connecthor

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EINDHOVEN UNIVERSITY OF TECHNOLOGY

Biomedical **Electromagnetism**

Thinking Through Technology

Pioneering a **Zero Emission Antarctica**

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Connecthor

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The Connecthor editorial board, from left to right: Sanne, Jan, Pauline, Jos, and Jurgen.

Later than usual you will find this "June" issue on your desk. As you might have noticed, it's becoming quite an ordeal to get the magazine done in time with just a few members. With that being said, we have an update on the search for new members to come join our Connecthor team. We are very happy to announce that Oded Raz is considering in becoming a member. He will participate in the next magazine. Nonetheless, our search for more members (students and staff) continues. So please feel free to contact us.

Please enjoy our new magazine, we have managed to gather many interesting articles for you to read.

We have a lot of new staff members introducing themselves to you. Moreover, we want to congratulate all the master graduates! On page 15, Oscar Mannens tells about his student team which allowed him to go to Antarctica for research. Besides that, you can read about the MedTech day for Maarten Paulides' inaugural lecture on pages 16 and 17. Furthermore, pages 18 until 20 will enlighten you about the book 'Thinking Through Technology' by Carl Mitcham, which will change your view on how you view what technology is. Finally, we have a nice puzzle for you and a column by Tom van Nunen on living in a utopia!

We wish you an amazing summer with family and friends. Have a wonderful and happy summer break.

Kind regards,

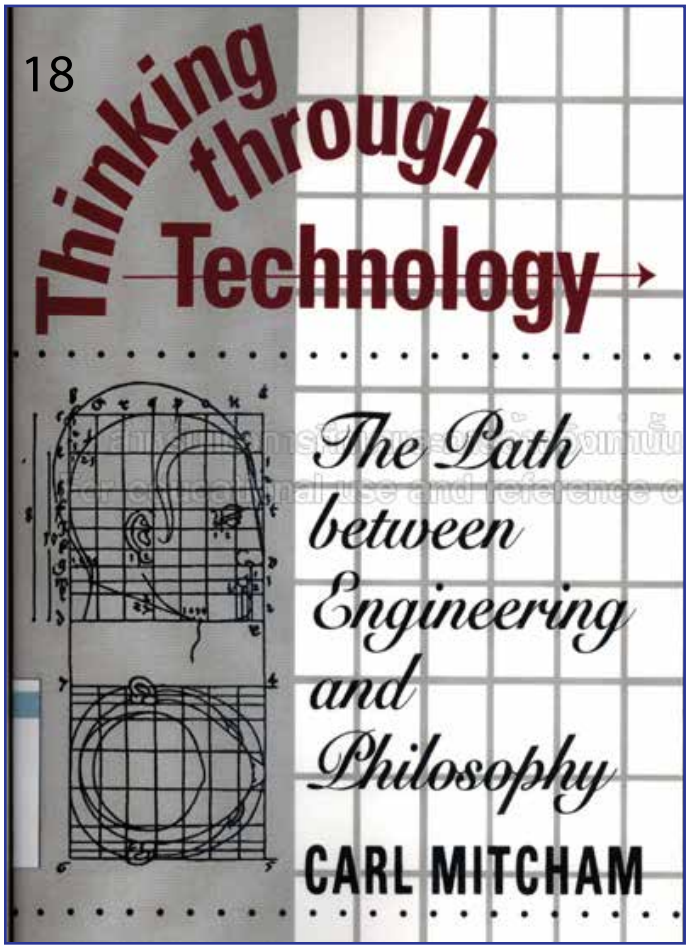
The Connecthor editorial board

Pioneering a zero emission Antarctica

Automotive Technology student Oscar Mannens went to Antarctica for Team Polar to do research for their student team that is working on a zero emission vehicle to be used on Antarctica. Read more about their mission on page 15!

Depth and Breadth in Biomedical Electromagnetism

Read about the MedTech day, organized for the inaugural lecture of Maarten Paulides, on pages 16 and 17.



Thinking Through Technology

The book 'Thinking Through Technology' will completely change your view on word 'technology'. Read about this book on pages 18 to 20.

Board issues

By: Guus Pemen

As I write this, a student team is building a beer crate bridge on our front yard, the Groene Loper. It is wonderful to be able to be on campus again, and to again experience the daily and lively presence of our students.

The university is currently paying a lot of attention to social safety. As Department Board, we also encourange our department and our research groups to pay attention to this important theme. For example, by visiting the MindPlay play as a group. Or by participating in one of the various training courses offered by the university. Personally, I can highly recommend the Active Bystander training to everyone. We receive the important signal from our faculty that social safety is an important theme not only for university employees, but also for our students. We are committed to give more substance to this theme for our students.

We are currently working hard on the implementation of a new financing round from the Sectorplan Techniek. Through this Sectorplan 2.0, a large amount of financing is structurally coming to our department. This offers opportunities for structural investments in people, infrastructure and facilities. This is also a good time to think carefully about the future of our faculty. We are currently growing fast. Both our first money stream as well as our second/third money streams are steadily growing. We're getting to a point where we really have a choice. Are we aiming for continued strong growth? This is in line with, for example, the continuously increasing demand for well-trained electrical engineers and research from the Brainport region. Further growth is only possible if we as a faculty can facilitate this well. What do we all need for that, what needs to be invested? Are we focusing even more on fundamental research? Or do we want to strengthen our relevance in higher Technology Readiness Level (TRL) research? Or both? It is high time we started having this discussion in the department.

On June 8, we had our department research day. This was a great opportunity to look ahead at the development of our department. We paid attention to the question of how to better relate the strategy of the faculty or a research group to the choices that people make in their work. The following two questions were central to our research day: how does a strategy help our employees to make choices, and for which choices would we like to see some more strategy? I'm very happy to have seen you all and work together on the development of our department. ■

From the President

By: Mart Philipsen

A lot has happened since writing this piece for the previous edition of the Connecthor. The corona measures we still had back then are completely gone now, and so the past few months have also have felt incredibly normal to us.

This has made it possible to organise all activities we were looking out to and or even the ones that we had to cancel in the beginning of the year. An example of this was the Dies week, which had been postponed to the week after the carnavalcarnival holiday, even though this was more than three months after the birthday of the association at the end of November. The 64th Board organised many activities that week, with the very timely theme 'Rise of the Pphoenix'. Activities ranged from the traditional cantus, party and dinner to 'the floor is lava' and a firebreathingfire breathing workshop. The ACCI also organized two activities, being 'Pprotect the President' and the hangover breakfast on Friday morning. The week was a great way of showing the first and second yearfirst- and second-year students what Thor can be like during a normal year. Overall, it was a very successful and fun week!

What also became possible again, was going on weekends with fellow Thor members. At the end of April, the SportCo made all the arrangements such so that Thor could participate in the Batavierenrace this year. With two teams, we set out to Nijmegen and Enschede to run throughout the night and theand day after from city to city. After our Vice President finished the final leg of the race in his Board suit, we had a barbecue at our sister association Scintilla and finished of the night with a big party.

