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The brain suppressed

Vincent Mentzel
The human dimension

Alumni Symposium
Focus on innovation

Glass constructions
Stronger than concrete

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tablet.delftoutlook.tudelft.nl

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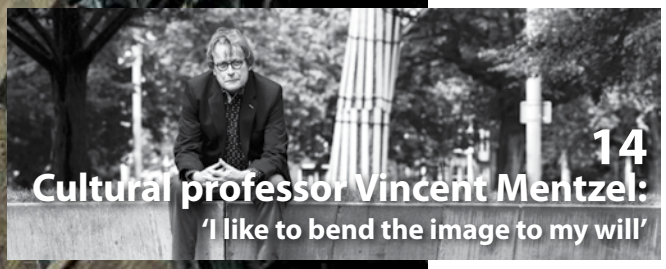

Editorial

"Decreasing productivity, an ageing population, food shortages, climate change, resource shortages – these developments require the utmost from our technical ingenuity and ability to find the right places for these new techniques within society," argues TU Delft alumnus and Dutch Labour Party (PvdA) MP, Diederik Samsom. Obviously the responsibility for making careful judgements regarding complex technology does not rest solely with engineers. We also need politicians who have clear agendas and backbones made of steel. That said, Zappi, the equally imaginary building material boasting of these same properties, has not yet been found, although Professor Mick Eekhout argues that we can do more with glass now than we could have ever imagined twenty years ago. A future dream for people with Parkinson's disease is the ability to stop spasm attacks with the push of a button. Researchers in the Smart Implantable Neurostimulators programme hope this could become a clinical reality within ten years. Along the long road from the lab to clinic, any potential risks posed by a technology should be mitigated as much as possible; however, since we are only human, we cannot take in everything, according to award-winning photographer, Vincent Mentzel, who, as TU Delft's first-ever cultural professor, will focus on the theme of 'The human dimension' in his classes and lectures over the months to come. So – regardless of how you think technology measures up – contentious social issues demand engineers who are open and strong-willed."

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Editor-in-Chief, Delft Outlook

Colophon

Coverphoto
Tomas van Dijk

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Remaking Mecca

Saudi Arabian authorities have been improving walking routes in Mecca to accommodate more pilgrims and reduce risks of stampedes. Professor Serge Hoogendoorn, TU Delft's expert on traffic flows and crowd management (CEG), was asked to advise on design solutions for the mosque in terms of increasing pedestrian capacity, together with his colleague Professor Hani Mahmassani from the Northwestern University Transportation Centre (US). "Based on my empirical knowledge of pedestrian flows, I could almost calculate the capacities of different design solutions on the back of an envelope." Mahmassani's group has made computer models and run simulations of the pilgrim flows inside the mosque. The funny thing was: both approaches yielded similar outcomes, and hence consistent advice could be given to the Saudi authorities.

Further information:
www.delta.tudelft.nl/23448


(Photo: Omar-Chatriwala/Wikicommons)

Fuel cell lab opened


(Photo: Tomas van Dijk)

Together with the existing theory group at process & energy, the newly opened fuel cell lab forms an integrated research centre on a European level. The objects of study here are solid oxide fuel cells (SOFCs: tile-like devices that transform gas directly into electricity.Assistant professor, Dr P.V. Aravind Aravind is glad the TU has taken over the equipment from ECN, the national energy research centre, which last year was forced to limit its activities as a consequence of budget cuts. Aravind says the acquired equipment nicely complements the activities of the group's theorists in thermodynamics, electrochemistry and computational fluid dynamics. The new lab enables them to work in 'an integrated manner' on both computations and experiments. "Not many universities have this combination," Aravind says.

Further information: bit.ly/sofc-lab
www.delta.tudelft.nl/23402

Merger

TU Delft wants to work together more closely with Leiden University and Erasmus University Rotterdam. These three universities believe there are five areas of research in which multidisciplinary crossovers are possible: health, sustainable environment, law and governance, globalising economy and society, and network society. If the universities of Leiden, Rotterdam antd Delft will ultimately merge remains unclear. Until May, that is.

Prior to then, everyone in the joint academic communities can influence the process, said Dirk Jan van den Berg, Chairman of TU Delft's Executive Board, during the opening of the academic year on September 5. His words made it clear that he doesn't like all the speculation in the press and on social media sites about the planned merger of the three universities. Van den Berg believes it is much more productive to discuss the 'substantive aspects'.

Microwave toilet

TU Delft researchers have received a grant worth approximaltely 500,000 euros from the Bill & Melinda Gates Foundation to develop a new kind of toilet that does not require water nor a sewage system. Using microwaves and a process called 'plasma gasification', the toilet will turn human faecel waste into a synthetic gas. This gas will in turn be used to produce elektricity.

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New challenges for Nuna

New solar cell regulations have turned the World Solar Challenge into a whole new ball game. This year teams are only allowed to carry 3 square meters of very efficient gallium arsenide solar cell panels on their car instead of the 6 square meters in previous years. It's either this, or they can fall back on the less efficient panels made of mono crystalline silicon of which 6 square meters are still allowed. This rule is meant to create a more equal playing field. The Delft team has decided to use mono crystalline silicon this year. Four times in a row the Delft students have won the race through the Australian desert which is held every other year in October. In 2009, Nuna was dethroned by a team from the Japanese University of Tokai, coming in second.

Further information:
www.delta.tudelft.nl/23451

Millions for antennas and nanocoatings

Chemical engineer Dr Ruud van Ommen and wireless communication expert Professor Andrea Neto both received a 1.5 million euros Starting Grant from the European Research Council (ERC) this summer to develop their own research teams. Van Ommen, of the faculty of Applied Sciences, will use his grant to ameliorate coating techniques for nanoparticles. Neto is working on a new kind of ultra-sensitive antenna for terahertz waves - electromagnetic waves with frequencies higher than 100 gigaHertz (0.1 TeraHertz). Among that which makes these antennas so promising is the fact that the terahertz bandwidth is virgin and thus a widely available resource.

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Formation flying

Nine TU Delft students have won a Dutch aviation award for their idea of having airliners fly like geese: in formation. They calculated a 50 percent fuel reduction.The force behind formation flying comes from the quasi-static air currents originating at the wingtips during flight. These so-called vortices are normally feared, as they can drag other aircraft down, but a vortex also has a region that pushes other aircraft up and reduces their drag. That's what geese benefit from. The organisers of the Nationale Luchtvaartprijs (National Aviation Award) called for innovative, energy-saving aviation proposals. The students reckon that the open rotor jet will save 20 percent on fuel, and formation flying, with the benefit of lighter aircraft carrying less fuel, will save another 30 percent.

Further information:
www.formationflying.nl
www.delta.tudelft.nl/23303


(Illustration: Piet van Rosmalen)

Electric avenue

MSc student Swagat Chopra (EEMCS) developed a contactless power transfer (CPT) for charging electric cars while waiting for traffic lights or driving down 'Electric Avenue'. The physics is not so different from what happens in any transformer, says Chopra's supervisor, Professor Pavol Bauer. The only difference is that the primary and secondary colis are not linked by a chuck of iron, but rather a gap of air. To overcome this obstacle, high frequencies are used (typically 100 kilohertz) and the coils are tuned to the same resonance frequency. After his graduation, Chopra will work to improve the overall efficiency of the system, which is now 83.2%

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(Photo: Tomas van Dijk)

Bike racing


(Foto: HPT)

Last August the TU Human Power team was only 2.3 kilometres short of the current world hour record in their sleek recumbent bicycle at the Dekra test track near Stuttgart (Germany). It rained practically all weekend and it was only Monday evening that Pieter Hollebrandse could finally climb into the bike. "His laps were encouraging with an average speed of 92.7 km per hour", says project manager Hajo Pereboom. But after some 20 minutes the speedometer started dragging, which forced the driver to stop. When he retook the record attempt, evening fell and air humidity rose resulting in a higher air resistance. Hollebrandse booked 88.3 kilometres in one hour. While waiting for a second chance for the hour record, the team now concentrates on the sprint challenge on Battle Mountain in Nevada (VS). Sprinters Sebastiaan Bowier and Jan Willem Gabriels will try to beat the current record of 133 km/hour.

