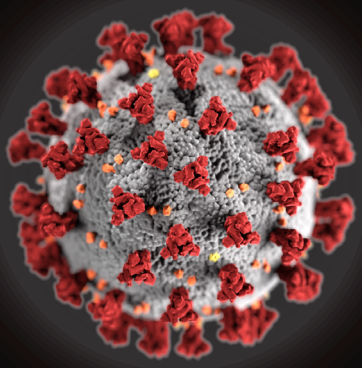
MAXWELL

Electrotechnische Vereeniging

Issue 24.1 | November 2020

Staying Connected



General Radio Company
A veteran in test equipment

Interview with Prof. dr. John Schmitz
About a bright future

Interview with Dr. ir. Nick van der Meijs
About the changing times

GENERATION

Merchandise

Longsleeve • Longsleeve • Longsleeve • Longsleeve •

12,49

Socks • Socks • Socks • Socks • Socks • Socks •

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From the Board

President

By Joris van Breukelen

Dear reader,

The first quarter of this year has already ended. It has been a strange quarter for everyone, and so for the Electrotechnische Vereeniging as well. The Board has changed and we are facing a difficult task: Staying connected with the students of EE. Everyone is working from home and a lot of students are suffering from loneliness. The ETV has been established nearly 115 years ago with 3 main objectives: improving education, providing good career prospects for EE students, and creating a social connection between the EE students. Therefore, the ETV is necessary more than ever. In terms of education, there has changed a lot. It might be difficult for students to adapt to a new way of education. Especially first-year students might have problems since they cannot quickly come by at the ETV to solve their educational issues. This is why we are more active on online platforms. We are organizing online events in order to create a social connection between the students as well. If you have creative for an event, you can always contact us.

Our magazine, the Maxwell, will of course still be published for all our members. The theme of this edition is very related to the time we are living in: Staying connected. I wish everyone a lot of pleasure in reading this edition. Stay healthy and hopefully, we can see you this year!

With excited regards,
Joris van Breukelen
President of the 149th Board of the
Electrotechnische Vereeniging

From the Board

Commissioner of Education & Vice-President

By Reinier van der Leer

Dear reader,

In this column I want to look back on the last two months: what a quarter it has been. Firstly, we had a record number of new students in the bachelor EE programme – up 19% from last year – many of whom also participated in the EOW, which received a lot of positive feedback. Electrical Engineering is now the fastest growing bachelor programme – something we can be proud of! Electrical engineers are in extremely high demand in the industry, so there, too, this growth is more than welcome.

Secondly, substantial steps are being made in revisiting the structure and branding of the bachelor programme. Most bachelor programmes at the TU Delft have electives, some more than others. The Electrical Engineering programme, however, is entirely fixed. One of the goals of the ongoing revision is to give students an opportunity to deepen their knowledge on a subject or expand their perspective within the bachelor. It will not be finished anytime soon, but the call for more choice in the programme is anticipated to be answered in academic year '21/22.

Last, but certainly not least, we see people are finding ways to Stay Connected and occupied in spite of the current situation. This also applies to us and our contact with fellow study associations. We are students at the Delft University of Technology, home to thousands of innovating minds, who take on challenges and do not stop at a single failure. The restrictions of the current situation create one of the greatest challenges many of us have ever faced, and people are adapting more and more to this new, albeit hopefully temporary, way of living. Social events are forced online, and we recently experienced that this does not have to be any less fun than a similar physical event. Of course, not everything we organize is as spectacular, but that does not deter us from improving and trying again.

Next to new types of social events, opportunities in the interdisciplinary academic field arose due to limited supply of medical equipment, in Europe as well as Africa and Asia. New projects with the goal of developing affordable, simple and reliable equipment like ventilators or oximeters sprouted at the TU Delft as well, joining the strengths of students from multiple faculties, giving them an opportunity to develop their soft skills and implement their knowledge in very relevant projects.

All in all, I would like to end on a positive note. We live in strange times where some things are not possible, and activities have to be reinvented. The situation does, however, offer countless opportunities to improve, to change, to reinvent and develop what was neglected or overlooked before, as our motto says: Ubi dubium, ibi libertas, "where there is doubt, there is freedom". This applies to the education here at the university, to how we live and interact with each other, but also to the business models of many companies, the fight against climate change, and things like the rise of open-source hardware and self-monitoring in healthcare. We take these opportunities, these challenges, and make the best of it, as we have done before and will keep doing for generations to come.

With excited regards,
Reinier van der Leer

Commissioner of Education & Vice President of the 149th Board of the Electrotechnische Vereeniging

Past Activities

Online 38th freshmen weekend (EOW)
21st and 22nd of August

Board change and constitution drinks
9th of September

Lustrum podcasts
20th-23rd Of October

Online & physical lunch lecture DNV GL
22nd of October

First General Assembly
25th of October

Motivational drinks
9th of November

Colophon

Year 24, edition 1, November 2020

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page 23 TenneT

Printing
Quantes, Rijswijk, 1400 copies

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Non-members can get 4 issues of the Maxwell against an annual contribution of €10,-.

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Editorial

Dear Reader,

The current set of circumstances reminds me of an ancient Persian adage, “This too shall pass.” This adage explains the ephemerality of the human conditions. The past few months have redefined the world we live in and the world we are socially connected with.

The most significant challenge for everyone who is experiencing the online environment is, “Staying Connected.” In this edition, we bring to you an overall perspective of the TU Delft staffs and the students on how the life at the university has changed to adapt to an alternative form of education. On a technical note, we take a look at 5G connectivity through an interdisciplinary lens. We would like to take a moment to express gratitude and appreciate the faculties of the TU for maintaining the education level in such vicissitudes.

In lieu of the current situation, I thank my colleagues of the 24th Maxwell Committee and the ETV board, whose collective effort has made the first edition of this academic year possible. This is also a huge achievement for the board, as we have accomplished to publish the magazine completely on a virtual platform.

We hope you stay healthy, stay connected and have a cheerful reading!

Aniruddh Kulkarni

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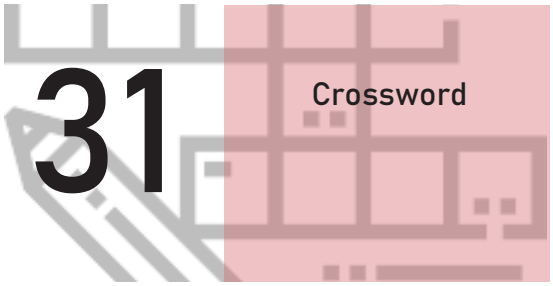

31 Crossword

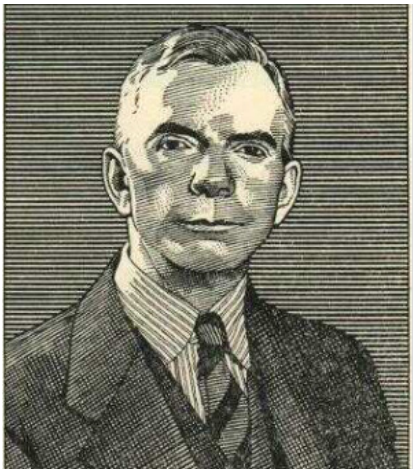
The General Radio Company
A veteran in test-equipment

Gerard Broodbakker

The General Radio Company was founded in 1915 in Cambridge, Massachusetts, to provide a starting radio market, with good quality components such as variable capacitors, decade resistors, coils and rectifier-systems. As time passed and the radio industry grew in sophistication and volume, the design and manufacture of electronic testing instruments became more important. When the United States entered the First World War in 1917, the demand for General Radio products rose dramatically. This was not the last time that the company's path was tied to war; it was destined to play a key role in supplying testing equipment during the Second World War, and still later in the Korean conflict (1950-1953).

General Radio has had a rocky journey. It rose to fame as an 'engineer's company', principally due to their strong relationship with the Massachusetts Institute of Technology. It was perhaps one of the first businesses in the USA to be employee-owned from the beginning. While this unique formula may now seem like an accomplishment by itself, at the end of the sixties the company's private shareholders were not prepared to finance the R&D for next generation technology. Their main competitors Hewlett&Packard and Tektronix had a better marketing strategy and were well-funded. In 2001, General Radio was split into three divisions that were bought by other companies.

Excellence had become too expensive, yet, quality is timeless. Even now you can find more than fifteen hundred of their items for sale on Ebay. Many of the original products are still available through IET-Labs. Our Study-collection has a beautiful set of very old and more recent General Radio instruments, of which some have been restored to their original condition; most recently, we had the great pleasure of giving



Melville Eastham Founder, General Radio Company

Some of General Radio's accomplishments:

- One of the world's first portable oscilloscopes.
- Production of stroboscopes such as the Strobotac.
- Production of high-precision impedance standards and metrological equipment.
- Invention of the "five-way" binding-post connector for accurate measurements.
- Invention of High Frequency and microwave genderless connectors (GR874- and GR900-series)
- Automatic PCB logic-analysers.
- The Variac variable autotransformers (U.S. trademark of General Radio from 1934 to 2001)
- Production of sound level-meters.

new life to the historic GR805-C Standard Signal Generator.

