada," Daimler. [Online]. Available: <https://www.daimler.com/innovation/autonomous-driving/freightliner-inspiration-truck.html>.
- [2] J. Karpowicz, "Project Talaria Creates Modular Drones to Support Urban Air Mobility Ecosystems," Amsterdam Drone Week, 26-2019. [Online]. Available: <https://www.amsterdamdroneweek.com/news/articles/project-talaria-creates-modular-drones-to-support-urban-air-mobility-ecosystems>.

# EEMCS Recruitment Days

## FAQ on the biggest faculty career event

### Who can join the event?

The Recruitment Days are organized annually for all master- and PhD-students within our faculty. This means that the students from all tracks of Electrical Engineering, Applied Mathematics and Computer Science are heartily invited!

### Where do I sign up and how much does it cost?

You can register online at our website, [www.eemcs.com](http://www.eemcs.com). Registration is easy and completely free! Registration will be open for the entire month of January.

### Where will the event take place?

The event will take place in the meeting rooms on the 3rd floor of our faculty. During the days itself, signs will be put up to show you the way.

### How does the event work?

The EEMCS Recruitment Days is all about getting the right students and companies in touch with each other. After a quick, online selection procedure, students and companies are matched. The best matches get to meet each other during the event!

### How does the matching work?

The selection happens on our website. Both on your dashboard and in the

menu bar, you can find a link to the company selection. There, you get to see an overview of all companies and their information. Do you find a company interesting? Press 'Select company'!

Similarly, companies can view the anonymous student CVs. They can rank these CVs from 1 - 3, indicating how interested they are. Based on the interests of both sides, our matching algorithm ranks the results from 'Perfect match' up to 'No match'. The best matches are invited for a meeting. No worries - if you have not gotten a 'Perfect match', you can still get invited for a meeting, depending on the number of available spots.

### How many companies should I select for the matching?

The number of companies you select does not influence your ranking for individual companies. For instance, selecting few companies does not give you a higher chance of getting a 'Perfect match' for one specific company. Thus, please feel free to select all the companies you find interesting!

### How long do the meetings take?

Every meeting takes about 25 minutes. We kindly ask you to come by our student desk 15 minutes beforehand, so we can confirm your meeting.

### Help! I Have a meeting but cannot make it on that specific time slot. What should I do?

Please send an e-mail to our team at [info@eemcs.com](mailto:info@eemcs.com). We will try to see if we can give you a different time slot. That way, you can still meet your match.

### How do I prepare for a meeting?

There are various ways to prepare yourself well:

- Join the CV workshop on January 14th and the Interview workshop on February 11th so you'll be sure to shine during the selection and meetings. Register for the workshops on our website!
- Be sure to have familiarized yourself with the company that you will be meeting! Read about their work online, so you know what they do and what they stand for. That way, you will avoid awkward moments during the meeting.
- Be your confident self and have fun! While the meetings may sound a little overwhelming, they are meant for you and the company to personally get to know each other. So, ask all you want to ask and enjoy yourself - your possible future employer will do so too.

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Looking for a thesis project,  
an internship or a job?



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**March 16th - 20th**



**CV Workshop**  
January 14th



**Interview Workshop**  
February 11th



**Interview Days**  
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# EOW 37

## Waar is het Phase'je

*Owen van Hooff*

At the end of the summer break it was time for the introduction weekend (EOW) for the freshmen students. As usual the first night was spent at our own faculty EEMCS. In the afternoon the freshmen took a tour through the building, in order to get to know the research groups. The groups visited among other things the Else Kooij lab and the terahertz sensing group. In the evening the committees of the ETV were presented to the students. Besides the committees all freshmen attended a short assembly to get to know the all traditions. After being dropped off in the dark, the day ended in our own /Pub, where the freshmen could share their experiences of the first day. The rest of the weekend took place on a camping site in 'S Gravenzande. While cycling to the