Further information: www.hptdelft.nl

(Illustration: Auke Herrema)

Schiphol enigma

Why do some people complain about aircraft noise while their neighbours do not? Dr Maarten Kroesen (Technology, Policy and Management) discovered that mistrust and loss of control intensify the impact of noise. Mistrust has grown over the years as noise limits were repeatedly surpassed and consequently adjusted. "People got the feeling that the economy wins out every time." Thus people lose faith in surveys, in noise calculations and in the government, which doesn't adhere to its own noise limits. Also, people tend to complain more about things they do not have control over. Giving people a say in how to insulate their homes from noise might improve that, Kroesen advises.

Further information:
www.delta.tudelft.nl/23343

Fresh light

Antoni Van Leeuwenhoek would only have been able to work with his microscopes during day time, or so some people have claimed. With her movie, 'Worm by candlelight', Dr Lesley Robertson, the curator of the Delft School of Microbiology Archive in the Kluyver Laboratory, proved this assumption wrong. Filmmakers from the BBC visited Robertson's museum two years ago, when they were making a documentary about Van Leeuwenhoek. "They filmed microorganisms through a Van Leeuwenhoek microscope," Robertson says. "But the results were far from perfect, which is understandable since they only had one day for the shooting." Robertson thought she could do better. She mounted her digital camera with a macro lens on a tripod in front of the microscope (magnification 118 times) and focussed on a sample with microorganisms. Her efforts (done during lunch break for months) resulted in razor sharp images.
bit.ly/leeuwenhoek-1
bit.ly/leeuwenhoek-2
bit.ly/leeuwenhoek-4

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Research award

(Foto: Tomas van Dijk)

While most hydrologists focus on the scale of river basins, PhD Student Ruud van der Ent (Civil Engineering & Geosciences) created global maps showing the sources of atmospheric moisture on a world scale. For his article, 'Origin and fate of atmospheric moisture over continents', he received the Research Award for Young Scientists from the World Meteorological Organization. He will present his research at the Alumni Symposium on October 7.

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The perfect kiss

For his achievements in the kissing number problem, Dr. Frank Vallentin (Faculty EEMCS) won the prestigious SIAG/Optimization Prize from the Society for Industrial and Applied Mathematics. In geometry the kissing number is the maximum number of balls that can simultaneously touch a central ball without overlapping. In three dimensions the number is 12. Take 13 ping pong balls, put one in the middle, and you will see that you can arrange all others such that they all touch the ball in the middle. These numbers might seem straight forward if you use perfectly round ping pong balls, but calculating them is a classical, long-standing problem in geometry. Starting from five dimensions, the exact value of the kissing number is still unknown in most dimensions. Vallentin and a colleague, found new upper bounds for 'kissing' in higher dimensions, using a new mathematical method based on semi-definite programming, harmonic analysis and invariant theory. The kissing number research has applications in geometry, in error correcting codes for telecommunications, and in material science.

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The strength of glass

For nearly a century architects have been dreaming of a material as strong as steel and as transparent as glass. We have now learned so much about glass that it is increasingly used as a sort of transparent concrete.

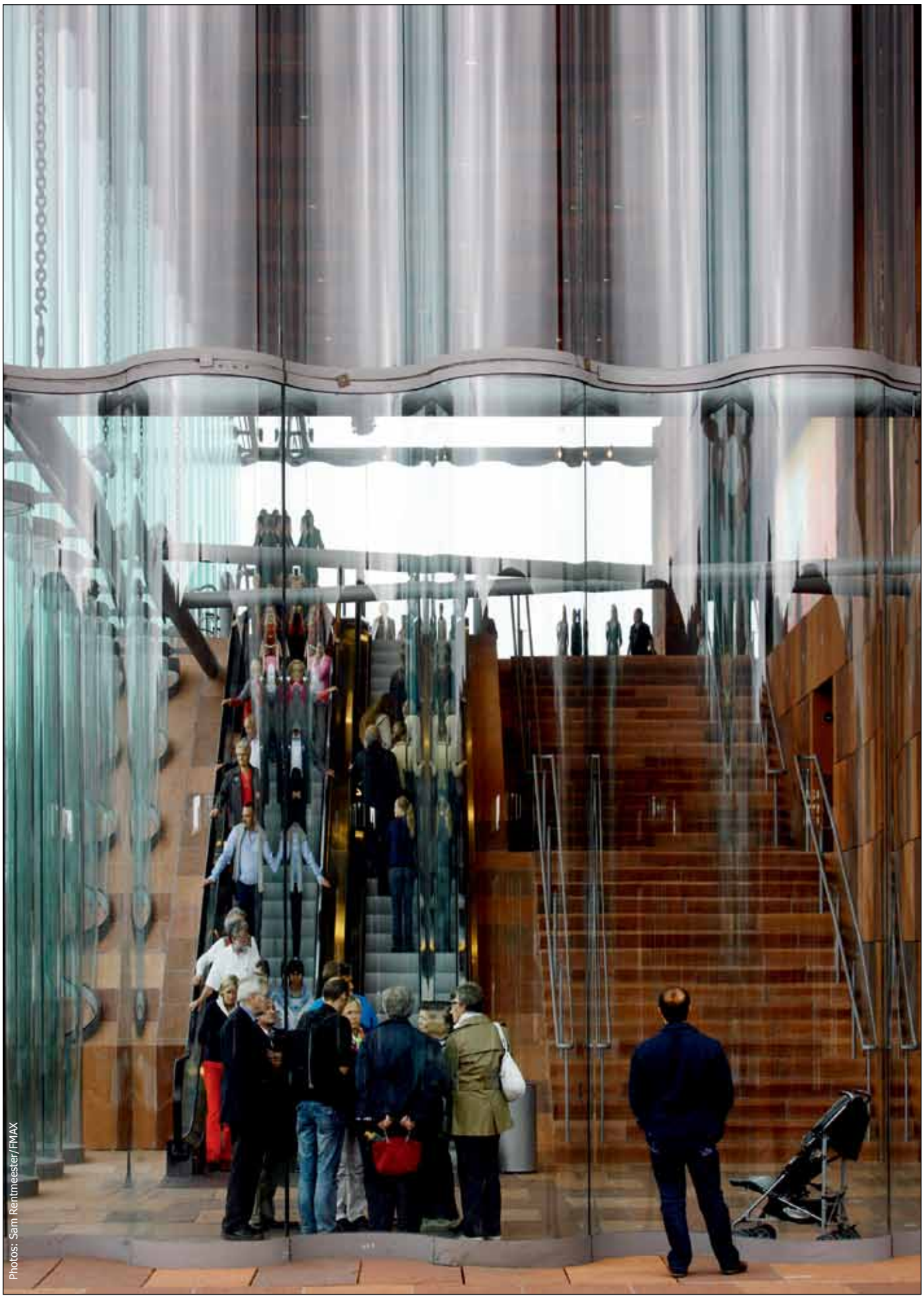
TU Delft has several world-renowned experts on glazing among its teaching staff. Professor Mick Eekhout (Architecture) and his company, Octatube. construct glazed roofs all over the world. Closer to home, the South and East glazed atriums in the university's BK City are his creation. Working to a tight schedule, Prof. Eekhout and his team expanded the existing main building with two enormous cubes, largely constructed in glass. For London's Victoria and Albert Museum, he constructed a spectacular glazed roof over a building in the museum's courtyard. Twisting, double-glazed panels rest on sloping laminated glass bearers up to 11 metres long.
Alongside his positions in the faculties of Architecture and Civil Engineering and Geosciences, Professor Rob Nijsse also works with consultancy firm ABT, for whom he created the wavy glass windows of Rem Koolhaas' building for the Casa da Musica in Porto, Portugal. This

'Glass can be used like reinforced concrete, and it is considerably stronger than concrete'

year he surpassed himself with even larger wavy windows at Antwerp's Museum aan de Stroom (architect Willem Jan Neutelings). As well as being visually attractive, these wavy windows are stronger than flat glazing, says Prof. Nijsse. Calculations show that the fluted glass panels barely sway under the effect of the wind, keeping the forces on the securing points to a minimum.
Looking at these structures, it is easy to forget what a fragile material glass is, and how unexpectedly it can behave. But then Prof. Nijsse recalls the glass shelters at Nijmegen's bus station: a glass sheet was placed carefully on its glass bearer, and crack! Well, such things happen. Another time it was the beam that gave way. "That's a strange sight," says the glazing expert from behind his frameless spectacles. Prof. Nijsse subsequently discovered that the holes in the beam were a little ragged. Peak stresses are generated at those points, and any crack can be propagated through the material at lightening speed.
The Octatube factory also has its collection of splintered glass panels. Recently, because crows picked up stones from an adjacent roof and took great pleasure in dropping them on Eekhout's glass roof. Once he realised what was happening, he had the gravel stabilised with tar. Problem solved! Eekhout puts things in perspective: "It's bound to break at some point, but what matters is that the structure must never fall to the ground."