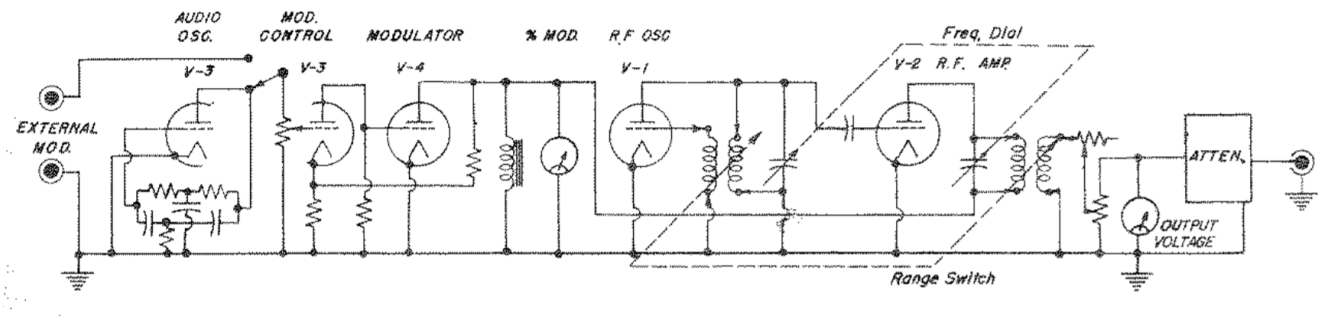
The GR805-C Standard Signal Generator

In 1941, the GR805-A design was commissioned by the USA army as a precision laboratory instrument primarily for the rapid and accurate testing of radio receivers. One of the designers was J.K. Clapp, patentholder of the classical 'Clapp oscillator'. The signal generator needed to be sturdy, with proven electronics that would aid the war effort; furthermore, it needed to meet the army's main requirements of operational simplicity and speed. Consequently, the instrument was intentionally constructed using neither advanced technology, nor the advanced innovations that marked GR products. When the GR805-A finally appeared in the 1942 GR sales catalog (K2), it had a price tag of $850, and limited availability. Material and production resources were scarce during the ongoing war, and orders were prioritized. General Radio eventually put out newer versions of the Standard Signal Generator in 1945 (GR805-B) and 1948 (GR805-C), and despite only minor improvements on the original design, they cost $1,350 i.e. over 60% more. Despite the considerably high prices, the GR805s were sold in huge numbers throughout the years. The instrument even had a fourth version in 1963 (GR805-D), priced at a whopping $2,250, which was discontinued in the following year.

One of our two GR805-C (serial no. 988)

The layout of the signal generator system is straightforward. The entire unit consists of:

- A modulation oscillator (400 Hz and 1000 Hz) with a voltmeter to read the percentage modulation,
- A carrier-frequency oscillator (16 kHz – 50 MHz),
- A tuned radio-frequency amplifier,
- A resistive output attenuator, with an RF-voltmeter reading the output level, and
- A well-regulated power supply with mains-filter. (not shown here)

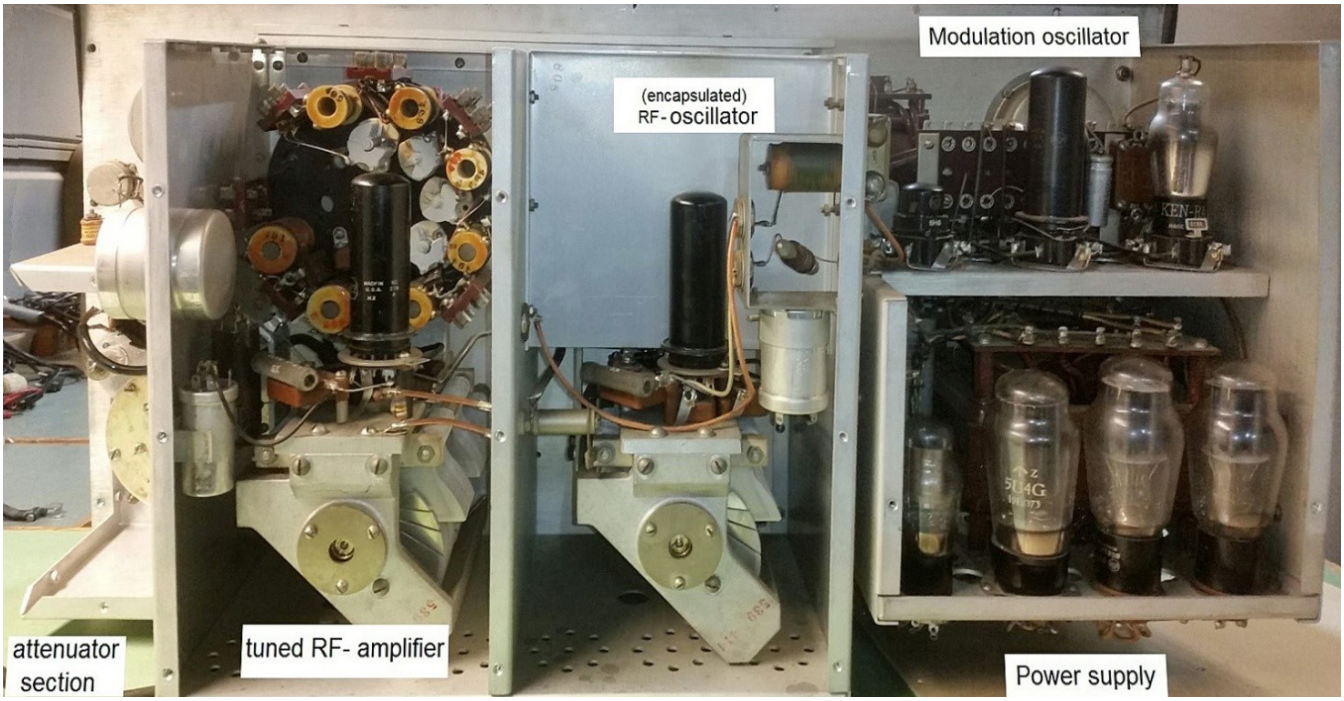


Simplified schematic of the 805-C from its operation manual

Instrument Description

For a stable oscillation-frequency, the free running LC-oscillator was isolated from the changing output-conditions using an RF-amplifier. Excellent signal purity could be obtained by tuning this RF-amplifier. The bandwidth of the filter had to be adequate to allow LF-modulation up to 7 kHz. Independence from the mains-voltage was a necessity, and required the use of a stabilized power supply with a proper control margin. An elaborate mains-filter was used to remove disturbance and electro-smog resulting from the AC-power source. The instrument's triple casing provided stability and prevented spurious signals from entering or escaping the instrument – this is critical when working with highly sensitive receivers and large power communication equipment.

The outer case of the GR805-C is a massive steel box with strong handles, giving the instrument good survivability even in difficult environmental circumstances. However, it does contribute considerably to its total net weight of 53 kg, 117 lbs. The case features ventilation-holes to easily rid the instrument of its 150W dissipation. Given its inception in 1941, this impressive AM-CW signal generator had exceptional specifications with respect to stability and accuracy.



Back view of the GR805-C

Restoration and calibration

The two GR805-C units in our possession appeared on our desk during an inventory check in early January 2020. These units were gifted to Delft University in 1948 by the Rockefeller Foundation, and were probably used for about 20 years, until the end of the sixties ushered in a new era of solid-state equipment. For over half a century, these historic units were kept safely tucked away in the echoing cellars of the Study Collection. Under the dust coating, was there something worth salvaging? With some hesitation, we dared to fire up the first box, carefully increasing the line voltage with a Variac. Although the main oscillator responded to 6 of the 7 frequency bands, there was no output.

Of course, if we gave up so easily, we would never have become electrical engineers. We quickly exchanged the valves by reaching into our stock of thousands of thermo-ionic vacuum tubes. Only the lowest frequency band, from 16 kHz to 50 kHz, seemed to be faulty. The problem was found to be inside the oscillator turret, where Coil A had a loose connection. Soldering the multiple litz wire was a straightforward job. The restoration process involved cleaning and lubricating the box's mechanics – a gratifying task for a machine this old. To our astonishment, all the capacitors were in good shape, even after over 50 years of unuse. "As long as the oil stays inside, they are okay," said a fellow member of the Study Collection.