Another weekend that took place was the ACCI weekend. The ACCI made sure that the entire weekend was filled with fun activities, excursions or and games to play. Both weekends were large succes-sessuccesses, and I am excited and curious about where the next weekend with Thor will take us.

At the moment of writing this, we just had another great activity: the Aactive Mmember Dday where for which we went to Mmovie pPark Germany with close to 60 of our active members. This is already fun as is, but what made it even more fun, was the presence of our fresh new candidates at this day. This gave our members a specific goal for that day: making sure that they got as wet as possible throughout the day. Luckily for the kandi's, it was particularly hot that day, so they did not mind too much.

This was even more of a special day for them, as this was the first day that they officially got to be there as the candidate Board for the first time. After we got back from the bus ride, we had a barbecue where even more members camecame, and we even had a visit from the company Fluke who handed out a gift to all members present. At this barbecue, the candidates introduced their sthemselves and alsoand announced their functions too.

It is great to see that there is a new generation of students eager that want toto take over from us and run the association for a year as the next Board. Even after two years where people were not able to get to know each other or the association as much as we all wanted, people are still getting or staying excited about being active within our association. Without these people, Thor wouldn't be what it is today, so thank you all!

Veel gedonder!

Mart Philipsen
President of e.t.s.v. Thor ■

Introducing...

Good day, my name is Ginny Toes and I started at ECO as secretary for 3 days at the first of April.

I have been working at TU/e for more than 14 years now. I started at the congress office and then worked at HR services at BMT in support. For 5 years, I worked at Traverse, at the course administration after which I worked for 8 years at department Built Environment as a secretary.

I moved to Uden a year ago. It was quite a step, but I have absolutely no regrets. I am very happy with my own place and my little garden! I have 3 grown children who are all still studying, my daughters are almost finished, my son is in his bachelor.

Besides my work as a secretary, I am a yoga teacher for 6 hours per week in Uden as well in Eindhoven and online. And I almost finished the training for Non-dual coaching.

I look forward to getting acquainted with the EE work environment and to all you personally. If you are curious, feel free to speak to me or to come by at the secretariat ECO.

Hello everyone. My name is Christina Papadimitriou and since March 2022, I am working as an Assistant Professor in Intelligent Energy Systems, in the Electrical Energy Systems group (EES), Electrical Engineering Department. I am from Greece where I obtained my diploma degree in Electrical and Computer Engineering and my PhD as well from the University of Patras. I have worked as a senior researcher at different institutions in the past as the National Technical University of Athens and University of Cyprus. I also held a position in industry as a system engineer for three years in the Greek Distribution System Operator being responsible for DMS and SCADA systems. I've been awarded three personal grants for research and academic teaching excellence in the past and I am a patent holder as well.

My current research interests are smart grids and flexibility of the integrated grid. Under this prism, my present research studies focus on addressing the challenges of assessing flexibility at the demand side taking on board cross-sectoral integration and different energy conversion technologies. These are the main topics of interest of the project that I am currently technically coordinating, eNeuron (eneuron.eu), so if you are interested feel free to follow our activities.

I am Sebastian Salas Laurens and I am a new PhD candidate here at the TU/e. I am part of the Electrical Energy Systems (EES) group. I joined in March 2022 so you may have seen me around the Flux building already.

I was born in Barranquilla, a very vivid and warm city in the north of Colombia. There, I obtained my bachelor's degree in electronics engineering. Next to that, I did an internship as a control systems engineer. In October 2018, I moved to Hamburg, Germany to study my master's there. I also got my first taste of researching by applying the theory of chaotic systems for the design of random sequences generators. Then I realized I wanted to continue doing research and follow the academic path.

Here in TU/e I am working in a new way to test for Electromagnetic Interference (EMI) that reflects more what actually happens in a real scenario. My goal is to fill the gaps that right now exist with the current standards ways of testing.

I enjoy going for long walks and going for small trips and get to learn from people around me about their customs and culture. I am looking forward to meet more of you during my PhD and maybe even work together!

Hello! My name is Mohammad Khorramizadeh and I recently started my journey in the EES group as a PhD candidate in March 2022.

I have obtained my BSc degree in Electrical engineering from Islamic Azad University in Dezful, in the same city in which I was born and grew up. I have received my MSc degree in Telecommunication Engineering from Shahed University in Tehran. I really nursed my ambition to pursue my PhD studies in a prestigious university and finally my dream came true.

My PhD project mainly involves investigating state-of-the-art modeling techniques and creating new knowledge in the understanding of Electromagnetic Interference (EMI) propagation in cables. To reduce EMI in the cables it is of primary importance to take into account both radiative and conductive EMI. In my project, thanks to exploiting a reverberation chamber one can have the privilege of having a clear view regarding EMI in cables resulting in developing cutting-edge modeling techniques to reduce EMI in cables.

Beside research, I enjoy hanging out with my friends and stepping out of my comfort zone to go sightseeing to far-off destinations. Meanwhile, reading is really my cup of tea enabling me to unplug myself from the chaotic world.

Hello everyone! My name is Lotte Ewals and I started as PhD candidate on April 1st. During my PhD I will focus on the implementation of AI solutions into clinical practice to support image analyses at the radiology department. Next to well-performing algorithms, it is important to investigate the interaction with radiologists to achieve the optimal use in the clinical workflow. This project is a collaboration between the TU/e, Catharina hospital, and Philips. I will primarily work in the Catharina hospital and from time to time you will find me at the TU/e.

I studied Technical Medicine, Medical Imaging and Interventions, at the University of Twente. Throughout my Master's degree, I explored different departments of various hospitals during five internships. During every internship, I both spent time in the clinic and performed scientific studies. With my interest in imaging and Artificial Intelligence, and both clinical and technical knowledge, I hope to contribute to this interesting project.

In my spare time, I like to cycle, run, and visit family and friends. I am looking forward to meet you!

Hello everyone! My name is Ercan Kalali. I recently joined the Electronic Systems group at TU/e as a postdoctoral researcher.

I was born in Kayseri, Turkey, the neighboring city of the Cappadocia region. I completed my bachelor's degree in Electronics Engineering from Istanbul Technical University, Istanbul. Turkey. Then, I received my MSc and PhD degrees in Electronics Engineering from Sabanci University, Istanbul, Turkey. During this time, I worked on energy-efficient hardware designs for video processing and compression algorithms.

After I received my PhD, I moved to The Netherlands and worked as a postdoctoral researcher with the Circuits and Systems group at the Delft University of Technology. During my two years at TU Delft, I designed energy-efficient sensor fusion hardware for two EU ECSEL (PRYSTINE and NewControl) projects on autonomous driving. I am currently working on pAvIs (Patient and Environment Aware Adaptive Intelligent Sensor Systems) project. ▶

Introducing...

Hello! My name is Mylene Frankfort and per April 1st I started as a as a projectleader for the SPS group, working within the Medicaid project and the Eindhoven MedTech Innovation Center (e/MTIC). I obtained my Bachelor's and Master's degree in Biomedical Engineering at TU/e. This new role complements my current position at Máxima MC where I work on projects mainly focusing on remote patient management, remote care and rehabilitation.