Find Zappi

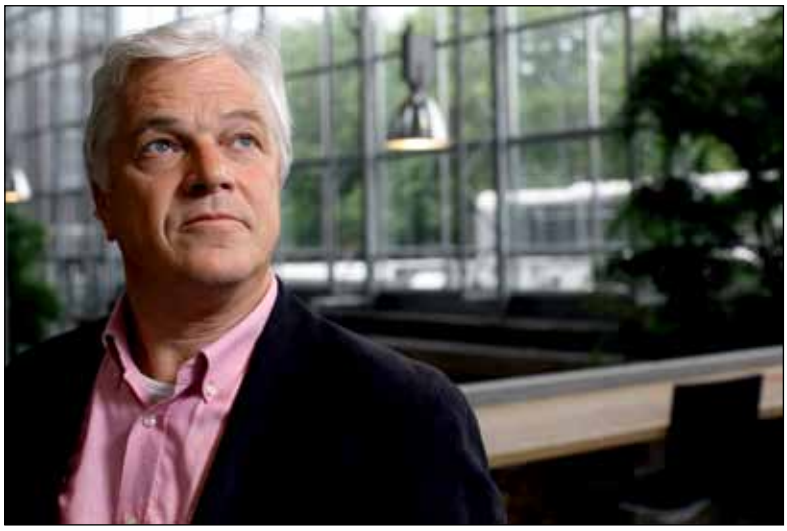
According to Prof. Eekhout, architects' fascination for glass dates to the early days of modernism, just after the First World War. People wanted to escape pain, poverty and suffering, and consequently placed their hopes in transparent, business-like designs and architecture, represented in Germany by the Bauhaus movement and in the Netherlands by De Stijl. Back in 1919, German architect Mies van der Rohe designed a transparent skyscraper with glazed walls for Berlin. Forced to flee from Hitler, he later built the skyscraper in Chicago. The Van Nelle factory in Rotterdam dates from the same period, and expresses the same yearning for clarity and transparency. The hope was that transparent buildings would lead to a transparent society. This was before the bankers and insurance companies developed their preference for mirrored glass.
In his inaugural lecture, when appointed a professorship in 1992, Prof. Eekhout called for a quest for an imaginary building material called "Zappi", which would be as transparent as glass and as strong as steel. When Dr Fred Veer came to work with him in 1995, his task was: "Find Zappi!"
During his quest, Veer has tested the strength of hundreds of glass samples. There can be few people who have made as many splinters as he has. He found that glass with a breaking stress of around 30 MPa (N/mm2) is not only 20 times weaker than steel, but also that chance plays a major >>



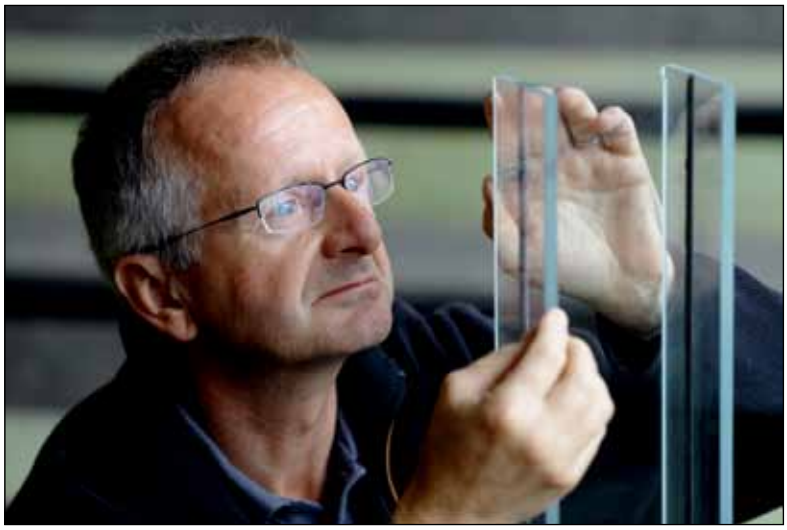
Photos: Sam Rentmeester/FMAX

Prof ir Rob Nijsse:"This wavy windows are stronger than flat glazing."

role. “Glass almost always fails in places where the edge has been damaged during manufacture,” wrote Veer in an article summarising ten years of research. Furthermore, glass failure is immediately catastrophic: as soon as the breaking strain is exceeded, the material loses all integrity.



Prof dr ir Mick Eekhout:” Experimentation is essential for innovation.”



Rob Nijsse created the wavy glass windows of MAS in Antwerp.

Photo: AGC Glass Europe

Sheet glass manufacturing at AGL Glass Europe in Tiel.

Only very recently has it become possible to calculate the failure of glazed structures. Professor Jan Rots (faculties of Architecture and CEG) explains that the finite element method normally used to calculate forces in structures fails with glass after the first crack. The results that come out of the computer are then nonsensical. Prof. Rots devised a method to restart the calculation after each crack. He calls this ‘Sequential Elastic Calculation’. The results here tally with the reality in the case of extremely brittle materials like glass.

Veer has come up with a practical method of inhibiting the spread of cracks. He constructed panels and beams from smaller stacked elements. This can be achieved using light-sensitive resins, with adhesive PVB (polyvinylbuteral) films, or with the spectacularly strong Sentryglass (see the demos on Youtube). He used this method to develop an eight-metre long hollow beam, intended for use as an aquarium. Artist Stefan Gross thought it would be great to use a completely transparent aquarium as a bridge below the light source in the roof of the library. Veer designed, built and tested the aquarium, but was refused permission to install it. Prof. Eekhout felt the design was irresponsible and even dangerous.

Veer perfected the concept of glazed loadbearing structures with steel reinforcement. Last year, Dr Christian Louter obtained his doctorate cum laude with his thesis, “Fragile yet ductile”. The basic idea was simple: if the glass fails, steel must take up the stresses. For this, Louter constructed a variety of multi-layered glass beams with an internal laminated steel strip or wire along the underside. He then loaded the beam well beyond the breaking stress

‘They hoped that transparent buildings would lead to a transparent society’

of glass. A beam 1.5 metres long and 28 centimetres high was loaded with 1200 kilogrammes. The glass creaked and cracked in various places, the beam bent several centimetres, but it didn’t fail. Lauter concluded that the construction was safe, provided the stress remains below 15 N/mm2. “We haven’t discovered transparent steel,” notes Veer, “but glass can be used like reinforced concrete, and it is considerably stronger than concrete.”

So while we haven’t found Zappi yet, we can do far more now with glass than seemed possible 20 years ago. The constructive use of glass means that ever-larger surface areas of structural glazing are possible with increasingly less steel support. The glass ribs behind the 14-metre high glass façade of the Apple Shop in Boston and the Apple Cube in New York (both designed by James O’Callaghan) are good examples.

We’ve also got better at avoiding pitfalls. Veer has already stated that cracks often start at points of minor damage. Prof. Nijsse therefore takes no risks, and has his wavy panes fitted with a steel profile fixed with elastic acrylate while still in the factory.