Several more replacements were made. The original power socket at the back was switched with a modern USA version. While the original output-connector was retained, the GR774 sock (designed for the USA Navy) was replaced by a genderless GR874 socket – both sockets have the same thread, which is rather convenient. At this stage, we could finally connect the output. With the exchange of the high power 1614-tubes, the instrument had to be fully recalibrated – no easy feat when most of the components are over 70 years old! As it happens, I remember having done this before in December 1968, as a trainee at the start of my technical education. Still a tough job but completed with success. I am curious about restoring the other one. The support of my colleagues is very much appreciated.

The 72-year-old instrument now surpasses all factory-specifications and is part of the permanent exhibition of the Study Collection. Quality is timeless indeed! Conclusion: To win a war you need 'the right stuff'.

GR874 Socket

Photograph #51

Aniruddh Kulkarni

The history of science is replete with facts that have been misrepresented, and with great researchers and personalities that have been ignored. A great personality and a genius scientist, who unfortunately experienced such response during her time, was Rosalind Franklin.

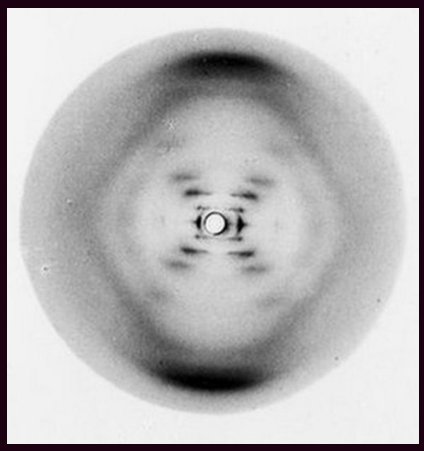
In the year 1962, James Watson, Francis Crick and Maurice Hugh Fredrik Wilkins received the Nobel Prize in Physiology or Medicine for their discoveries concerning the molecular structure of nucleic acids, and its significance for information transfer in living material. Little did the world know that without the data of Rosalind Franklin, the discovery of the structure of DNA would not have been possible.

Rosalind Franklin was born into a Jewish family on July 25th, 1962. As a child, Rosalind showed signs of exceptional intelligence, which led her to pursue an interest in physical chemistry. She earned her bachelor's degree in Natural Sciences in 1941 from Newnham College, Cambridge, with a specialization in Physical Chemistry.

Rosalind's career was initiated by working at the British Coal Utilization Research Association. Her graduate work aided her to earn a doctoral degree from Cambridge in 1945, and earned her an offer from the Laboratoire Central des Services Chimiques de l'Etat (Central Laboratory of State Chemical Services) in Paris. Rosalind worked there from 1947 to 1950, where she carried out experiments that perfected her methodology to apply x-ray diffraction patterns on imperfectly crystalline matter. Her research on graphitizing and non-graphitizing carbons are cited till date.

Rosalind soon moved to King's College, where she conducted research on the DNA model. Over the years, she performed x-ray diffraction on DNA samples. The DNA model at the time had not been conclusively explained. Rosalind, based on her obtained diffraction patterns, proposed two types of configurations of DNA: The A-type and the B-type. The researchers who worked prior to Rosalind had failed to explain the separate diffraction patterns. The reason that the diffraction patterns were inconsistent was the mixture of the A-type and the B-type configurations.

DNA consists of four nitrogenous bases: Adenine, Guanine, Cytosine and Thymine. The A-type configuration is a dry crystalline while the B-type configuration has a fully hydrated structure. The existence of A-type and B-type configurations can be proven based on their individual diffraction patterns (or images). Rosalind was by then a virtuoso at determining x-ray diffraction patterns; cautiously and pre-



Photograph#51: DNA x-ray diffraction pattern

©Rosalind Franklin, 1953, Illustration by Jody Hewgill for TIME

cisely, she measured the data for A-type and B-type configuration separately, which aided in obtaining additional data on DNA such as its density, unit cell size and water content. Rosalind was the first to apply the cylindrical Patterson map calculations onto molecules. Other biologists, such as Astbury and Bell, had also proposed their research data for the DNA model. However, their data lacked the diffraction patterns and the intricacies of layer lines, resulting in Rosalind's data being more precise.

The famous Photograph#51 is the image published by Rosalind Franklin illustrating the results of the x-ray diffraction pattern of the DNA. Despite the genius of her work, she was not given the credit she deserved. In the 1953 paper of Watson and Crick, they mentioned that their work has been stimulated from the unpublished works of Wilkins and Franklin. Such oblique acknowledgements have gravely misrepresented her contributions to science. In some of the literature, Watson has portrayed Franklin as a good experimentalist but also as a person who could not interpret her own data. In the 1962 Nobel Prize acceptance speech, neither Watson nor Crick acknowledged Franklin's work or the role that her data played in their discovery.

Rosalind Franklin died on April 16th, 1958. She has never been awarded the prize posthumously. Her absence at the Nobel Prize Ceremony was one of the reasons the world believed that the model presented was the result of the work accomplished solely by Watson, Crick and Wilkins. With her name included it would have been named the Watson, Crick, Franklin and Wilkins DNA model.

Rosalind Franklin was one of the meticulous scientists and can be seen as a great role model for scientific community. She should be looked upon with respect for her work and her contribution to the structure of the DNA as we know it today.

Interdisciplinarity in 5G Research

Interview with Dr. Yanki Aslan

Natasha Birari and Yunus Emre Döngel

Yanki Aslan was born in 1991 in Ankara, Turkey. In October 2016, he joined the Microwave Sensing, Signals and Systems group at TU Delft as a PhD researcher. He graduated Cum Laude in August 2020, with his PhD dissertation titled 'Antenna Array Synthesis and Beamforming for 5G Applications: An Interdisciplinary Approach' whose objective was to develop, evaluate and verify for innovative multi beam array techniques and solutions for 5G base station antennas, which have not yet been used or proposed in mobile communications. In particular, it introduces aperiodic arrays as a novel and innovative approach to 5Gmm-wave systems, and investigates novel methods for irregular / sparse array topology optimization, beamforming and thermal management.

The outcome of the research includes the design of the first ever irregular/sparce, sub-array-based antenna that features the desirable characteristics of wide-scan multi beam capability, lower temperatures, high-efficiency power amplifiers and low side lobe levels (SLL).

In his research, Dr. Aslan explores several different disciplines that are usually not taken into consideration in traditional antenna design: these include electromagnetics, thermal management, front-end architectures, and computationally efficient signal processing algorithms. Although his PhD project was intended to have a narrower scope on electromagnetics and antennas, the progressive outcomes have led to the inclusion of a broad range of disciplines gathered around the initial focus of the research.

"The PhD project was a collaboration with NXP Semiconductors," Aslan told Maxwell in a short interview, "And their challenge was to address the thermal problems in their design of 5G antennas."

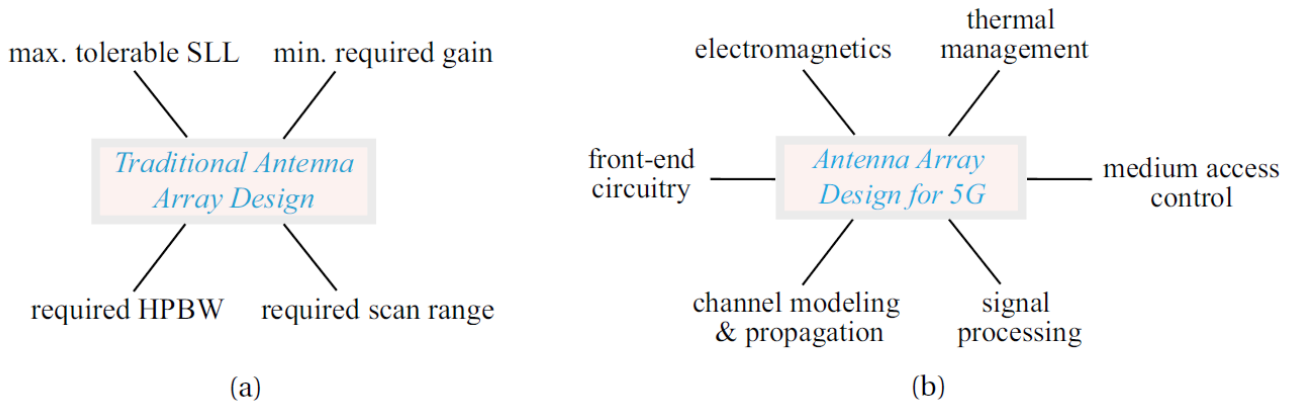
"The high frequency of 5G technology leads to a higher capacity, but reduces the efficiency of the electronics, which means there is large heat dissipation. And as the wavelength gets lower, the antenna design gets more compact. You now have a smaller volume, with very high heat dissipation. This can only be feasible with active cooling components – fans, water pumps and so on."