Together with the Recover@Home student team, we will work on remote healthcare solutions to enable the recovery of patients at home. Specifically, we will focus on innovative ways to assess quality of life and patient/staff experience.

By being part of this collaboration I am looking forward to connect with students and researchers to set-up an innovation loop, where we will work on a development platform at TU/e together with industry partners and validate use cases in a clinical setting. Do you want to share some thoughts or are you interested in joining this team, please reach out!

In my spare time I enjoy doing gymnastics, practicing yoga and being outdoors in nature. Besides that, I enjoy the company of family and friends. In summer I love going sailing to catch some rays and do some travelling to explore new places.

Hi everyone, my name is Tineke de Vries. As of March I have started my training for Qualified Medical Engineer (PDEng) in the Signal Processing Systems group. I'm working at the Catharina Hospital in Eindhoven, so most of you probably haven't seen me yet.

I studied Biomedical Engineering in Enschede at the University of Twente. I graduated on a topic to automatically determine the intention to grasp something for the support of a robotic glove. The last four years, I have been working for Onera as a signal processing engineer. During this period I have been working on all kinds of topics ranging from the recording of physiological parameters to post processing of the data and to clinical studies. At the Catharina Hospital I will be designing a data warehouse in which continuous signals can be stored to facilitate research and algorithm development.

In my spare time I like to be outside: hike, run, play tennis, and travel most importantly. I hope to meet you all in the future!

Hi! My name is Victor Truong Thinh Lam (but you can call me Victor) and since February 2022 I started as a PhD student in the EPE group. I was born in Dordrecht, but my parents, myself and my sister moved to Eindhoven when I was three years old. My parents are both born in Vietnam, so I grew up with both the Dutch and Vietnamese cultures and languages.

In 2017 and 2020, I obtained my BSc and MSc, respectively. Since 2020, I have been working as Research Assistant and Teaching Assistant in the CS group. My research interest lies in Model Predictive Control (MPC) and how it can be used in real-life applications such as Power Electronics. The MPC principle is often compared with chess, where you look at the board, consider all possible sequences of X future moves, choose the best sequence, apply only the first move, wait for your opponent and repeat this procedure. This process involves optimization and lots of mathematics, which is something I enjoy!

I also go to the Vietnamese Protestant Church in Dordrecht and in my spare time I like 3D modeling in Blender, playing piano and traditional drawing with pencil and paper.

Hello! My name is Xiao Li and I recently started my joint-PhD at PhI group of the Electrical Engineering (EE) department. I come from Taiyuan, which is a small city located in the middle of China. In 2020, I joined PLC group of COER department in Zhejiang University and attended the joint-PhD program IDEALs between ZJU and TU/e.

During the time in ZJU, I was working on the theories and experiments of devices on silicon-on-insulator and Lithium Niobate platforms, in which I grasped the ability to run the process from fabricate to test. Now, my project is centered on the system generating THz frequency on Indium Phosphide (InP) platform by integration. Similarly, I will devote myself to learn more knowledge, gain more skills and make more friends here.

Besides research I also love cooking, drawing and exercising with my friends and family. Looking forward to meet more friends at TU/e!

Hi everyone! My name is Christiaan de Leijer. I am 26 years old, I was born in Den Bosch, and I live in Boxtel. I started my PhD in March 2022 in the EM group.

For as long as I can remember I have been interested in technology. I completed both my bachelor's and master's degree in Electrical Engineering at the TU/e. During my studies I have seen how beautiful electromagnetics is and I learned that the understanding of electromagnetics is very important in Electrical Engineering. In both my internship and graduation project I worked on electromagnetic modeling techniques and I really enjoyed that. During my PhD I will be working on a new electromagnetic modeling technique for 5G/6G design applications.

In my free time I like to play tennis and chess. Also, I really like to travel and to enjoy nice weather. ■

Master Graduates

Congratulations to all the Graduates who received their Masters degree on March 15th, 10:00.

Arham Mawali Sulaiman, Pau Brossa Rodriguez, Filip Forro, Nadine Nijssen, Nanda Kishor Panda. Antoine Post, Li Ping Trinh, and Emilija Lazdanaitė

Master Graduates

Congratulations to all the Graduates who received their Masters degree on March 15th, 12:00.

Ramona Cîrstian, Thijn Hermsen, Tristan Stevens, Joris Broekmans, Koen Kusters, Kurt Stolle, and Amaan Valiuddin

Congratulations to all the Graduates who received their Masters degree on March 15th, 14:00.

Sjors van Dijk, Sven Fiktorie, Jeroen Goudswaard, Bertje Kuijpers, Lorenzo Orsini, Giuseppe Fortuna, and Mathijs Verhaegh

Congratulations to all the Graduates who received their Masters degree on March 15th, 16:00.

Femke de Bot, Bram van Esch, Elwin Hameleers, Stijn Ringeling, Remco Schalk, Sander Heijmans, Rick Weenink, Daan de Rooij, Koen van Vugt, and Mikolaj Wolny

Congratulations to all the Graduates who received their Masters degree on March 16th, 16:00.

Christiaan de Leijer, Sjoerd Aker, Gijs Neerhof, Qinghua Guo, Kambez Ebrahimkheil, Ivar de Vries, Martyn van Dijke, I.W.J. Rooijackers, Goutham Mallireddy Sree Ramulu Reddy, and Marco Claessens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SIOUX


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1. ACCI weekend
2 & 9. Active member day
3 & 4. Batavierenrace
5. Career day
6. Dies dinner
7. Ivaldi track attack
8. Sioux pub lecture
10. Dies firebreathing workshop
11. Dies get lit party
12. Ivaldi beerlympics
13. Ivaldi open house day
14. Dies pie opening
15. Aegir into the jungle party

Studenten zijn belangrijk in een duurzame energietransitie

De woningmarkt staat onder druk en de uitdagingen zijn enorm. Voornamelijk starters, middeninkomens en kwetsbare doelgroepen kunnen moeilijk een woning vinden. Onder meer stikstof en de mogelijk nieuwe wetgeving voor geluidsnormen, die woongebieden onleefbaar kan bestempelen, zorgen voor complexiteit.

Duurzame ontwikkelingen

Naast de uitdagingen op de woningmarkt staan we ook voor één van de grootste uitdagingen in de wereld; reductie van CO2-uitstoot. Om de opwarming van de aarde en de resulterende klimaatverandering tegen te gaan moet de CO2-uitstoot van onze wereldeconomie verminderen. Nederland heeft harde afspraken gemaakt en samen met bijna 200 andere landen getekend voor het klimaatakkoord van Parijs om deze doelen te behalen.

Innovatieve denkers nodig: studenten

In Nederland is er kennis en kunde nodig van de gehele bouwketen om deze uitdagingen op te lossen. Momenteel ontbreekt het aan werknemers en tijd om nieuwe concepten uit te werken en de energietransitie te versnellen. Door samen te werken met studenten in het beroepsonderwijs, innovatieve denkers en concepttesters, kunnen zowel het bedrijfsleven als studenten veel leren.