camping site the freshman had to make creative pictures. It was really enjoyable to see the enthusiasm during the cycling. On the camp site it was time to get to know each other better. The freshman played several games against each other after which they all gathered together to race against the (then still) potential board through the obstacle course. The joy on the faces of the freshmen made us as committee really happy and proud. The day ended with a Pubquiz and relaxation at the campfire, where the day could be discussed while enjoying eating marshmallows. The last full day was mostly spent outside the campsite. In the morning the local gym was made unsafe by our freshman. Starting the day with morning gymnastics given by the potential board. After

the sportive morning, they went to the beach. On the beach they had lunch together and enjoyed the cold water. Many freshmen took their shot to throw some potential board members in the water. The weekend traditionally ended with a big party starring the great band "De Broer van Henk". The party was really crazy. Also during the party the freshmen learned to do the famous Elektro dance. All in all it was a great weekend in which the freshmen have been able to get to know each other, the faculty, and our beautiful study association. Beautiful memories were made and many great friendships began.

It was an actual Phase'je!

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# Activities

An overview of last quarter's events



## Zackie Night

24 October

A live band and a karaoke - what better way to end the summer? The 24th of October, we, the ninth summer activity committee organised the ZAkCie night. We had an awesome night with delicious snacks, fun games and of course great people. The newest Electro band It Hertz made their debut, live on stage in the /Pub. They haven't been together for long, but they were amazing and we can't wait to hear more from them! After the band, the stage was cleared for all the other ETV'ers to show their singing talent. Although most were not on key, everyone had great fun singing along to their favourite songs. It was really fun to be able to organise such an activity and we were very glad to see everyone having so much fun! Sadly all good things must come to an end. So after the last round of beers everyone left to go home or to the Koperen Kat to continue the party.

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### Kwartjes avond

7 October

An annual event the ETV is very proud of. I'm ofcourse talking about the Freshmen Night, also known as the "Kwartjesavond". On this night our freshmen got the chance to rejoice and commemorate all summer events. It is also an evening dedicated to spending all remaining coins from the freshmen weekend. Members showed up in their overalls and the EOW tankards were generously filled.

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### ASML Besturendag

24th October

Two board members were invited to spend the day at ASML Headquarters in Veldhoven. For people who are unfamiliar with ASML: it is a high tech company which manufactures the machines that produce microchips. Thomas and Shea got an elaborate tour through the huge building and got to experience the production of the microchips in the Experience Centre which expanded their understanding of how microchips are actually made. Complimentary to the tour was an inspiring leadership workshop. The day was finalized with a tasty buffet with employees of ASML, after which a bus was waiting to pick the board members up and bring them safely back to Delft.

€

### Welcome Back BBQ

16 September

The Welcome Back BBQ is the first event of the year. We were lucky this year because even though "buienrader" said it would rain, the BBQ remained dry. There was plenty of food to fill everybodys stomach accompanied by enough drinks to wash it down. The zAkCie committee took the effort to assure everybody enjoyed their evening, which resulted in a great BBQ and an enjoyable night.

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### IFF

17 october

The yearly "InterFacultair Feestje" was once again a great success. This year it took place in the Bierfabriek which offered a nice contrast to the usual location: the Lorre. The party was organized by ETV, CH, Froude, Life, and MV. Each Study Association had a color in which their students could attend the party which resulted in a room filled with a rainbow of colors. We look forward to next year's IFF!

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### Technolution workshop Rust