The original idea was to combine antenna array design, beamforming chips, and intelligent topology to relax the thermal requirements of the antennas. The project was to serve as a bridge the thermal engineering and electromagnetic engineering.

He dived into the details, and as he started including more aspects to get a complete picture of the problem, the multidisciplinary nature of the project became inevitable. While it remained predominantly in the area of antenna arrays and beamforming, it branched out to include the elemental aspects and implications of the antenna hardware, signal processing and channel modelling which were previously not discussed in a single paper.

Once Aslan had defined his project, his immediate challenge was to familiarise himself with the domain of thermal engineering. He collaborated with the thermal engineers at NXP Semiconductors to learn the basics; after about a year, he had become comfortable using the domain knowledge that the thermal engineers were familiar with. He notes that is not easy to regularly talk to people from different disciplines when you are not familiar with their terminology.

"You first feel like you're not at the same level and you don't understand each other; it requires some work to come up with a common language."



Design methodologies for antenna arrays: (A) Traditional Apporoach, which considers the max tolerable side lobe level (SLL), minimum required gain, required scan range and required half power beam width (hpbw). (B) 5G perspective, which takes into account sevral interdisciplinary aspect in the antenna design (Aslan, 2020)

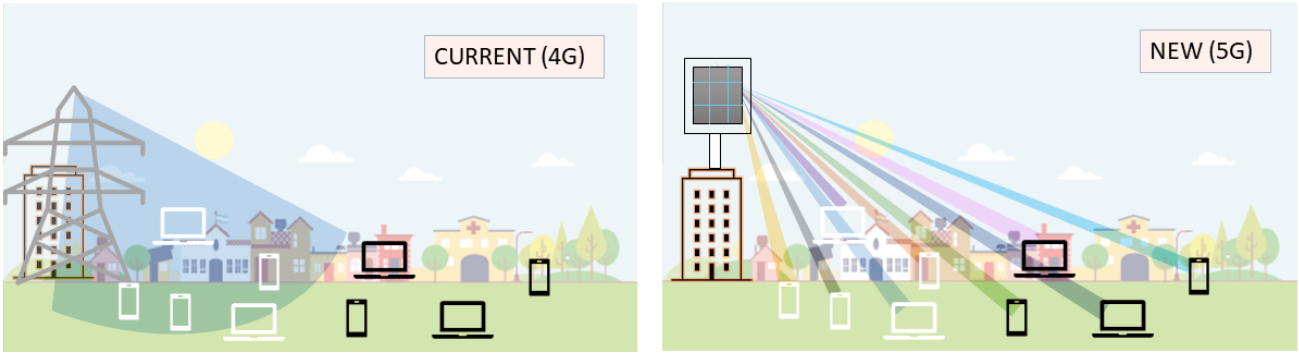
"When you have a multidisciplinary study, it is interesting for both fields. It also gives you a chance to introduce yourself to a different field, and people really appreciate to see the common points in such different disciplines."
Once Aslan had defined his project, his immediate challenge was to familiarise himself with the domain of thermal engineering. He collaborated with the thermal engineers at NXP Semiconductors to learn the basics; after about a year, he had become comfortable using the domain knowledge that the thermal engineers were familiar with. He notes that is not easy to regularly talk to people from different disciplines when you are not familiar with their terminology.
"You first feel like you're not at the same level and you don't understand each other; it requires some work to come up with a common language."

The Research Process

In traditional wide beam communication systems, each base station serves a large area, and users in the area are served at different times, different frequencies or using different codes. On the other hand, next generation communication aims to create small cells of network connectivity, with a single dedicated beam for each user in the network. This would enable the embedding of base stations in city infrastructure at about every 100-200m, leading to massive connectivity. Once the network achieves this scale of connectivity, the applications are very broad, such as smart cities, smart homes/buildings, autonomous vehicles etc.

This concept of dedicated beams for each user is not a new one. "The concept has already been in use for space applications for decades," says Aslan, "but the struggle was to find a cost-effective way to apply the same

concepts to cellular 5G communication."
The first year of the PhD project consisted mostly of coming up with the idea of combining electromagnetics and thermal research, and refining it further. At the same time, Aslan was thinking ahead – he was already looking for possible ways to test his idea via simulations and experiments, and devising efficient ways to realise the concepts. In the second year, the discussions around the idea began to unfold.
"My original idea was to see the impact of the position of the heat sources on the temperature [of the beamformer chips], and that is purely a thermal problem. I was lucky to find some key references to guide me, so I didn't really get lost. Then I had to merge the studies from both fields, antenna synthesis and thermal engineering, in a way that both disciplines can recognise it and give credit. That took almost one more year. So, in two years, I managed to start working on reasonable results."
Some of the techniques used by Dr. Aslan already existed in fields outside his discipline. For instance, he observed heat source layout optimization being used in thermal engineering, but not in antenna engineering, and so the opportunity of taking a concept from thermal engineering and applying it to antennas instead, quickly roused the curiosity of the antenna community. Similarly, thermal engineers were interested in finding out how a computationally efficient array synthesis technique from antenna theory could be applied in the thermal engineering domain.



Traditional wide beam communication systems vs next generation system with dedicated for users

Aslan was fortunate enough to be able to choose his research subtopics without any boundaries. "I was able to think out of the box. I believe it is important to think freely, make use of the collaborative environment of both academia and industry, and form a novel research idea. After that, it's about investing in the idea, and prototyping to see the result."

Active Collaboration

Traditionally, you have a system engineer who comes up with requirements specific to the system, then the RF and antenna engineers have to satisfy these requirements. There is this feedback-loop relation between the software and hardware engineers. For 5G, since the requirements were not well defined, all the work had to be collaborative – you have to design software for the hardware, and hardware for the software. According to Aslan, each person in a multidisciplinary project should know part of other peoples' work – the key is to train yourself to understand the basics of other disciplines, he says. This is easier said than done. When you mix a group of people with different backgrounds and sufficient knowledge about each other's disciplines, you could potentially create a productive multidisciplinary group capable of achieving very good results. However, this kind of fruitful collaboration requires active cooperation between the group members.
"People should be willing to cooperate and compromise at some level," says Aslan. "When you try to achieve something in one field, you probably need to compromise something in another field. In the end, it

Complementary Research Domain	Motivation
Channel modeling & propagation	The requirement that a narrow beam has to be pointed to a user (especially in NLOS scenarios) and has zeroes towards other users, while a wide beam will always cover the user
Signal processing	Large amount of control parameters in arrays with limited processing power and speed
Front-end circuitry	Compact system integration challenges, component (and cost) reduction requirements
Thermal management	Low efficiency of PAs, high spatial density of the heat sources, much higher heat generation than the conventional systems
Medium access control (MAC)	The need to manage multiple data streams to simultaneous users, where each user receives a dedicated co-frequency beam

Motivations behind the interdisciplinary 5G study. NLOS stands for Non Line of Sight; PA stands for power for Power Amplifier (Aslan, 2020)

Research Topic	Thesis Content
Electromagnetics	Multibeam architectures, high gain, low sidelobe antennas
Channel modeling & propagation	LoS SDMA system model & mm-wave link budget in different BS deployment scenarios, impact of multipath on the system performance
Signal processing	Several beamforming algorithms with/without complexity reduction
Front-end circuitry	Low-complexity beamforming architectures, power-efficient array synthesis
Thermal management	Thermal system modeling, passive cooling methods
Medium access control (MAC)	User selection & scheduling approaches

Thesis content with respect to the respect topics. SDMA stands for Space Division Multiple Access; BS stands for Base Station (Aslan, 2020)

should be balanced. As a single researcher, it is not so easy to reach that level of achievement. But by actively cooperating, you can reach it."