Hoe werkt dit dan?

Deze samenwerking tussen studenten en Schneider Electric wordt toegelicht door Harold van Faassen: "Bij Schneider Electric krijg ik de mogelijkheid om studenten te ondersteunen bij een internationale bouwcompetitie. Met een nieuw woningbouwconcept behaalde deze studenten de finale plaats in de Solar Decathlon 2020 Washington DC. Schneider heeft gesponsord in de vorm van kennis, netwerk en technische oplossingen op het gebied van elektrotechniek."

Studenten zijn belangrijk in de energietransitie. Volgens Harold krijgen én nemen studenten bij deze samenwerking grote verantwoordelijkheid. Ze leren enorm snel en door krachten te bundelen konden we een goed eindresultaat neerzetten.

Harold vertelt over zijn ervaring: "Tijdens mijn eigen studie Electrical Engineering aan de Hogeschool Utrecht heb ik ook meegedaan aan de Solar Decathlon 2017. Samen met medestudenten hebben wij een woning ontworpen en gebouwd vanuit de visie modulair, circulair en zelfvoorzienend. Dat ik de studenten ging ondersteunen met de nieuwe uitdaging was dus logisch.

Innovatief bouwen en multidisciplinair samenwerken

De hoge leercurve door innovatief te bouwen en multidisciplinair samen te werken met alle opleidingen die nodig zijn om een bouwbedrijf te starten, zorgt ervoor dat je tijdens je studie breder leert kijken dan jouw eigen opleiding/expertise. Er is een combinatie plaats Bouwkunde, Werktuigbouwkunde en Elektrotechniek samenwerkend met de opleidingen Technische Bedrijfskunde, Finance, HBO-Rechten, Communicatie, Veiligheidskunde en Bedrijfskunde. Het zoeken, overtuigen en laten samenwerken van zo'n diverse groep studenten met bedrijven zorgt ervoor dat er duurzaamheidstalenten voorbereid worden op uitdagingen van morgen.

Doen is leerzamer dan toekijken

Van Faassen: "Als we kijken naar de uitdagingen van vandaag en de mogelijkheden die technische innovaties brengen op het gebied van digitalisatie

en elektrificatie, ben ik van mening dat het gericht werken aan oplossingen veel uitdagingen kan oplossen. Uiteindelijk zie ik dat studenten én bedrijfsleven het meest leren van actief ondernemen. Het daadwerkelijk doen is leerzamer dan vanaf afstand kijken en beoordelen. Het delen van kennis in de vorm van een wedstrijd zorgt ervoor dat studenten worden opgeleid als werkkrachten die onze maatschappij nu nodig heeft."

Life Is On bij Schneider Electric

Het doel van Schneider Electric is om iedereen in staat te stellen alles uit beschikbare energie en hulpbronnen te halen en zo vooruitgang te boeken en verduurzaming te garanderen. We stimuleren digitale transformatie gedurende de gehele levenscyclus voor woningbouw, gebouwen, datacenters, infrastructuur en industrieën.

Bij Schneider Electric bieden we trainingen, stages en afstudeermogelijkheden aan gepassioneerde mensen om ons te helpen innoveren op elk niveau en een toekomst te bouwen die alles in staat stelt om het maximum te halen uit hun energie en resources, en om Life is On altijd, voor iedereen te verzekeren. ■

Life Is On | Schneider Electric

Pioneering a zero emission Antarctica

By: Oscar Mannens

Sustainable, autonomous and affordable: those are the values of Team Polar, a student team focused on the pristine continent of Antarctica. Antarctica is protected by the Antarctic treaty, which states that the continent cannot be owned by any country and that it can only be used for peaceful purposes like science. The research performed here is crucial for understanding the past, present and future of our planet with topics like climate change being one of the biggest.

Team picture of Team Polar, the student team focused on Antarctica

The research is currently done using vehicles powered by fossil fuels, the same vehicles that are one of the major causes of climate change. The heavy fossil-fuel-powered pickup trucks and Pistenbully vehicles produce emissions that contaminate both the air and soil. The reason those vehicles are used is because there is currently no real alternative. Creating the sustainable alternative to these vehicles is the goal of Team Polar.

The vehicle that the team is developing will be solar powered and autonomous and it will ll be used mainly to facilitate and improve the current state of research. By using solar power, the vehicle will drive during the Antarctic summers and make use of the 24 hours of daylight. The solar panels will not produce enough energy for the vehicle to drive continuously, so an optimal drive cycle will have to be developed to maximize the range of the vehicle. This eliminates the need to ship or fly in fossil fuels which also reduces emissions and saves on costs. Shipping and flying in fuel can easily cost hundreds of euros per liter on the plateau (the central part of antarctica).

Oscar Mannens in Antarctica

By having a self-driving vehicle, research can be facilitated for a longer period of time without having to return to a research station. There is no need for refueling and picking up new provisions. Next to that, there is no cabin that has to be heated which reduces energy consumption further.

Currently, the team is in the process of building the first proof of concept prototype which will be around the same size as a quad. Based on the prototype, all components will be further developed to withstand the extreme cold and dry environment of Antarctica. ■

Depth and Breadth in Biomedical Electromagnetism

By: Jan Vleeshouwers

For the occasion of Maarten Paulides' inaugural lecture, on June 3rd, the Center for Care and Cure Eindhoven organized a MedTech Day, on the expanding area of health technology. But at the same time, applying technical knowledge tends to go very deep, especially if it involves very fundamental phenomena such as electromagnetism.

Maarten Paulides, professor in Biomedical Electromagnetics, is attracted to both the breadth and the depth of the topic, but finally, he says, he finds his motivation in the patients he may be able to help become healthy again. There were two routes to his office at Erasmus Medical Center, where he worked before becoming a professor at TU/e: one through the building, where he would encounter the patients he was working for, and one around it, through quiet gardens surrounding the building. He almost always chose the route through the building.

His current activities are substantially shaped by his role as scientific director of the Center for Care and Cure Eindhoven (C3Te). This Center (one of the four centers of the Department of Electrical Engineering) tries to connect biomedical research in the department to related industrial activities, especially in the Brainport region but also beyond. From these connections, cooperation opportunities arise, and funding proposals are conceived and submitted. Currently, the Center has a portfolio of around 30 projects. The Center is small, just three people, with Noortje Bax as project officer and Danielle van der Hagen as management assistant next to Maarten. But now that TU/e has stopped the 'Strategic Area Health', which addressed the health activities of the whole university, the Center sees its activities expand to more research groups and more departments, and to represent TU/e in for example 4TU Health, the technical university collaboration for patient centered healthcare.