Prof. Eekhout sees it as essential that design and execution should occur within the same company. This avoids

The 'Museum aan de Stroom' in Antwerp.

sloppiness and misunderstandings. He sometimes worries about unforeseen hazards, and thinks of his experimental projects as swords of Damocles, dangling above his head. "Experimentation during a project is risky, but it's essential for innovation," he says

Prof. Nijsse emphasises the need for further research, for example into glazed columns and the use of adhesive fixings for glass in place of steel connections. "We are now at the front of the pack," he observes. "But the others are catching up." China is already producing wavy glass. "We need to keep pushing the limits if we are to retain our position." Prof. Nijsse is aiming to identify three or four externally financed PhD students to continue the research: "Otherwise, we'll have to close down our lab." (JW) <<

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Glass for beginners

The manufacture of 90% of sheet glass worldwide is based on a single patent dating from 1952, granted to Sir Alistair Pilkington. After World War II, the British inventor devised a method to produce glass, literally on a conveyor belt. Pilkington's invention made possible the continuous production of glass with perfect smoothness and controllable thickness, ranging from 0.4 to 25 mm. In the patented process, molten glass (made from a mixture of 70 percent silicon dioxide ('sand') with sodium carbonate and lime) flows from the furnace over a bed of molten tin. The process takes place in an atmosphere of nitrogen and hydrogen, since oxygen would oxidise the tin. The liquid glass, known as 'float glass', floats on the molten tin and flows out to a perfectly even thickness. As it travels onward the liquid glass slowly cools from 1500 to 800°C. In a second room the glass solidifies as it is slowly cooled further from 700 to 300°C, then cut into 6 metre lengths, 3.21 metres wide. The length of these jumbo sheets is standardised to ease transportation. The above process creates annealed glass. There is just one glass plant making sheet glass by this method in the Netherlands - at Tiel. It can produce 50,000 square metres of 4mm-thick glass per day.
Hardened glass - known as tempered or safety glass - undergoes another thermic process. It is heated to around 700°C and then exposed to a cold air flow on both sides, cooling the surface, while the core remains fairly molten. This results in a glass sheet 2 to 3 times stronger than untempered glass. If tempered glass breaks it produces small chunks. Untempered glass breaks into shards.
Laminated glass, made in two or three layers bonded with film or resin, can retain its form following a breakage.

Controlling the brain

People with brain disorders like Parkinson's disease and tinnitus may one day have an ingenious, miniaturised neurosimulator implanted in their bodies. Made in Delft.

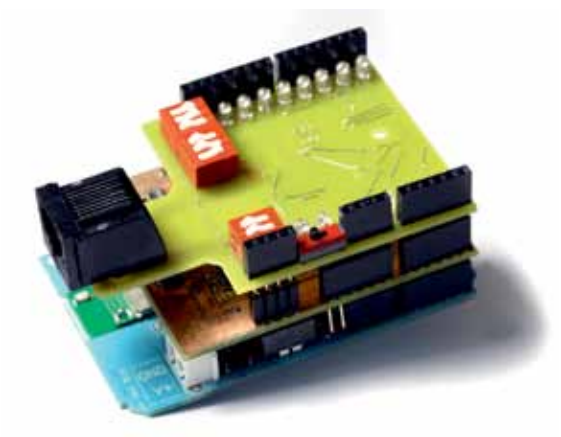
The Parkinson's patient presses a button on his remote control, and suddenly his violent spasms cease. The man has just activated his neurotransmitter, a device the size of a mobile phone implanted in his chest. It sends electrical impulses via a cable to electrodes in certain areas of the brain which exhibit abnormal activity. The neurostimulator suppresses these brain regions.
"It's fantastic to see how well the technique works for this patient," says electrical engineer Marijn van Dongen, as he shows a film of this seemingly miraculous cure on his computer. "Electrical currents flowing around our bodies determine a good deal of how we function," continues the PhD student in the Micro-electronics department of the faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS). "Intervening in that process allows us to tackle numerous brain disorders, like Parkinsonism, tinnitus or epileptic attacks, on a highly localised basis."
"However", Van Dongen adds after a brief pause, "at the same time these techniques are really rather medieval."

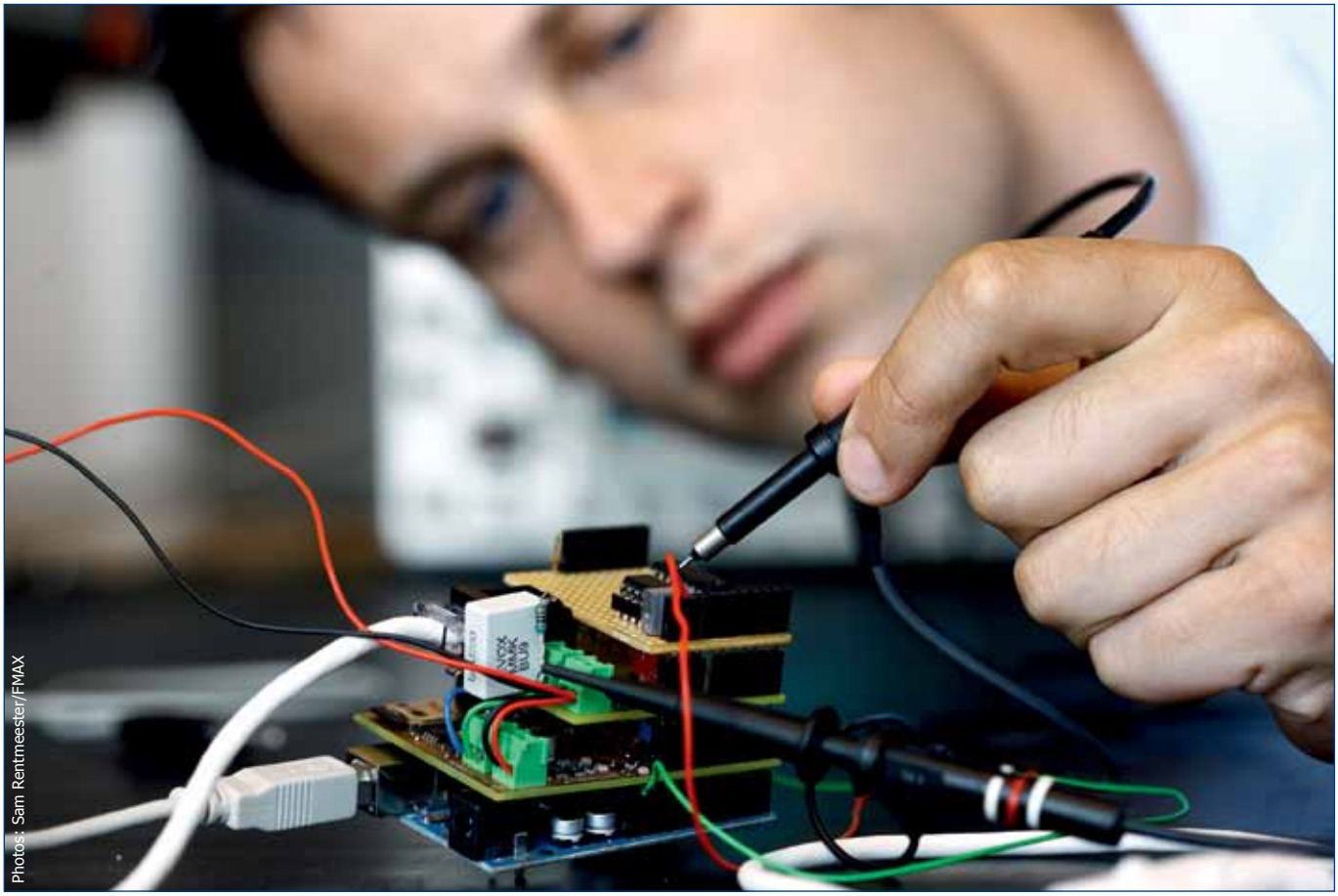
The electrical cables that run up the neck and into the brain can break or cause infections; they also cause scar tissue in the neck, making it painful for patients to move their heads.
But these tribulations aren't really what Van Dongen is referring to. It's the design of the stimulator he thinks is "medieval".
The present design is impeding further miniaturisation, so the entire design needs to be revised to get around the business with the cables.
Van Dongen and various colleagues in the Smart Implantable Neurostimulators (Sins) research programme are working on a completely new design for the implant. Their goal is to have a neurostimulator - a 2mm thick by 2cm square device also housing the battery and antenna - ready for implantation inside the cranium within ten years.
The research programme was launched in 2008 when neurosurgeon, Professor Dirk De Ridder, and neuroscientist, Eddy van der Velden, from University Hospital in Antwerp, Belgium, met up with Dr Wouter Serdijn (Micro-electronics department - EEMCS). Serdijn specialises in the design of electronic circuits for medical implants.
The two neuroscientists, who work primarily with tinnitus sufferers, asked Serdijn if he could make smaller, smarter stimulators for them. "These new stimulators will also need to be able to detect when they should generate impulses by analysing the signals from the brain, just like a pacemaker does with the heart", says Serdijn, the TU Delft programme manager for Sins.
The impulse patterns must be adjustable, and more natural in form - not angular as they are now. The current impulses look like the crenellations on a castle wall. This is so unnatural for the brain that the neurostimulator often fails to effectively suppress or control the relevant brain region. This means that the technique doesn't work for half of all tinnitus patients.