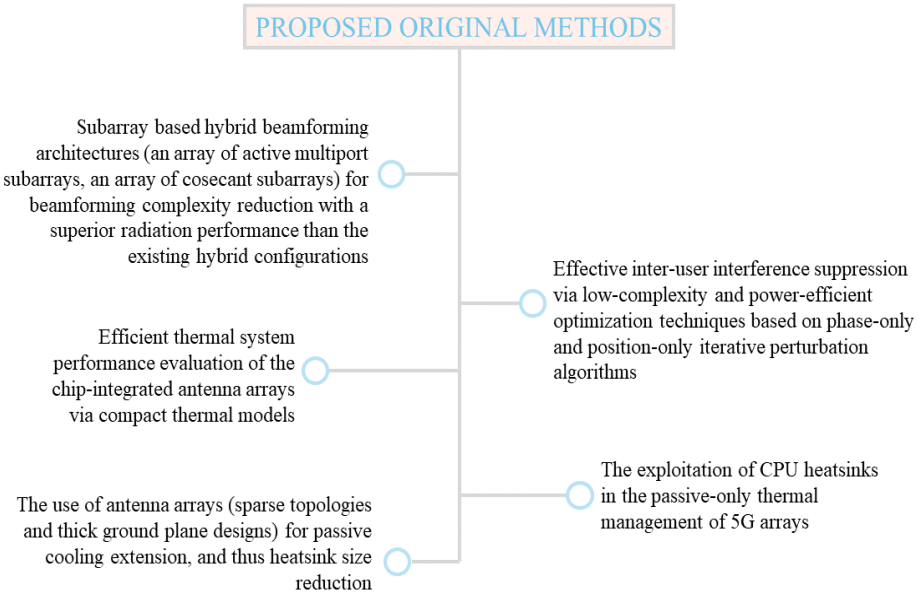
As researchers, we are encouraged to make our questions, methods and activities as specific and focussed as possible. It is often a challenge then to take a step outwards instead, and remember the bigger picture – especially in the field of telecommunications and 5G, which is directly and rapidly influenced by the intertwined roles of policymakers, businesses and consumers. How, then, can researchers stay connected to this bigger picture, and what role do they play in it?

"By being on the academic side," says Aslan, "I focussed on the part of doing novel research and creating innovative outcomes. In my PhD, I was able to follow what I wanted, and I was free to select the subtopics of my research. But of course, in the big picture you have demands that you need to satisfy, and your results need to show that you have the potential to solve meet these demands to a certain extent for the society. So, at the back of my mind, my aim was to achieve more capacity and connectivity in wireless networks in a more energy-efficient and cost-effective way than of today.

"You define the bigger picture at the beginning of your research," he continued, "and what you do is, with small steps, satisfy that demand or go towards that aim."

new developments in 5G?
"There needs to be more initiative to invite speakers to talk to the students early on and broaden their horizons – people from

gree in 2014 from Middle East Technical University with a double specialization (Communications and Microwaves & Antennas). With the Justus & Louise



The main original methods proposed during the study in pursuit of the interdisciplinary approach

Opportunities in education

A few years ago, 5G was relatively unheard of outside of academia. Today, everyone seems to have at least heard of it, and many people also seem to harbour strong opinions about it.
"There are many wrong assumptions about 5G," says Aslan, "It will be good to follow the experts and what they say. On one side, you have the academics; on other side, you have businesspeople, and society has more interaction with them. I believe the academics can be more visible and can do a better job of explaining what they do to reach a larger audience."
This may be a good way to inform and educate people outside of academia. What about the optimal way to inform budding academics – in other words, bachelor and master students – about

different parts of academia or industry, who have knowledge of the technology's history, as well as a clear vision for its future.
"Other than that, for bachelor or master students, there are basic courses that have to be given, but having an additional course just on the high-tech or recent developments is a possibility; or some aspects of the new developments in 5G technology could be included towards the end of other courses, showing the applications or the use of theory."
What's next for Dr. Aslan? He will continue to work on the frontiers of development in 5G. Aslan has recently started his postdoc at the TU Delft, where he has zoomed out from cellular communications to space communications by extending his PhD research into the exciting domain of next generation space-based communication systems.
Yanki Aslan received his BSc de-

van Effen Scholarship from Delft University of Technology, he completed his MSc in Electrical Engineering in the Telecommunications and Sensing Systems track, where he graduated Cum Laude in 2016. In October 2016, he joined the Microwave Sensing, Signals and Systems (MS3) group at TU Delft as a PhD candidate. He worked on the project "Antenna Topologies and Front-end Configurations for Multiple Beam Generation" which is a part of the NWO & NXP Partnership Program on "Advanced 5G Solutions". His work has resulted in 10 journal publications and 10 conference papers. With his achievements during his PhD project, he received the IEEE-APS Doctoral Research Grant in 2018 and the first EuMA Internship Award in 2019. With the latter award, he took a 3-month visiting researcher position on leaky-wave antennas at the University of Pavia in

Italy. He graduated from his PhD in August 2020, once more with the Cum Laude honor. Aslan is now working as a postdoctoral researcher at TU Delft. His main research interests include multi-beam antennas, phased array optimization methods, antenna front-end architectures, beam-forming algorithms, communication system modeling and antenna cooling.

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Interview with the Dean of EEMCS Dr. John Schmitz

Yunus Emre Döngel and Merel Verhoef

After almost 4 years of being the dean of our faculty, Dr. John Schmitz is leaving us next year. After having studied chemistry in Nijmegen, worked for Philips and NXP, he came in as an outsider at the TU Delft in 2017. What has he accomplished during his time, what are the challenges of the future, and how did he manage the corona crisis?

Concerning the coronavirus; which do you consider to be permanent changes due to the virus? It sometimes is insinuated that blended learning will become the norm in the future. What is your take on that?

"Well that is very complicated. Firstly I would like to point out that as a student of course you come here to learn things, subject matter, but there's also a part of its academic education. That you learn to stand up for yourself, work in teams, and develop social skills. You name it. The social skill-like things would be neglected if you were to work online only, so I really think that that's an aspect we should pay attention to when this situation persists for a long time. Then we hope we will be able to do better than we do now. An important consideration to have on campus eductational activities is the social aspect, to keep up the social interaction and getting to know each other. It is also ment to support the on line courses. When it comes to education itself, I think that you can achieve quite decent results online but with certain adaptations. Some professors don't teach 1-hour lectures, but divide it into smaller sections and constantly ask questions, to have continuous interaction. We have learnt that there do exist quite some methods, I think, that work quite well and can be added to some blended learning-like construction. I do believe that.

But then again, there's more to it than just learning formulas and calculating this and that. Another aspect are the practical classes. It's hard to replace them with an online equivalent. Although I saw that the solar division has online practical classes now. I took some of those classes to see for myself how it feels. I was very impressed. You're sitting at your desk, looking at your screen, but you really feel like you're at the lab. You can push buttons. It's very fun to do, but is it the same? Really being present in a lab and using a soldering iron. No, of course not.

Long story short, I think that we, forcefully I would say, have learnt certain things. Which things go right and which go wrong. How can one try to shape the social skills and the fun student life, despite the lack of physical contact? That remains a tough challenge. Right now, as a society, we're heading in the wrong direction. It's not a given, but I do cherish the hope that when this situation remains like this for a longer time, that we, with the creative people that we have all around here, can come up with some improvements. We see for example that the on campus visiting numbers are dropping. We are looking into creating more study places for students to compensate for that. Not only for studying, but also for chatting with each other, expressing things. Of course under corona-safe conditions."

So if the coronavirus were to have vanished in a year, everything would get back to normal? That would be the best?

John Schmitz: Yes, I think so. I do think that we have learnt some things that we can turn to our advantage. We also see things not running smoothly. Of course we want to get rid of those, but there are also some teachers that, mainly when it comes to practical classes, see some things going better than before. We will take that knowledge with us. But you are right, in the end of course I hope to walk around on a campus tripping over students, so to speak. I recently was on campus and yes, it's dead silent. Nobody walking around. It's very sad. I cannot say otherwise. Of course I hope also for our teachers and other colleagues that things can turn back to normal because they also face quite some challenges.

TU Delft wants more and more international collaborations and some research groups collaborate with Huawei. What do you think of such collabora-

tions? Shouldn't we take politics more into consideration instead of looking at the advantages only?

"We consider every case individually when it comes to a collaboration with a company. Concerning Huawei, well… It is like this: you can ignore China, you can do that. Or you can admit that it's a significant factor nowadays and see how we can collaborate with Chinese companies or the Chinese government. Science is international and China is not a developing country anymore. In some technologies they have already surpassed us. You may dislike that, but that's how it goes. A company like Huawei has become, however that may have happened, a significant factor and we look at that. The Dutch government has not issued clear guidelines to the universities with whom they may or may not collaborate, at least not when it comes to China.

I don't think the university should take a stance. You do have to look at whether or not something can be used for dual use for example. Things like that. We do consider that. But Huawei is even applied in the Dutch networks, so who are we as TU Delft? It's an interesting partner for us, so we do work on projects together. It is also good to realize that we typically publish all the results of projects that we run, so they will become public. See, of course when at some point there are clear guidelines then of course we will comply with those. There's no doubt about that. But until then, I don't think that as a university you should exclude companies a priori. You have to look at it case by case. And I can tell you that during my time as a dean we have certainly rejected some companies. Companies with something shady about them when it comes to cyber security for example, or image processing. So we do really take that into account. I don't claim that we get to know the ins and outs so easily, so we sometimes hire an external firm to perform an in-depth study about dual use, and give an advice about whether or not it would be in the danger zone. And we stick to that judgement. We do that on our own initiative. We don't need the Dutch government for that."