Maarten Paulides, picture by Bart van Overbeeke

The Center activities require from Maarten to have a wide scope of attention and expertise in a broad area of technical topics, but also in the clinical and industrial world, with its special language, rules and procedures. He was privileged, he says, to go through the complete development cycle of a medical technology innovation during his PhD-project. He designed a microwave device (Figure 1) to fight tumors in the neck area by localized heat (hyperthermia). Heat makes radiotherapy and chemotherapy more effective but directing it at a tumor without heating neighboring areas, requires a very versatile, steerable set of antennas, and a simultaneous measurement of the real-time effect of the heating, in order to guide the process. What made the project fit in 4 years, was the fact that they could prevent experiments on animals. There was the practical fact that the human neck is not like that of any other animal, so Maarten and his colleagues invested heavily in modelling the human neck, and they were able to convince the ethical committee of the effectiveness of their device, without reverting to animal tests. As a result, by the end of the PhD-project, Maarten Paulides was

able to attend the first clinical tests of the device on real patients, which was exciting, but also tense.

This advantage of careful modelling is exactly why there is need for depth as well as breadth. Creating a model of any area of the human body, with sufficient detail and accuracy to predict the biological effect of electromagnetic radiation on cancer cells, is a tremendously detailed research effort. In addition, the effects of other therapies which are applied in combination with hyperthermia, must be included. The model must also be created from measurements of an actual body, because every tumor is different. Being able to create these detailed models is essential for designing safe equipment, and they will become future standards for certification, rather than animal testing. Establishing these standards is also a drive for broadening activities: only if a substantial set of partners agree, methods will become standards. For that reason, besides his work at Erasmus Medical Center, Maarten is now seeking to collaborate on hyperthermia also with other academic hospitals both nationally (Utrecht and Amsterdam) and internationally (Munich, Cologne, Baltimore).

There are many more possible applications of electromagnetism in a biomedical context, and several are being picked up at the moment, for example the neurostimulation work of Rob Mestrom and the MRI-research of Debra Rivera and Irena Zivkovic. But although there is a lot of medically oriented research going on in the department, according to Maarten Paulides, it suffers a bit from being scattered across many locations. A few years ago, he the Care and Cure research lab of the Electromagnetics group (EM4C&C), which is combining some activities. The department further has one large CWT/e-lab for wireless research, and dedicated labs for energy research and electromechanics. For more collaboration, visibility and showcasing of the research, a single medical devices research lab would be crucial.

The same considerations regarding breadth and depth shape Maarten Paulides' wishes for education. There are many students who currently get involved in a variety of concrete research topics through the Bachelor Final Projects or through internships, for example in hyperthermia devices, in eye-prosthetics, in electromagnetic neuron stimulation and in modeling the human body. But Maarten also sees a need for courseware, especially on biomedical modeling and on designing medical devices. For now, his involvement in C3Te slows down taking this up.

The inaugural lecture Maarten held on June 3rd, was an unexpectedly time-consuming endeavor. Preparing a lecture for a large general audience which addresses both the breadth and the depth of the area of Biomedical Electromagnetism, Maarten found more difficult than anticipated. And in addition, he says, there is the inaugural lecture's official aim, which is to address fellow professors and try to interest them to collaborate. He is not sure if his lecture will have this effect, but the MedTech day has certainly shown that there is more than enough fascinating work to be done in the area of biomedical research. ■

Figure 1: impression of Sensius FocusCollar System for treatment of tumors in the head and neck

Thinking Through Technology

By: Jan Vleeshouwers

After reading Carl Mitcham's book 'Thinking Trough Technology' [1], you will not use the word technology with the same ease as before. That is not because it uncovers some deep uncomfortable truths about technology, but because it provides you with an overwhelming load of thought and analysis, leaving you quite disoriented about what you thought was your simple daily occupation.

'Thinking Trough Technology' is a compendium of everything that people have reflected on regarding technology (and related topics such as techniques, crafts and skills), at least in the Western cultural hemisphere, and at least for as far as sources have remained accessible.

Arranging these thinkers, Mitcham sees there are more or less two poles, with little in-between. The one pole are the engineering thinkers of technology, who show affinity with the subject, often in combination with positive expectations of what technology will bring to mankind and earth, and a tendency to suggest or impose technological methods on other areas of society, for example out of considerations of efficiency.

The other pole are the humanities thinkers of technology, who show less or little affinity with technology, and often stresses the limited scope of technological thought, its ignorance of core human values such as love, beauty, religion, and free will. They have a reluctant view on technological progress (and science), and sometimes even show plain hostility. But also, Mitcham notes, they often show little to no real knowledge of what goes on in technology. The engineering pole thinkers, however, often find humanities pole thoughts vague and beside the point. Mitcham concludes that there are bridges missing here. Mitcham wrote this in 1994; I think nothing much has changed since then.

Having arrived at a very diverse and multifaceted view of technology through the eyes of a score of people of a very varied background, Mitcham uses the 2nd part of the book to analyze the topic from four core perspectives. What follows is a truly impressive account of thoughts, through the ages, on technology, organized along these four perspectives. It is not helpful to try to summarize these thoughts and ideas, because they themselves are already a summary to a large extent. Rather, I will try to highlight where this account undermines the things we usually take for granted regarding technology.

Technology from the objects perspective

Technology is about tools and machines, or in general about artificial, human-made objects. That seems clear, but there is certainly no one-to-one correspondence. When our ancestors used natural objects like stones, sticks and caves, that is certainly technical, isn't it? And surgery, although technical, does not turn a body into an human-made object, does it?

Some people argued that deterioration is the distinctive aspect, "because [in technical objects] form and matter are not really one" (p.172); but natural objects deteriorate just as well. Some would say that human-made objects are those to which humans have contributed to make it usable. This would mean that if an artificial object was also a piece of art, one and the same object can be both technical and non-technical. Still others suggest that temporary objects as sounds or images must also be considered technical. And in the line of technocratic thought, which applies technical rational reasoning to organizations, even immaterial constructs as institutions and businesses could belong to the technical domain. Continuing on this line of reasoning, one might end up calling all objects technical, which of course is rather meaningless.

So technology cannot be described well based on artificial, human-made objects, although there is certainly a relation. That leads toward a different view: human-made objects are the tangible remains of human technological activity, the third perspective. That leaves sufficient room for the objects themselves to be ambivalent with respect to technology.

Carl Mitcham, author of the 'Thinking Through Technology' book

Technology from the knowledge perspective

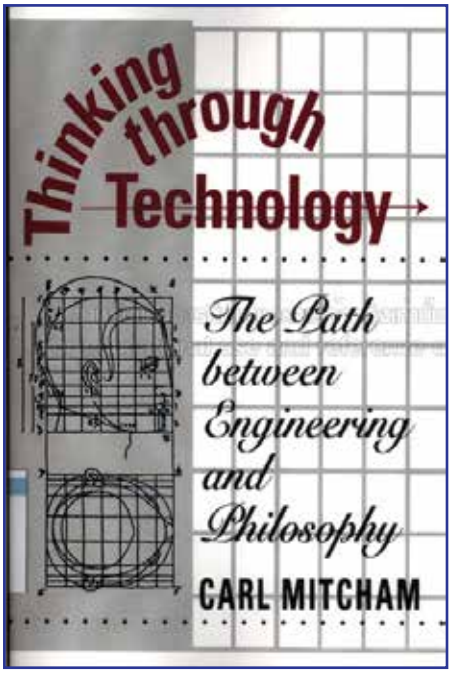
Technology rests on specific knowledge. This realization is old, Greek philosophers already pondered the knowledge behind skilled crafts. But crafts were not the highest valued activities. Instead, the ancient Greek focus was on virtue, on politics, and on understanding nature, the duties of the more privileged; technical knowledge was less relevant.