'The great challenge is to get the neurostimulator to listen to the cacophony in the brain'

Sardines

Van Dongen has a neurostimulator lying on his desk, the same type of device as the man in the film has in his body. The upper section of the titanium frame has been peeled back like a tin of sardines. "Just look at it," he sighs. "A massive battery, loads of separate components on a circuit board, large condensers."
Van Dongen wants to integrate all the separate components into a chip, and get rid





Photos: Sam Rentmeester/FMAX

Marijn van Dongen:"The new design allows us to give the pulses any form we like"

of the space-consuming condensers.
The condensers ensure that the positive and negative currents are balanced, which is not a minor matter: all electrons sent into the tissue need to flow back later, otherwise all kinds of electrolytic reactions will occur around the electrodes in the brain.
In the new design made by TU Delft scientists, the condensers are replaced by electronic circuits that monitor the currents flowing in and out of the brain.
The researchers have already completed a prototype of the equipment which will eventually be implanted in the brain. It is still a little larger than the existing stimulators, but it will be miniaturised in the coming years.
The TU Delft researchers recently tested the prototype. "This was a first test, intended to see if our neurostimulator is able to produce anything like a suitable neural response," says Van Dongen. The test was successful. Neuroscientists De Ridder and Van der Velden acted as test subjects, with each having electrodes temporarily implanted in their brains. They were able to control the stimulator via an iPhone app. The scientists then used electroencephalography to measure the responses.
The great challenge is to get the neurostimulator to listen to the cacophony in the brain and then respond very precisely with stronger or weaker impulses according to need, just as a pacemaker does with the heart. The researchers refer to this as a "closed loop". With a pacemaker, the task is relatively simple. That device only needs to monitor a single wave - the beating of the heart. The electrodes in the brain by contrast must deal with thousands of neurons.
The medical researchers are hoping that the closed loop technique will allow for a better understanding of the brain and any irregularities occurring within it, which will allow for improved therapies to be developed. "So we are working on sensor electronics that can zoom in on the specific frequency bands where the problems occur," says Senad Hiseni, another PhD student working in Serdijn's group. "This would have several advantages. Take tinnitus, for example, twhich is caused by unusual activity in the auditory cortex, the region of the brain where sound is perceived. Tinnitus doesn't always occur at the same spot, and the source can even change location. A closed loop system allows the stimulator to keep track of that change and only provide stimulation where it is needed. Tinnitus can be more efficiently countered, and the energy requirement is lower, extending battery life."
The new design is still a long way from being a closed loop, and it isn't very small yet, either. But it is already flexible. "The new design allows us to give the pulses any form we like," Van Dongen says. "The circuitry takes care of balancing the load. So we are no longer tied to angular impulses. We could even fire Rolling Stones music at the brain." Serdijn laughs: "But maybe AC/DC would be better."

'Electrical currents in our bodies determine a good deal of how we function'

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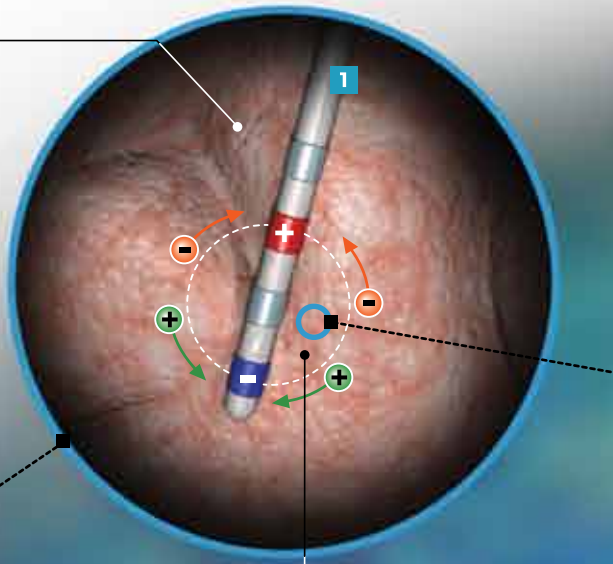
Brain stimulation

It is possible to suppress the effects of brain disorders such as Parkinson's disease by correcting abnormal pulse patterns in the brain between neurons. As soon as an electric field is generated in the brain, the effects of the disease disappear. However, the development of such neurostimulation is still in its infancy. The electrical parameters have been determined through trial and error and it is still not clear how the suppression exactly works.

Electrodes
Electrodes are implanted in the brain. These electrodes, which are approximately 5 mm long, are situated at the end of the conducting wire. 1 By applying a potential difference across an electrode pair, ions (e.g. potassium, sodium and chlorine) move through the body to the electrodes.

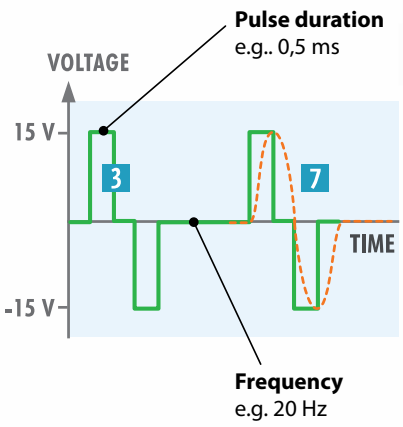


Electric field
The ion displacements cause an electric field in the brain tissue that blocks or generates signals between neurons. The size of the area around the electrodes (e.g. 5 mm) that is affected by the electric field depends on the potential difference.

Undesired side effects
As different functional areas in the brain are close together, there is a chance that not only the target area will be stimulated. The result is that undesired side effects can occur. For example, a patient can be troubled by undesired mood changes with the suppression of Parkinson's disease because the brain areas that are responsible for this are close by.

Existing neurostimulator 2
The neurostimulator sends electrical pulses 3 to the brain to affect the working of the brain. Currently available neurostimulators consist of a titanium case with a printed circuit board with electronic components, a battery and a number of capacitors. The neurostimulator does not fit in the brainpan 4 and is therefore placed under the skin in the chest.