But other than that you are satisfied about your time served as a dean?

"There are so many other things I would have wanted to do, but we do have some good things. The ESP lab [Electrical Sustainable Powerlab], formerly known as the High Voltage Laboratory, is now ready. You should have a look at it yourself. Put on some sunglasses, because it sparkles like crazy. It's a lab that knows no equal in Europe, or even the world. We truly are leading in that field and I expect huge contributions towards sustainable energy in the years to come. Another area of great success are the TU Delft AI Labs. I don't know if you have heard about them,

but a year ago the eight faculties have submitted a proposal at the executive board to found 24 AI labs between all of the faculties, where you combine fundamental AI and applied AI.

The first eight labs have been launched, another eight will follow soon, and next year another eight. That adds about 120 scientists to the field of AI in Delft, so we've become quite a big factor there. We [the EEMCS faculty] have played a key part in order to achieve that. We have stirred it up and I'm quite proud of that."

Which difficulties did you encounter on a management level?

What we've had to deal with are of course the increasing numbers of students. In the past ten years or so. You know the discussion. Certainly the universities of technology feel that the funding is falling behind. That puts pressure on the scientific staff. In the second half of 2019 we have made sector plans. EEMCS participated in the sector plans at the Beta side (mathematics and computer science) and also at the Technology side (electrical engineering). In those plans we sketched the expected developments over the next 5 years in terms of both research and of education. The minister has made extra resources available to those fields, for our faculty it means that we could add 26 extra scientists.

At the moment we have about 75% of these positions filled.
Then there is the job market. If you look at the shortages, then those mostly exist in electrical engineering and computer science. That is taken into account in those sector plans. Plans are being developed to pay more at-

tention to that in high school, to steer more students towards those studies. In addition the government has made more funding available for the technical universities (called the "van Rijn gelden"). This has made extra resources available and we have added them to computer science and to mathematics. Another part of the van Rijn gelden will be devoted to improve workload and professional support to our teachers.

Looking at the job market and the shortage of electrical engineers, you might be able to almost halve the problem if the share of women studying electrical engineering would be equal to the share of men.

At that point I fully agree with you. In those education plans I just mentioned, we are strongly looking into getting more girls to study electrical engineering. We score really badly concerning the amount of girls in the first year. If you could double or triple that, you'd be a long way in the right direction. In the sector plans we've promised to accommodate 300 first year bachelor students and 200 master students. As to the master students in numbers we're good, but not concerning gender.

This year we've had twice the amount of female enrollments in the first year of the bachelor compared to the year before. The percentage of girls is still quite low, but you see that when you pay attention to it, you can actually do something about it. It will still take years until girls make up their fair share, but my successor, Lucas van Vliet, is of the same opinion, so the attention for this matter will not swindle.

In the battle against the underrepresentation of female scientists TU Eindhoven implemented a preference policy, so that in the first six months only women could apply for positions. This policy was overturned by a judge because it was too strict and discriminatory towards men. Is TU Delft looking into taking such measures too?

You know for example we have the DTF program, Delft Technology Fellowship. In the context of that program, university-wide, every year ten positions are only open to women. In the sector plans we also had to make a solid promise that we would improve the balance and I think we need to hire at least 35% female staff and I think we're at 37% now. That's not yet 50/50, but we're heading in the right direction. And we've reached that without a preference policy. For a DTF position only women can apply, and we've been sued over that and won those lawsuits, but in general we don't apply a preference policy and all the women we hire are chosen on the basis of quality. We have adapted the interview panels and the texts of vacancies in such a way that they attract more women. We have paid a lot of attention to that and now we see the results. When we had to promise that 35% in the sector plans I thought that was quite a lot, but with the right effort, it is achievable.

Thank you very much for your time. Would you like to address the students?

Electrical engineering is a field of study where demand and supply are way out of balance. Be it sustainable energy, microelectronics or embedded systems. Those are fantastic tracks. It is one of the hardest studies of this university, but once you've overcome this hurdle you can go into any direction. I am very curious about the role the techniques we develop here now and in the future will play in society. Electrical engineering is quite an invisible factor in society, by which I mean that we enable things. You don't see from the outside what's inside. That doesn't help very much when you want to make it more popular. It's a beautiful field of study, and you guys are doing it, so before you become an alumnus, maybe think about that and send in your ideas. And be responsible in your work. The future looks bright, so I wish everyone good luck and I am very proud that we offer this field of study at this university.

Changing times

Interview with Dr. Ir. Nick van der Meijs

Yunus Emre Döngel and Merel Verhoef

In recent times a lot has changed, physical classes have been abolished, lab sessions and projects continue more online than offline and the BSA has been postponed. How did these changes reach the students and how were these decisions made by the teachers? And last but not least, what about this change after the pandemic? We discussed all this with Associate Prof. Dr. Nick van der Meijs, active in the Circuits and Systems group and director studies for Electrical and Computer Engineering..

First of all, I would like to thank you for accepting our interview request. We know that your time is limited, so let's begin! How did the pandemic affect education, how did the educational staff respond to this, and wat was the first impression when the lockdown was announced?

That's a tough question to start right? *(laughs)* I have to dig in my memories, a lot changed since then and is still changing so some details are more difficult to remember. The first thing that comes to mind now, and what makes me proud of the teaching team of our faculty is their self-reliance. The will and willingness to adapt oneself and the profession to the needs of this new period was astonishing. In the beginning teachers improvised and used platforms they were, or sometimes not, familiar with to teach online. Later more structure was created with an interfaculty crisis team that was set up at TU Delft to investigate which methods would and could be used by different teachers and groups. Also, shared documents were created on SURFDRIVE where different teachers could share their experiences with the different learning environments. This allowed teachers to develop a suitable method of teaching that met the needs of the subject and was easy to use by the teachers and their students. Before the lockdown was officially announced, there were some rumors about it and thoughts about online education began to rise by our educational staff. This was ultimately not done because it would cause a mixed timetable of subjects that were taught online and others that were offline. When finally lockdown started a week later, these teachers made the switch to online education more conveniently.

What were the biggest challenges you encountered and what were the most creative solutions to these challenges?

Well I think using Discord for group work was one of the more creative ideas. This was used for EPO2 and the lab sessions of sys-

tems engineering. Of course this also entails side effects, teachers and student assistants are easier to reach, for example during the weekend, which is not always the intention. Besides that, many activities have been adapted for online education. This meant that physical elements of a project such as taking measurements and building things were replaced by simulations and computer models. An example of this was how a team that consisted of teachers and student assistants who together gamified the EPO 2 project. And I can proudly say

'There was some chaos, never panic'

that we succeeded in this.

The TU Delft certainly had the Collegerama infrastructure that has been used for years. But were there still shortages of infrastructure? If so, how were these resolved?

As you have said we already had a good infrastructure at the university with Collegerama, but it also had some shortcomings such as real-time teaching. Zoom turned out to be a good solution to fill the gaps, some teachers bought a license themselves. When we saw that more and more professors were using a zoom license, the university bought a professional license that could be used by all or teachers. Some professors were earlier in applying communication and teaching methods than others, these could share their experience based knowledge with their colleagues in our shared document. The same document was later used to share methods of taking exams according to the different needs of the courses.

It happens that a student has to use different environments such as Teams, Bongo, Zoom, Discord etc. which is sometimes confusing. Isn't it time for a standardization?

Students prefer discord, teachers zoom. Each has its pros and cons, but when possible we try to standardize with a hybrid solution of Microsoft Teams and USeeYou Bongo from Brightspace. The reason we prefer to standardize is to meet the AVG [General Data Protection Regulation (GDPR)] standards and this is not possible with the first two. There are also differences in nuances between these softwares. Discord leans more towards popular culture and does not always indicate the serious aspect of teaching and as a matter of facts it is not a professional environment. Microsoft Teams can almost do as much as Discord but is a bit more clumsy or less intuitive. Nevertheless, it does have a better streaming quality compared to Discord. Microsoft Teams is not as easy for teaching and recording lectures as is Bongo, but Bongo has a limit of 150 attendants.

What about exam proctoring and AVG-proofness? Why was there *(not)* chosen to proctor exams using cameras?

Originally there was the idea and desire to proctor the exams, but later it turned out that the proctoring contractors of the TU did not have enough capacity for this. After that, we tried as DIY solution with Bongo, but then we ran into the limitations of the software. Proctorers could only proctor 6 students at a time, which of course was not enough. This could be avoided with a few tricks, but then you had problems on the part of the students. They had to set everything completely according to the guidelines, which did not always work out or was equally efficient. All this, together with the Executive Board, which felt that this had too much influence on the privacy of the students, it was decided to ban "DIY proctoring". So as educational staff we proposed to set up exams
that are not proctored but that are "cheat proof". This can be done for example by applying time limits per exercise, individual questions that are randomized with their own parameters and formulating the questions in such a way that the answer cannot be found elsewhere and that you need all your time for such an exam. There were relatively few incidents, so we are not worried.