This difference in approach has continued until now. Mitcham mentions some limited exploration into skills development in children, phases that can be distinguished and the existence of both practical and cognitive dimensions in skills (Piaget, p.194; Dreyfus, p.195; Polanyi p.196; Gille p.196). But these did not find their way into technology thought. Instead, for the technological knowledge philosophers and engineers have consequently turned to science. Scientific knowledge has the advantage that it is accessible, since it is codified (written down), while technical knowledge is tacit. And of course, technological development builds upon the findings of science. This resulted in viewing technical knowledge as applied scientific knowledge (Bunge, p.197).

But a closer look casts doubts upon this view. To begin with, there is technical knowledge that cannot be reduced to

a scientific basis (Staudenmaier, p.199; Smith, p.200; Vincenti, p.200; Klein on the induction motor, p.202). Mitcham gives the example of the eight-year study of Project Hindsight (1966) on the extent to which the US Department of Defense benefited from basic research. The study concluded that just 1% of the development could be attributed to basic science; 91% was unreducible technological knowledge. Secondly, engineers sometimes modify scientific concepts without scientific reason. "A study of the invention of the induction motor, 1880-1900, shows that the attempt to make what might be called top-down application of Maxwell's scientific theory of electricity actually inhibited the development of electrical motors." (p.202) The motor was realized using insights and tools based on practice, with Maxwell's laws merely as a guide. Thirdly, even more showing, is the fact that engineers handle problematic data even though science does not provide a lead. Skillfully handling real-world cases which do not fit to scientific theory, is a source of relevant, albeit tacit knowledge, which has no roots in science.

Scientific knowledge itself does not develop in a clean, 'scientific' way either. Mitcham cites Kuhn: "There are no strictly objective facts or observations that can uniquely determine some scientific law." (p.204) Science develops with the use of technology, and with the use of knowledge dependent on technical skill. So science is as much dependent on technology as vice-versa.



The 'Thinking Through Technology' book by Carl Mitcham

So from an analysis of technological knowledge, it follows that technical knowledge, like technical objects, is a result of human technological activity. Humans do things to find something out. This can be accidental activity, but is can also be highly structured as in modern science. It results in experience, in technical knowledge of what actions lead to what results. But it does not start with the knowledge.

Technology from the activity perspective

"Activity is arguably technology's primary manifestation" (p.209), but this perspective has attracted much less thought and analysis than the previous two perspectives. Technological activity can be associated with diverse human behaviors, but the boundaries are not clear, Mitcham warns, also because activities include individual as well as group forms.

Mitcham starts with an initial division between activities that make things and those that use things. 'Making' covers a range of activities, but Mitcham pays special attention to the technical activity of designing, because it is considered as the essence of engineering. Describing designing as the "attempt to solve in thought, using available knowledge" (p.220), he sees that in practice, designing is a repetitive process: "continuing design through final execution is in fact the norm" (p.223). Design leads to concrete results, not of a fixed form but sufficient to convince relevant people of the viability of the road ahead, or to decide between alternatives. As such, designing turns into a regular aspect of structured making.

Related to design is the topic of efficiency. "Engineering design is a systematic effort to save effort." (p.225). Some philosophers (Lyotard p.225; Ellul p.57; Smith p.146; Skolimowski p.226; Simon p.227) have identified ultimate efficiency as the essence of technology and engineering. "But the first use of the word efficiency in what has come to be called the technical sense occurs, … during the second half of the nineteenth century" (p.225), so fairly recent. In addition, efficiency is always dependent on a given context; there is no absolute efficiency. Thirdly, engineering design disregards aspects which are physically unfeasible (like using no energy) and which humans do not value (e.g. exhaust natural resources, create waste). Efficiency is therefore not an essential characteristic of technology.

If the technological dimension of making remains unclear, the dimension of using is even more so. Mitcham suggests, from the etymological background of the word and from the fact it is "oriented toward engagements with things, even artifacts" (p.230 & 231), that the word's meaning may have evolved along with technology, and in response to it. It is remarkable that activities that harmoniously interact with objects (Mitcham denotes these as "having a self-contained quality", p.232), have their own verb, like living in a house, reading a book, driving a car. These of course imply a kind of use, but if you would say you are using a house, a book or a car than you have "failed to engage them in the proper manner" (p.232). 'Using' implies a more distant relation between actor and object. But the scale is gradual, which means that 'using' may be 100% technical, but other ways of interacting certainly may have a smaller or larger technical flavor.

The last form of activity that Mitcham analyses as technological, is work. "Despite its modern significance, however, there is surprisingly little by way of explicitly philosophical analyses of work" (p.241). Mitcham uses Arendt's concept of work [2] as a set of activities in between labor, those repetitive activities needed to sustain life, and action, those activities through which a person becomes part of a community and contributes to it, e.g. politics. Work "provides an artificial world of things", which "is meant to outlast and transcend" individuals, so work is technological by definition. Work is both making and using. The central position of work shows from the fact that in modern society work has become the main source of identity. Arendt observes a persistent process in which work changes the character of action. Still this is evaluated in very different directions: it can be seen as a way "to overcome man's own natural, i.e. animal, limitations", or as "carrying human unpredictability in that realm" of fixed nature (Drucker, p.244; Cooper p.245).

Summarizing: the activities of making and using certainly have technological aspects, but do not suffice to describe technology. It is insightful to separate human activities into labor, work and action, and to associate technology with work, but since aspects of work are entering labor and action, these become technological too, to a certain extent. The general picture is that what characterizes activities as technical, depends to a large extent on the objects which are made, used or interacted with. With that conclusion we run into a circular reasoning: the conclusion from the first two perspectives was just the opposite. This makes the fourth perspective (volition) particularly important.

Technology from the volition perspective

Trying to get to grips with the previous perspectives, which clearly have a technological flavor but do not allow to fully describe technology, Mitcham turns to the perspective of volition. What moves humanity to put effort into technological activities, with the associated creations and knowledge? Mitcham: "Whereas technology as object, as knowledge, and as activity can readily be engaged by philosophical traditions of reflection, it is difficult to get a philosophical purchase on technology as volition. This is because willing, although clearly a theme, is itself so poorly articulated by philosophy." (p.247)

In reviewing the previous perspectives, many motives have already come by: the will to survive; to control or power; to freedom; to efficiency; the entrepreneurial spirit; to realize a self-concept; the utopian will; the will to will; the desire for ease; altruism; and even the very abstract 'aspiration to merge subject and object'. These show a practical problem in analyzing volition: it is "the most individualized and subjective" perspective of all four (p.250). An act of willing, except one's own, cannot be directly known. On top of that, an act of willing does not undoubtedly follow from observable actions. It is almost as if anything goes.