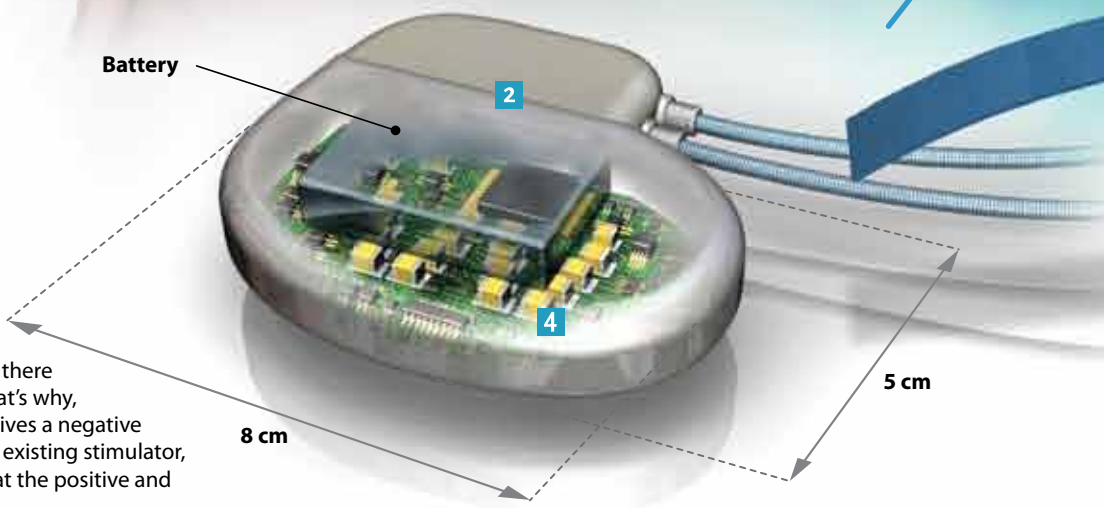
Conducting wire
To get the neurostimulator signals to the electrodes in the brain, electrical conducting wires (diameter approximately 2 mm) are inserted under the skin. The scar tissue of these wires in the neck makes it painful for the patient to move the head. Also, the wires can break as a result of the movements.

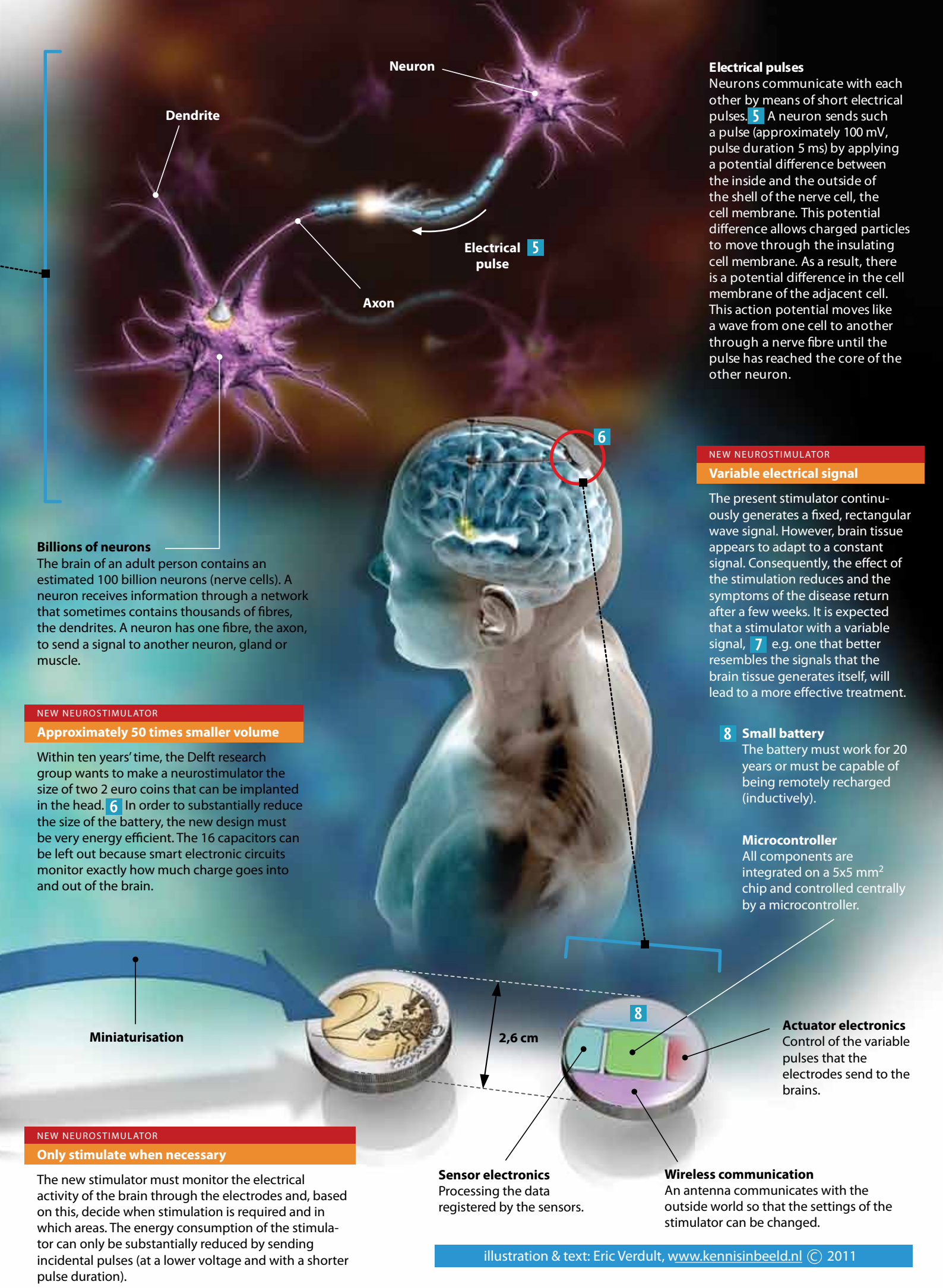


Pulse duration
e.g.. 0,5 ms

Frequency
e.g. 20 Hz

Balancing the charge
If electrons were to remain on the electrodes, undesired chemical reactions could occur that are dangerous for the brain. For example, metal ions could start to react with brain tissue. It is therefore essential that there is no build-up of charge at the electrodes. That's why, after a positive pulse, the stimulator always gives a negative pulse that removes all built-up charge. In the existing stimulator, large capacitors 4 are required to ensure that the positive and negative charges are exactly the same.





Electrical pulses
Neurons communicate with each other by means of short electrical pulses. 5 A neuron sends such a pulse (approximately 100 mV, pulse duration 5 ms) by applying a potential difference between the inside and the outside of the shell of the nerve cell, the cell membrane. This potential difference allows charged particles to move through the insulating cell membrane. As a result, there is a potential difference in the cell membrane of the adjacent cell. This action potential moves like a wave from one cell to another through a nerve fibre until the pulse has reached the core of the other neuron.

Billions of neurons
The brain of an adult person contains an estimated 100 billion neurons (nerve cells). A neuron receives information through a network that sometimes contains thousands of fibres, the dendrites. A neuron has one fibre, the axon, to send a signal to another neuron, gland or muscle.

NEW NEUROSTIMULATOR

Variable electrical signal

The present stimulator continuously generates a fixed, rectangular wave signal. However, brain tissue appears to adapt to a constant signal. Consequently, the effect of the stimulation reduces and the symptoms of the disease return after a few weeks. It is expected that a stimulator with a variable signal, 7 e.g. one that better resembles the signals that the brain tissue generates itself, will lead to a more effective treatment.

NEW NEUROSTIMULATOR

Approximately 50 times smaller volume

Within ten years' time, the Delft research group wants to make a neurostimulator the size of two 2 euro coins that can be implanted in the head. 6 In order to substantially reduce the size of the battery, the new design must be very energy efficient. The 16 capacitors can be left out because smart electronic circuits monitor exactly how much charge goes into and out of the brain.

8 Small battery
The battery must work for 20 years or must be capable of being remotely recharged (inductively).

Microcontroller
All components are integrated on a 5x5 mm^2 chip and controlled centrally by a microcontroller.

Actuator electronics
Control of the variable pulses that the electrodes send to the brains.

NEW NEUROSTIMULATOR

Only stimulate when necessary

The new stimulator must monitor the electrical activity of the brain through the electrodes and, based on this, decide when stimulation is required and in which areas. The energy consumption of the stimulator can only be substantially reduced by sending incidental pulses (at a lower voltage and with a shorter pulse duration).

Sensor electronics
Processing the data registered by the sensors.

Wireless communication
An antenna communicates with the outside world so that the settings of the stimulator can be changed.