It is interesting to hear the technical aspect and behind-scenes of education during the pandemic. But what about student welfare, what has been done about it?

Their concerns are our concerns, and we are willing and doing our best to help them. You will probably have noticed, some students can handle this situation better than others. We tried to keep and strengthen contact with students as much as possible. Personally, I held open office hours online and (together with our colleagues) made myself open and easily accessible to our students. We also ensured good and honest communication with our students in order to answer their questions regarding exams, proctoring, BSA etc.
We always kept them informed about the state of affairs and decisions made. We noticed during surveys that this was also appreciated by students, unanswered questions can be irritat-

ing, we are aware of that and doing everything to prevent that. Of course, we were also aware that this was not always enough. After all, social contacts are of vital importance for people and certainly for students who are developing both socially and morally. We do our best and sometimes drop the ball but are always looking for ways to improve.

What will happen after the pandemic? Will there be permanent changes in the way of educating?

There was always an idea to offer a wider variety of online education, but often encountered difficulties such as conflicting priorities, lack of time on the part of the educational staff or infrastructure needs. For example, the staff was working to move the lab sessions on solar cells to an online practical long before the pandemic but because of the pandemic the transition could go faster. In this specific case, this process accelerated and students can now follow this practical completely online.

So there is still something positive about the pandemic, right?

(laughs) Indeed, as said a larger online offer had been the aim of several teachers and departments for years, laying the foundations of a method similar to blended learning. Just think of the first-year course Probability and statistics, there they already worked with pre-lecture videos to explain the subject matter for the lessons beforehand and thus they spent valuable lecture time in a more efficient way. Because distance learning and video lectures became the norm as a result of the pandemic, time was found to work on this.

Well let's continue with a non-COVID related question. What does the industry expect from the students, do they live up to these expectations?

Our duty as faculty is to teach young, energetic and enthusiastic people to learn and adopt the knowledge essential to an electrical engineer. Doing this we also try to deliver graduates who are satisfying the needs of the industry which will help them become more successful. To get a clear view on these needs, questionnaires are sent out every two years to the recent alumni and we have meetings with representatives from industry. We use this to further improve and adjust courses and the curriculum.

'We fulfill the needs of the industry'

The results of these questionaries tell that we are fulfilling the needs of the industry, the knowledge and qualifications of our graduates are of high quality. Besides their knowledge, they are trained to be open to and adopt new methods or specialize in new subjects besides their profile. Of course, according to company recruiters, our graduates have also some problems such as formulating the reason of choices or legitimize the correctness of their decisions. To counter this, the systems engineering course was introduced who teaches and shows the general aspects of being an engineer and doing engineering. At this moment, the industry's biggest problem is not the qualification of the graduates but the number of them. According to the numbers of the federal labour office there are 5.7 vacancies for each freshly graduated engineer, which is a lot and causes an imbalance between the industry and university.

As a final question, what are the changes you want to achieve in the curriculum or faculty?

Well that would be a long "TODO list" (laughs). At this time we are revising the BSc electrical engineering so that our students fulfill the needs of our society in the future. Doing this, we consider the developments in energy transitions, machine learning, biomedical engineering etc. which are currently absent or less represented in our curriculum. Doing this we have to preserve the balance which is a very difficult task, because while we are currently missing these new subjects we also want that our students have a more in-depth knowledge in physics, signal processing, mathematics, microelectronics, power engineering (laughs). Like I said, education of engineering is finding the balance between the needs of the society and the industry, the needs and expectations of the students and what the faculty can deliver. As a faculty we are doing our best to reach to and keep this golden balance.

Bachelor Student Column

Evelien de Wolff

Evelien de Wolff is a second year Electrical Engineering student at the TU Delft who had an extraordinary first year. She started her BSc in "normal" circumstances but fully adapted to the "new normal" now.

How did your choices lead you to the TU Delft and BSc program?

Before I opted for a technical study and chose TU Delft, I visited many universities so the choice was a well-considered decision. During the open study days I felt that TU Delft had the best atmosphere, which made it clear to me that I could feel at home here. The reason I chose Electrical Engineering was the multidisciplinary aspect of the study. During my high school period I liked the physics and mathematics courses but also wanted to see the application of these theories instead of its pure form.

What do you like best about our faculty?

Like I said the atmosphere, energy and synergy in the air. It was also more inclusive in my opinion in comparison with the Electrical Engineering faculties elsewhere in The Netherlands, also the vision here which is more multidisciplinary appealed to me.

What do you do in your free time?

I am active in the scouting since my youth and for the last three years I am the leader of the "De Bevers" (group of the youngest, 5-7 years old). Besides that I am a drummer and like to hang out with my friends.

Do you play in a band then?

During my high school period I played in the school orchestra but that's not the case anymore, so no.

How do you stay connected with your friends during these times?

When the measures were declared I withdrew into my bubble, my family. This crisis brought the importance of my smartphone back to life. Maybe it was the ultimate thing that kept me in touch with my friends, study etc. All the changes hit me hard but the hardest part was the fact that I couldn't have normal contact with my friends and loved ones anymore. Now that some physical activities on campus are possible again. Also environments such as Zoom and Discord which I never used came up in my life. All this digitalization has its pros and cons of course but I am trying to make the best out of it.

What about the changes on the academic stuff such as the lectures and exams, do you think the support of the teachers was enough?

I have nothing to complain about, it went smoothly. To be honest, I didn't expect things to go so well in the middle of a quarter. Also the teachers were very understanding and went out of their way to help us as best they could. For some subjects online lessons were given that could also be viewed, other subjects used recordings from previous years but they were so good that I did not notice the difference between physical and online lessons. What I did notice was that the balance between studying

and not studying was lost, I was only busy with my studies.

How was the adaptation from high school to university?

Well the "normal" university life was done for me after a couple of months, but I can tell something about that short period. The difference between the two was obvious, during my high school period things happened with minimal effort. This was the complete opposite case at the university, the time which was really needed and had to spent on the study.

Could you enjoy from the student life or was the pandemic too soon for that?

Yes certainly, I am active in the Electrotechnische Vereeniging and participated to all the parties which were there. I hope to go back to these days as soon as possible

Master Student Columns

Mosab Diab

Mosab Diab is a 24-year-old student who strongly upholds that life is about learning different things. He is enrolled in the Signals and Systems track in the Master Electrical Engineering program.

How did your choices lead you to the TU Delft and master's program?

I got my bachelor's in electrical engineering from Sudan, where I did a specialisation in Controls and Instrumentation. So, I wanted to do control systems for my master's, but there were no opportunities to pursue this in Sudan. You can mostly only study and work in the oil industry in Sudan. So, I came to the TU Delft. However, I wanted to approach Controls from the electrical side, not from the mechanical side, and at TU Delft that's taught in the Signals and Systems track. I feel like electrical engineers have a more solid background towards control systems – starting from the fact that it's all about complex frequency and the s-domain – and mechanical engineering doesn't have that. Right now, I'm baffled that the Systems and Control program is at 3mE, and not at EEMCS. It used to be a joint program, until a few years ago, when they moved it to 3mE completely.

You are one of the very few Sudanese students at TU Delft, is that right?

Very few. I only know three or four others. It would be nice to hang out with other students from Sudan, maybe, but I really don't get why you would go halfway around the world to stay with the same people, in the same bubble. Life is about learning, and I think you should learn a different culture.

What are your future plans for your thesis?

Robotics, maybe sustainable automated vehicles. I don't have a clear idea yet, but it has to be related to automated transport. Not necessarily cars, it could be an electrical plane, that's very interesting to me. The EPE has some great projects. And it needs to be sustainable. We're sort of forced into that as a generation, it's not really a choice – sort of like Corona forcing you to wear a mask.

So, have your first few weeks in the Netherlands been what you expected?

Corona changes your expectations. Something I wasn't expecting is how people are very friendly and nice. I expected a very individualistic community, and apparently that's not the case – at the University, at least. I'm also surprised that here, in the Netherlands, they don't know the backgrounds of international students. In the Netherlands, they do 3-year bachelor programs; in Sudan, we do 5 years. And that's a big difference. They are aware of it during the admissions evaluations of course, but I'm more surprised that the professors don't know the backgrounds the other students have. They only know the Dutch system. There's a Robotics master program here which I was also interested in, a new one that started at 3mE this year. So I went to talk to one of the professors, I told him, "My background is in electrical engineering," and I was told I need a mechanical engineering background to do this program. I asked, "What kind?" And the professor began to list things that, to me, seemed like first-year physics in college. I'm very surprised at how specialised they are right from their first year in the Dutch bachelor program. You study circuits and electronics off the bat. In my bachelor's, I did strength of materials – that's a civil engi-

neering course. I did thermodynamics – that's completely mechanical engineering. Here, they wouldn't expect you to know any of that if you're in the Master's EE program. Other than that, the weather in Delft is very turbulent. You get the four seasons in one day.