Mitcham still attempts to provide some structure. "All descriptions or definitions of technique which place it outside ourselves hide us from what it is. … Technique comes forth from and is sustained in our vision of ourselves, as creative freedom, making ourselves, and conquering the chances of an indifferent world." (Grant, p.250.) But this is combined with either a lack of direction ("Whatever is willed calls forth its appropriate technology.", p.249; "Human beings make themselves, or will what they are to become.", p.250), or with the observation that technology may be related to weakness of will: one knows what should be done, but does not do it.

These aspects of free and uncontrolled will lead to a contradiction. On the one hand, one identifies "freedom as the human essence … to ground the technological project (the aim of which is to realize that freedom), while the project itself (the Enlightenment pursuit of a union of science and politics in knowledge-based power) presumes the impossibility of … freedom [beyond self-control]." (p.265.) Technology originates from unlimited freedom but can only work by limited freedom. This rather discomforting view "… is documented by the sociological literature. Technological desires engender and are reinforced by technological motivations, which ... reflect back onto and are supported by consent to the technological presence. It is this feedback process and its large-scale institutional formations that give rise to what has been referred to as technological momentum, technological autonomy, or a technological imperative." (p.255.)

Wrapping up

Mitcham's explorations of technology on the four dimensions of objects, knowledge, activity and volition lead to a disorienting picture of technology, without providing a solid basis and without much direction either. It seems technology is a thoroughly human activity, hard to separate and distinguish from other (non-technical) activities. They bring forth a wide range of objects, mostly material but also immaterial. They are supported by a large though indistinct body of mostly tacit knowledge, with a mutual supportive relationship with science. If there is such a thing as free will, it may well be the source of technology, both in a positive way (bringing profit to humanity) and in a negative way (responsible for the destruction is brings to Earth's life, and humanity as part of it). Should we be pleased with this sketch? Or disappointed?

Could it be that Mitcham addressed a question no-one will ever be able to answer in a satisfactory way? That could very well be possible, but that does not mean the last word on technology has been said. Knowing how humans love to talk and discuss, I would expect there is still a lot to come. You are welcome to join in; as mentioned, Mitcham sees that there are still bridges to be built. And apart from welcome, there is also a clear urgency. After reading Mitcham's book, would you still say we, as a deeply technological species, know what we are doing? ■

[1] Carl Mitcham '*Thinking Through Technology*', University of Chicago Press, 1994.

[2] Hannah Arendt, '*The Human Condition*', University of Chicago Press, 1958.

Careers at Fluke

Fluke is committed to global market leadership in compact, professional electronic test & measurement tools. Our products are used by technicians in over 100 countries in various different industries like service, maintenance, production and quality control. Founded in 1948 by John Fluke, our most well-known product was the portable digital multimeter, but today under the Fortive holding company, we have a whole range of test and measurement technologies ranging from a simple non-contact voltage tester to high-end oscilloscopes and everything in between and beyond. Our products have essential impact on supporting our customers in their most critical challenges and make the world stronger and safer. Pride, personal fulfillment and opportunity to improve is at the core of our day to day work.

The headquarters of Fluke in Eindhoven, at the Brainport Industries Campus

Fluke's global headquarter is located in Everett, Washington, USA and our EMEA headquarters is located in Eindhoven, Netherlands at the new Brainport Industries Campus alongside many other technology companies. In addition, it is also home to our state-of-the-art training and customer experience center with several prototype machines to provide real-life scenarios for using Fluke tools and classrooms for trainings. Almost all departments of our company can be found here, such as calibrations & repair, sales, marketing, purchasing, logistics, warehouse, customer support and HR with the exception of product development which is performed at various locations around the world. Currently, we have more than 2,500 team members globally – and we are always growing!

A presentation by Fluke on the company

There are many opportunities within Fluke, from entry level to senior. Here, we are committed to "kaizen" which means continuous improvement. This doesn't just apply to our products, but also to our people! Personal and professional development and growth are at the forefront of every employee experience. In the past few years we have been rolling out a Europe wide internship program in which we have hired some of our amazing interns for permanent positions, which we consider a testament to the great talent who join our company and stay to grow within it. At Fluke, our motto is that we keep the world up and running – and we would love it if you would like to join us in doing that! Take a look at our careers page to see what opportunities we currently have open: www.careers.fluke.com

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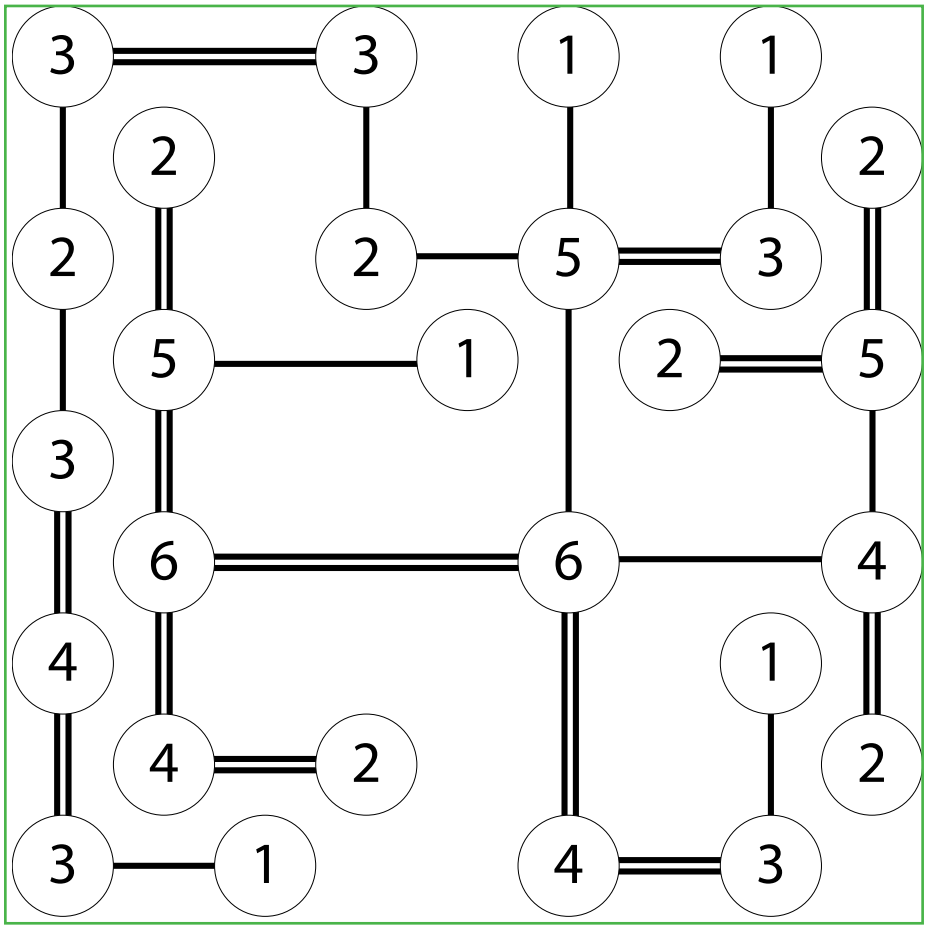
Puzzle