‘I wish photography had another dimension’

For four decades he captured the important news events of the day, “without fuss, in order to inform the public”. This autumn, photographer Vincent Mentzel is Cultural Professor at TU Delft.

“I can spend ages looking at this photograph,” Mentzel says. “Why is Beatrix looking like that? What is she thinking?”

We met at the Kunsthal in Rotterdam, venue for the exhibition, ‘The Netherlands in Focus’, a retrospective of Mentzel’s work featuring more than 200 photographs, which opened in the spring of 2011. We were looking at a photograph of Queen Beatrix taken in 1986 during celebrations marking the centenary of the Dutch Penal Code. The photograph depicts the Queen seated on a bench, hands folded in her lap as if in prayer. Around her stand dozens of men: ministers, lawyers, judges. In the foreground are journalists, spokesmen and security guards. But only the Queen looks into the lens, giving the image a somewhat surrealistic air.

The photograph emphasises Beatrix, but also her entourage. Mentzel: “That ceremonial assembly of men shows respect. The day was all about authority, and that is beautifully captured here. But each of these men has his own little world. Perhaps he has a wife at home who he beats.”

How man relates to the space he inhabits is a question that fascinates the photographer. The theme of Mentzel’s lectures at TU Delft will therefore be “the human dimension”. Over a period of two months, he will advise students as they draft reports on this theme. You are only a person of a certain scale within an environment, and you cannot take in everything. That is Mentzel’s message.

Should scientists spend more time thinking about ‘the human dimension’?

“What do I think about science...?” He frowns. “Scientists are focussed on a^2, b^2, c^2. They work out that men can go to the moon and they send them there. The calculations are correct, after all. However [laughing] they’re also overjoyed when the astronauts return alive. Indeed, you may well have worked everything out, but something can always come along to spoil the fun. You’re only a person of a certain measure. You must always take the unexpected into account.”

How do people react when something unexpected happens, something beyond their control?

“Take that accident with the nuclear power station in Japan. Nuclear power stations cannot simply explode, but they do anyway. That accident produced something intangible, something in the air that you can’t do anything about. I then ask myself: What does a person do in the face of approaching radiation? And then I use photography to show this, and that can be in a very representational or abstract way. So these classes will not be lessons in portrait photography. I use photography to compel students to investigate something.”

What kind of camera do you have with you now?

“A nice Canon. I don’t know which one… hold on a minute.” He takes out his camera, an EOS5D with wide-angle lens.

“I’m not really that technical. Not at all in fact: I don’t know anything about it. It doesn’t interest me. I did enjoy the work in the darkroom, although I’m no expert. I was fortunate to meet a really good image processor, and now he does that work for me. He is someone who speaks my language and identifies with my feelings.”

What is your language?

“I like to bend the image to my will, for example by allowing the light to burn through in some places. But apart from that my photographs are without fuss. When I photographed for the newspaper, I had to inform the readers, although of course you still try to be distinctive in this.”

You don’t regard yourself as an artist, but your work does hang in museums. Where is the dividing line between photojournalism and art?

“Take for instance the work of the New York street photographer Weegee. Shortly after he died his work was shown in the MoMA. Weegee took superb ‘straight from the shoulder’ shots of policemen, prostitutes or people with bullets through their heads. The man really had his own signature style.”

But you also have your own signature style?

“Yes, but sometimes I have difficulty recognising my own signature. Pieter Broertjes [former editor-in-chief of de Volkskrant newspaper, ed.] came to visit me once. My house is a huge mess. Broertjes said, ‘Yes, an artist lives here’. But that’s not how I regard myself. I do like being with artists. I loved being with the Cobra painter, Eugene Brandts, sitting there among all those pots of paint. I also like to get paint on my hands. I’d much prefer to paint or draw the things I photograph…but I can’t. Painting or sculpting with chisel or clay gives the ultimate feeling of freedom. I find photography...I won’t say too easy...but I really wish it had another dimension, something more than just that flatness.”

How do you go about doing your work?

“Every photograph involves a huge amount of tension. It starts as soon as the phone rings. The newspaper and its readers have certain expectations and this gives me a knot in my stomach. Then I have to get going, and all kinds of trivial worries come up: Will I get there in time? Will I be able to park my car somewhere? And then it really starts. You arrive at the location and are restricted by all kinds of rules. There are the PR people, and the security guards pushing the press away.”

As an example he refers back to the photo of Beatrix during the centenary celebrations for the Dutch Penal Code. “Imagine that situation. I’m surrounded by people, with only a split second to decide what to do. Push through all the spokesmen and security guards and kneel at the Queen’s feet, or exploit the entire situation? I chose the latter option.”

And when you take portraits?

“If I go to someone’s home and they are very kind, I get really nervous. Such people are often full of expectations and they’ve practiced posing in front of the mirror. So I try to knock them off balance, get them to relax a little. I’ll chat with them a bit, ‘Nice

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'You must **always** *take*
the unexpected *into account'*

painting you have there, and what lovely books'. People must surrender to you. They often ask how long I will need to take the photo. Well, taking the photo itself only takes a minute, but the prelude lasts much longer."

He laughs. "I once told Beatrix that she would first have to put me at ease, by pouring me a cup of tea. And sometimes you just get lucky. That happened to me when I made a portrait of Joseph Luns when he stepped down as Minister of Foreign Affairs in 1971." Mentzel puts on a pompous voice: "'Where should I stand?' Luns asked. And right at that moment a woman walked by. Luns raised his hat and I pressed the shutter. It's a clumsy image, but it's exactly right, given that it is his farewell photograph."

You take lots of photos of politicians.

"Yes, and I also get along well with many politicians. I have a particularly good friendship with Ruud Lubbers, but that wasn't always appreciated. One time we were chatting in the Binnenhof when one of my colleagues shouted: "Hey Mentzel, piss off for once!" [This happened in 1982. Lubbers was the newly elected Prime Minister and had just made his maiden speech. He was walking back to his office with his papers. It was the shot all the photojournalists wanted, but then without Mentzel in the frame - ed.] And those friendships also weren't right. You must critically follow people." [As a result of this incident, Mentzel took fewer photographs of politicians - ed.]

Here in the Kunsthal there is also an exhibition of photos made with the iPhone, including one taken by you. Do you like taking photos with your mobile phone?

"I've already taken three photos for the NRC Handelsblad newspaper with my iPhone. And during the Painters Week event in Domburg, I took photos with it. The organisers had asked me how I was going to work. 'With the iPhone,' I said. That left them speechless for a minute. I use the Hipstamatic app a lot. The program looks like a camera, and you can put a black & white or colour film in. It really fools you. It's great! And you can put in films from the 1920s or the 1970s. It's a real laugh. I think these technical developments are fantastic."

Did it take you a while to get used to these technical advances?

"I used to go around with a big case so I could send in photos using a fax modem, with all the beeping and pulsing. That all changed around 18 years ago when I got a Mac from the newspaper. I was told I must use it, but I held off for a year. Can't I just send normal prints, I'd ask."

You like to take photographs with the iPhone, yet you still have your SLR with you. So you go around with two cameras?

"Yes. During the transition from film to digital, I always went round with two cameras as well. I didn't yet trust digital photography. At that time I always took photos with film first, and then digital. And a good thing too, because when I look back at those jpegs, they're actually worthless now, 10 or 12 years later."

What is the advantage of the smartphone?

"People hardly notice it, and that's great. I also experienced the same thing before, when I would take photos with a little Leica. You're not walking around looking like some Japanese tourist or somebody from the press. People don't push you away, but you do still need to photograph from close by, although some nut has made a long lens you can attach to your iPhone. And then the phone rings, and you're standing there with this enormous thing pressed to your ear. But the technical developments keep coming really fast. A colleague of mine at The New York Times went out on patrol with the military in Afghanistan. The soldiers were all photographing each other with their smartphones, so he started doing that as well. A whole new way of working has emerged, a different relationship of trust."

Are you happy to have retired?