If Covid-19 was not a factor, how would you envision student life?

I'm really looking to join one of the Dream Teams! Sadly, teams like the Solar Car are a full-time thing. To get the whole Dream Team experience you need more time than as an international student, where it's pretty difficult to stay for master's program for longer than 2 years. Other than that, I'd join a student association. I would also imagine being part of a study association.

What do you do in your free time?

I'm a video gamer! I also play volleyball regularly, because I like sports, both watching and playing. I read about world history and philosophy. I also like expressive music, where a story is told through innovative lyrics (hip-hop for example). That was when I had free time, in the good old days.

Elke Salzmann

Elke started her time in Delft about 7 years ago as a bachelor's student in electrical engineering. A familiar face around the ETV – having been an ETV Board member, as well as a member of the Vattenfall Solar Team (the Solar Car team, for the new students at TU Delft) – she is now working on her master thesis in the area of distributed signal processing at the CAS research group.

How did your choices lead you to the TU Delft and master's program?

When I was in high school, I actually wanted to study architecture! But it seemed too creative. It is still a personal dream for me to buy an abandoned house somewhere and renovate everything. Eventually, I decided that I wanted to do mathematics, but in an applied way. So electrical engineering was the perfect choice for me, because I liked the study material, but also the faculty and environment at the TU Delft.

What do you like best about our faculty?

It's not too big, so you get to know everybody! Part of the benefit of being a smaller faculty is that if you're having problems with the content, or struggling with studying, there is always someone you can go to almost immediately. If you go to the professor or lecturer, the door is almost always open, and they can help you when you want. It feels more personal compared to the 3mE faculty where I also take some classes – they have strict office hours, and sometimes you can only email the TA instead of lecturers.

What was your favourite course while you were studying?

At the TU Delft, I enjoyed Information Theory the most. It was really well taught, and the assignment was very broad, so I could put in as much effort as I wanted to get a good grade. The project of the Estimation and Detection course was also very well organised. You have contributed quite a lot to the ETV community.

What was your motivation?

I was really active in the ETV for the first few years, until I joined the solar car team. I'm still part of the Archive committee – we still have a big archive which most students don't know about, with documents from 1906 when we first started. When I started EE, I unfortunately wasn't able to

come to the freshman's introduction weekend (EOW). So, on the first day of my study, I didn't know a lot of people, and I was also one of only about 5 girls in a hall of 180 students – I felt singled out. On the other hand, I was one of the few girls, so it wasn't weird to talk to someone. I really enjoyed the social atmosphere at the ETV – I got a lot of energy from it. And I started doing more stuff at the ETV – committees, bigger committees, even bigger committees … I started to fail exams because of it, I remember, in my second year. In my third year, I was the Secretary of the ETV Board.

What was the highlight of your board year?

Ooh, there's a lot of highlights. So with the 6 of us in the board, we did a lot of fun activities, and really got to know each other. One of the most fun activities I organised with the Lustrum Gala. A professor from the bioelectronics department actually celebrated his 50th birthday at the Gala, which kind of felt like an honour, because he wanted to celebrate his 50th birthday with all of us students. And once we spontaneously drove to France.

France? Like the 6 of you?

Yes!

Was it in the old ETV limousine?

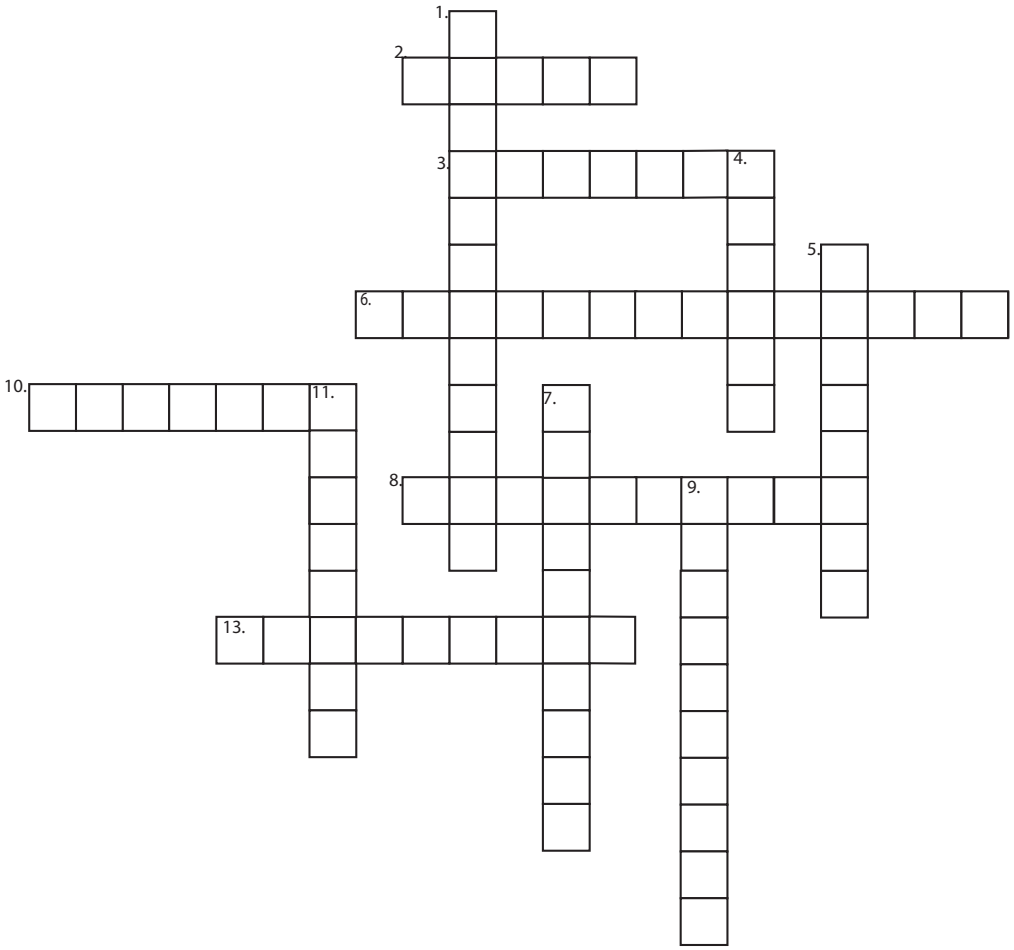
Yeah, in the old ETV limousine. It was around 11 pm, and we wanted to personally ask a member of the ETV to join a committee, and he texted back saying "Sorry I'm with my parents in France". Everybody in my board said, "Well, let's go to France". And sometime around 11 pm the next day, we were back home. That was the most spontaneous thing I ever did.

The theme of this edition is 'staying connected'. What does that mean to you?

It's funny that in the beginning, when we got used to doing everything online, I had a lot more contact with friends from high school, and from Switzerland where I've only lived a year, because everyone came online. And when the lockdown was lifted around the beginning of June, what I experience now is that I meet with the same amount of people as I did before corona, but more 1-on-1 or with smaller groups. I actually really like this way, since I am more of a small-group person, but it takes some more effort to get in touch with everybody. I miss physical meetings; And I miss the spontaneous coffee machine conversations, where you get to know more about a subject. So now, if I'm really struggling with an assignment, then I can call or text someone that I know. But if I don't know that I'm having struggles, then I don't.

And finally, before corona, I sometimes had weekends with 6 different activities planned – coffee, stress, next meeting, next birthday party etc. Now it's more relaxed, so I can stay half an hour longer at one activity if I want to because I have fewer meetings. I'm really trying to keep it that way, and be 100% present when I'm doing something.

Crossword Puzzle



Horizontal
2. Theoretical two-port network consisting of a nullator at its input and a norator at its output
6. Lustrum theme
8. Law that relates the system capacity of a channel with the received signal power, the noise power and the bandwidth
9. Dean who will succeed John Schmitz
10.Bridge used only by Electrical Engineers
12. Error correcting code

Vertical
1. Inventor of the pentode
3. First Nobel Prize Winner in Physics
4. A feedback structure with an odd number of digital inverters
5. Scientist whose statue is next to the entrance of EEMCS
7. A resistive component that is designed to be temperature sensitive
11. Name of the ship in the novel 'Twenty thousand leagues below the sea' by Jules Verne

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