23 October

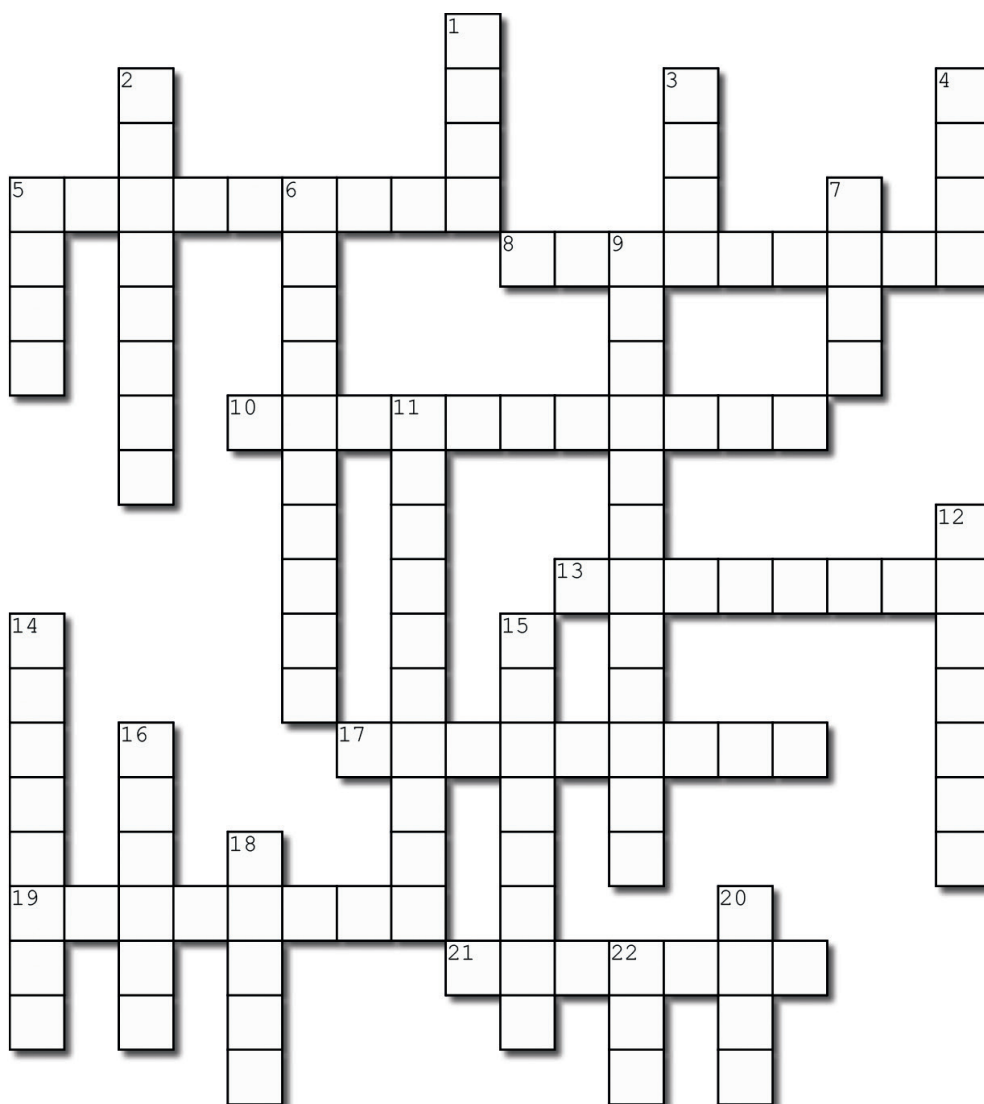
Our first workshop was hosted by the kind people from Technolution. With the help of Erwin and Johan, a group of 20 ETV'ers were instructed in the programming language of Rust. As an alternative to C, Rust focusses on memory safety without compromising on performance.

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# Crossword

Test your knowledge

*Koen Peelen and Marco Postma*



## Vertical

1. Memory cell
2. Not enough power
3. 8 bits
4. Full of energy
5. Director of studies EE
6. Inside working components
7. Reduced instruction set computer
9. Transport

11. Opposition
12. James Clerk
14. In something else
15. L
16. Wizard of Menlo
18. Small flying device
20. Serial communication
22. LM1117

## Horizontal

5. Magnet
8. Ability to do work
10. Dead and alive
13. Shortest path
17. Range of frequencies
19. Not continuous
21. True or false



# Upcoming Activities

For members of the Electrotechnische Vereeniging

*Sam Aanhane*



## CoDe ETV Party

The ETV will visit Leiden again to celebrate a fun evening with our friends from CoDe. In the past years they have always received us with open arms, so we are glad to announce we'll be having a party with them again for the second time this year. The theme will be "LED's glow" this time, so wear your brightest dancing shoes to "De Kroon" and show those criminology student what you're made of!