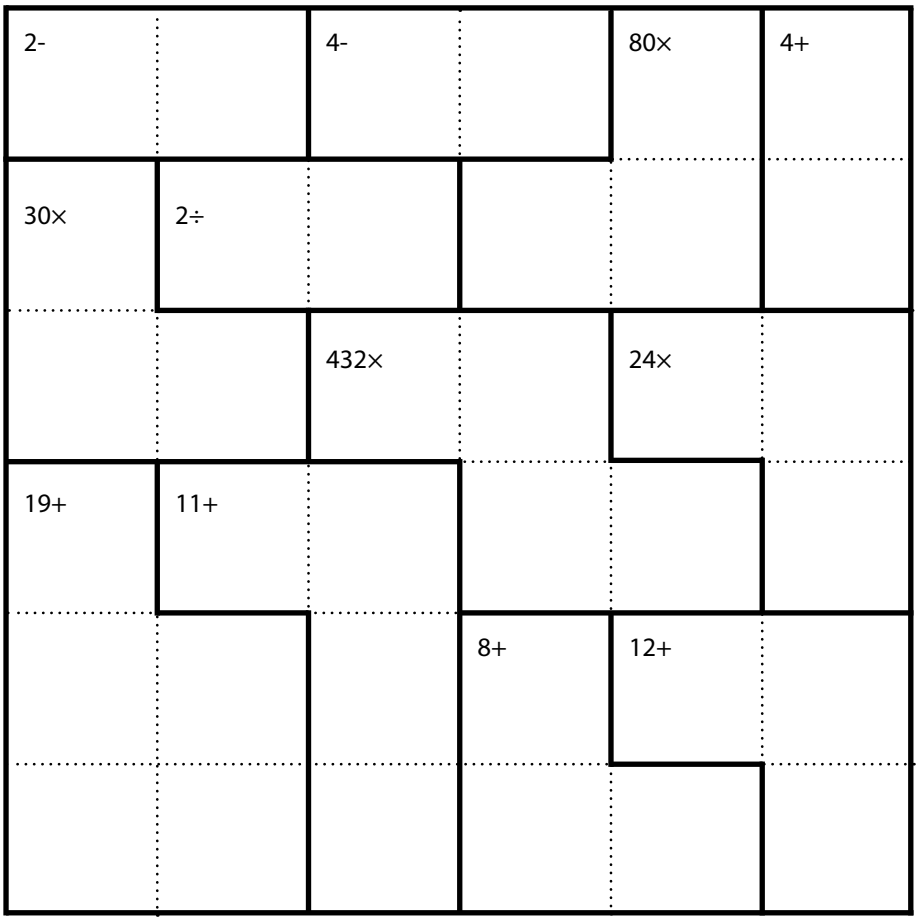
New puzzle
The K-Doku below is a bit similar to sudoku; you have to place numbers (in this case 1-6) such that they appear once in a row and a column. A section is given by the thick lines, and contains a number and a mathematical operation (+,–,×,÷). The numbers that you fill in within a section should together be equal to the resulting number mentioned, by performing the given mathematical operation. Within a section, you are allowed to use the same number multiple times.

So having a section that spans multiple rows and columns with four numbers that contains the hint 6× could for instance be 3×2×1×1.

Don't forget to send in the answer to connecthor@thor.edu at the 15th of August, 2022 at the latest if you want to have a chance at winning a pie!

Good luck!





The answer to the March puzzle

Answer and winner of the March puzzle
The solution to the March edition puzzle can be seen above. If you are interested in more of these kind of puzzles, they are called 'hashiwokakero', which translates to 'build bridges!'

The winner of the March puzzle is Noortje Hagelaars. Congratulations Noortje! ■

Noortje Hagelaars receiving her prize pie for solving the March puzzle

Living in a utopia

By: Tom van Nunen

With the current housing crisis, food prices, and uneven distribution of food globally, it's hard to imagine that the entire human race will live in an utopia anytime soon. Nevertheless, it's an interesting thought. What would happen if we were to live in a world where all our basic needs were met? That's exactly what John B. Calhoun asked himself around 1972.

In his experiments, he created living environments for animals like mice and rats. There would be an infinite supply of food and water, plenty of nesting space and material, and the temperature would always be ideal. Needless to say, no predators were present.

The most infamous mouse utopia was called 'Universe 25'. Four breeding pairs of mice, selected for their health, were placed in this environment, and their behavior was monitored over time.

After an initial settling phase during which the available territory was divided, it quickly became clear that mice had plenty of time left. After all, there was no need to flee for predators or search for food. Not very unexpected, this time was used for having excessive amounts of sexual intercourse.

The population of Universe 25 started to grow fast; first, it roughly doubled every 55 days, later it slowed down to a doubling every 145 days. Around day 400, the growth came to a halt, when the total number of mice reached 2200, short of the total capacity of 3000.

By this time, Universe 25 had changed completely, and 'utopia' was not exactly the right word for the situation any moreanymore. When the population hit about 620, groups began to form. In a natural setting, those who do not fit in would migrate, but in this case, there was nowhere to go. This resulted in many mice becoming isolated, withdrawing in a large pool in the center of the universe. Withdrawn males became very inactive and did no longer interact with other outcasts. They were no longer seen as competition by territorial mice. They would also not respond when attacked

by other withdrawn males , and would later attack others the same way. This group was characterized by their many wounds and scars.

Other individuals would withdraw completely, paying only attention to the condition of their fur, cleaning it constantly. They would not mate and never get into fights.

Also, inside the groups, strange behavior was observed. The 'alpha mice' became very aggressive, and would randomly attack other mice, even if there was nothing to gain for them. They would regularly rape both male and female mice, and fights could even end in cannibalism.

Mothers would abandon their young, or just forget about them. When they did stay with their young, they would be very aggressive to trespassers, and this aggression would spill over, resulting in mothers killing their own young. The ones who did survive, never learned 'normal' mouse behavior, and preferred a beautiful fur over mating.

The combination of aggression, high infant mortality, and lack of interest in mating, eventually resulted in complete extinction, the 'mousepocalipse'. I encourage you to read the rest of the story online, as it's just bizarre.

What can we learn from this experiment? Some say that, when the human population continues to grow, and all our needs are met, this will be our destiny. Others, however, think this is too short sighted. Maybe the extinction was caused by excessive social interaction, or by the fact that the setup enabled an uneven control of resources. And what about the lack of genetic diversity?

One might also question whether the claim that 'all basic needs were met' is really valid. After all, when you have nothing to do all day, that doesn't really sound like a perfect life, does it?

This column was inspired by https://www.iflscience.com/plants-and-animals/universe-25-the-mouse-utopia-experiment-that-turned-into-an-apocalypse/ ■

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