When: 27<sup>th</sup> of November 2019

Where: Café "De Kroon"

Price: TBA



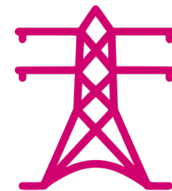
## Di-Et-Tri Activiteit

Due to the pressing interest of the study association of Di-Et-Tri, the study of nutrition and health, the party with the ETV will have a sequel in the end of November. Last year our trip to Wageningen with the Kwibus was a great success, so this year the pubs in Delft will be visited with our friends from Gelderland. It will be a promising evening with plenty of new people to talk to!

When: 28<sup>th</sup> of November 2019

Where: Wageningen

Price: TBA



## DNVGL Excursion

Our chapter the "Sterk Stroom Dispuut" who are responsible for all activities related to the power master organizes an excursion to DNVGL. DNVGL has over 100,000 customers in more than 100 countries, and provide risk management and quality assurance services to the maritime, oil and gas, and power industries. They are global leaders in certifying management systems of companies. Sign up at the ETV Desk!

When: 28<sup>th</sup> of November 2019

Where: DNVGL, Arnhem

Price: Refundable Fee of 5 Euros



## Sinterklaaslunch

On the 5<sup>th</sup> of December, a time old tradition of the Netherlands will be celebrated in the pub. This is because Saint Nicholas will be in town again and this needs to be celebrated of course. Everybody will get to enjoy a nice free lunch and the possibility to leave a homemade shoe in the Boardroom. Who knows, if you haven't been naughty perhaps Saint Nicholas himself will leave a gift!

When: 5<sup>th</sup> of December 2019

Where: /Pub

Price: FREE



## Alcmaeon Gala

Love is in the air during the winter month of December, so this is the perfect chance to meet the one to bring home to your parents during the holidays. The Gala will be organized in collaboration with Alcmaeon, the study association for Psychology students. Dressed in white tie, we will visit the town of Utrecht with the Kwibus to enjoy an evening with our foreign friends who have proven to be absolute party animals.

When: 12<sup>th</sup> of December 2019

Location: Utrecht

Price: 44 Euros



## Kerstlunch

Of course, if the arrival of Saint Nicholas is celebrated, Santa Claus cannot be forgotten. He will get his own lunch on the 20<sup>th</sup> of December. This will be a great moment to see your classmates a final time before the holidays begin. Some say that Santa himself will be present... All in all a great free lunch with the possibility to taste the secret, decade old recipe of the ETV for glühwein!

When: 20<sup>th</sup> of December 2019

Location: /Pub

Price: FREE



# CREATING A SUSTAINABLE FUTURE TOGETHER!

## Wie zijn we?

Van klimaatverandering tot razendsnelle verstedelijking. Onze wereld wordt steeds complexer. De ruimte in steden moet optimaal worden benut en onontgonnen land moet bewoonbaar worden gemaakt. Juist op deze terreinen creëren wij buitengewone en duurzame oplossingen. Onze mensen werken gezamenlijk aan het creëren van meerwaarde door gebouwde en natuurlijke elementen naadloos in te passen in hun omgeving. Van winkelcentra in Shanghai tot een nieuwe metro in Doha en het terugdringen van luchtvervuiling in Los Angeles. Arcadis. Improving quality of life.

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Of het nu gaat om het duurzaam optimaliseren van de ruimte in de stad of het beschikbaar houden van (natuurlijke) grondstoffen in het productieproces, Arcadis behaalt uitzonderlijke en duurzame resultaten voor haar klanten. Het is onze passie om de kwaliteit van de leefomgeving duurzaam te verbeteren door waarde toe te voegen op sociaal, economisch en ecologisch vlak.

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27.000 werknemers	—
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