"It's terrible. I had to go when I reached 65, as that was when all the pension funds started paying out. It's enough to drive you mad." (TvD)

Cultural professor

The tradition of the guest author has been revamped, its scope broadened to include other artistic disciplines. From now on the guest artist will spend two months as 'cultural professor' at TU Delft. In addition to writers, visual artists, composers, film makers and photographers will also be invited to serve as cultural professors. Vincent Mentzel is the first cultural professor. He will start work at TU Delft on 23 September with a public lecture, entitled 'Cultural Promotion'. In the subsequent period, he will host a series of seven meetings exclusively for students. Mentzel will end his cultural professorship on 25 November with a public lecture.

Who is Vincent Mentzel?

Vincent Mentzel (b. 1945) has been active as a photojournalist for more than 40 years. Mentzel studied at the Rotterdam Academy for the Visual Arts from 1963 to 1967, but left the academy in 1967 without taking a degree, following a dispute with the director. In the same year he met the Amsterdam theatrical photographer, Maria Austria, and went to work as her darkroom assistant. It was from her that he learned the photographer's trade. In 1970, Mentzel joined the NRC Handelsblad newspaper as a staff photographer. During the 1970s he took many photographs of politicians around The Hague. In 1973 his photo of Prime Minister Den Uyl received an award from World Press Photo as 'Best Netherlands Press Photograph'. Mentzel also became renowned for his foreign reporting, in particular his work in China, Japan and Tibet. Mentzel's photographs were used for the image of Queen Beatrix on the Netherlands' stamps and coinage. He has made official portraits of the Queen on four occasions.

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Column

The Regulars

Diederik Samsom studied Applied Sciences at TU Delft and since 2003 has been a PvdA (Labour Party) Member of the Dutch House of Representatives. www.twitter.com/diederiksamsom

Once at a party in Delft I met a PhD student who, glowing with pride, told me "there are only five people in the world who can understand my thesis". He may have been exaggerating a bit, but the message was clear: the obscurity of an academic publication is a measure of its quality. The incident is a little sad, but unfortunately it's also rather typical.
For my own final thesis presentation, I was bold enough to invite the staff and regulars of Café Locus Publicus, where I worked at the time. I interspersed my lecture - on the measurement of background radiation - with a PowerPoint presentation featuring various photographs and graphics, and told the audience something about the consequences of radiation for people and animals, separately from my research. That earned me a reprimand from the professor: "You made your lecture far too popular". He'd rather have seen me scrawling incomprehensible formulae about effective dose equivalents on the blackboard while mumbling about time-dependent neutron flux equations. In those days - and we're talking 1995 - students were not taught about effective technical communication, or any kind of technical communication for that matter.

Photo: Sam Rentmeester/FMAX

I'm aware that much has improved since then, but there is still plenty of room for more improvement. I meet them still as a Member of Parliament, in halls where the local residents are herded together to be informed about some new development (gas extraction, CO^2 storage, wind turbines, etc): the nervous, sweating technician who manages to infuriate the audience with his complicated sheets of figures. "Yes," sighs the scientist in reply to the first suspicious question, "it is all terribly complicated, but the experts all agree that it's harmless." "I see", thinks the resident, "so it's all terribly dangerous, and that's why he isn't telling us how it really is." And this is how essential democratic consultation turns into unnecessary suspicion.
Yes, technology can be very complex. You try explaining the effects of radiation on humans. Or the complex mechanisms underlying climate change. Or the benefits and risks of nanotechnology. But it really must be done, no question. Because our future depends on it. Stagnating productivity, an aging population, food scarcity, climate change and shortages of raw materials: these issues place extraordinary demands on our technical ingenuity, but also on our ability to give new techniques their proper place in our lives. And in an increasingly articulate society, it is less and less obvious what that place should be. This isn't a bad thing: these complex new technologies, with their advantages and disadvantages, need careful consideration. But it does mean that the people responsible for the technology must be capable of clearly presenting the pros and cons to the public. Because one thing is certain: the new discovery that "only five people in the world understand" isn't going to get very far.

Under construction

Photo: Sam Rentmeester/FMAX

On 22 September 1911 the *Afdeeling Werktuigbouwkunde en Scheepsbouw* (Department of Mechanical Engineering and Naval Architecture) took up residence in a new building at Nieuwe Laan 76. Today it's a listed building which houses appartments.

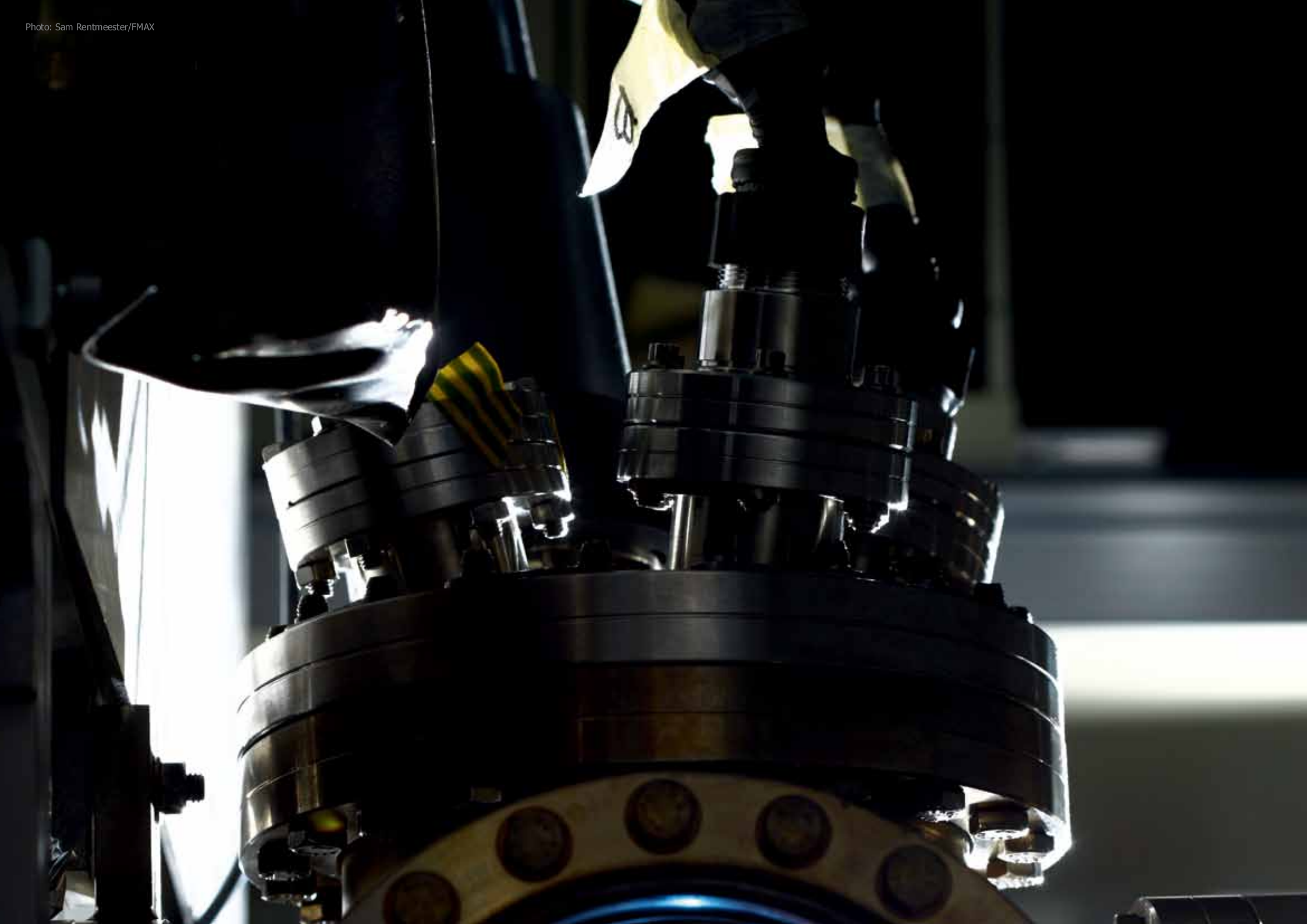
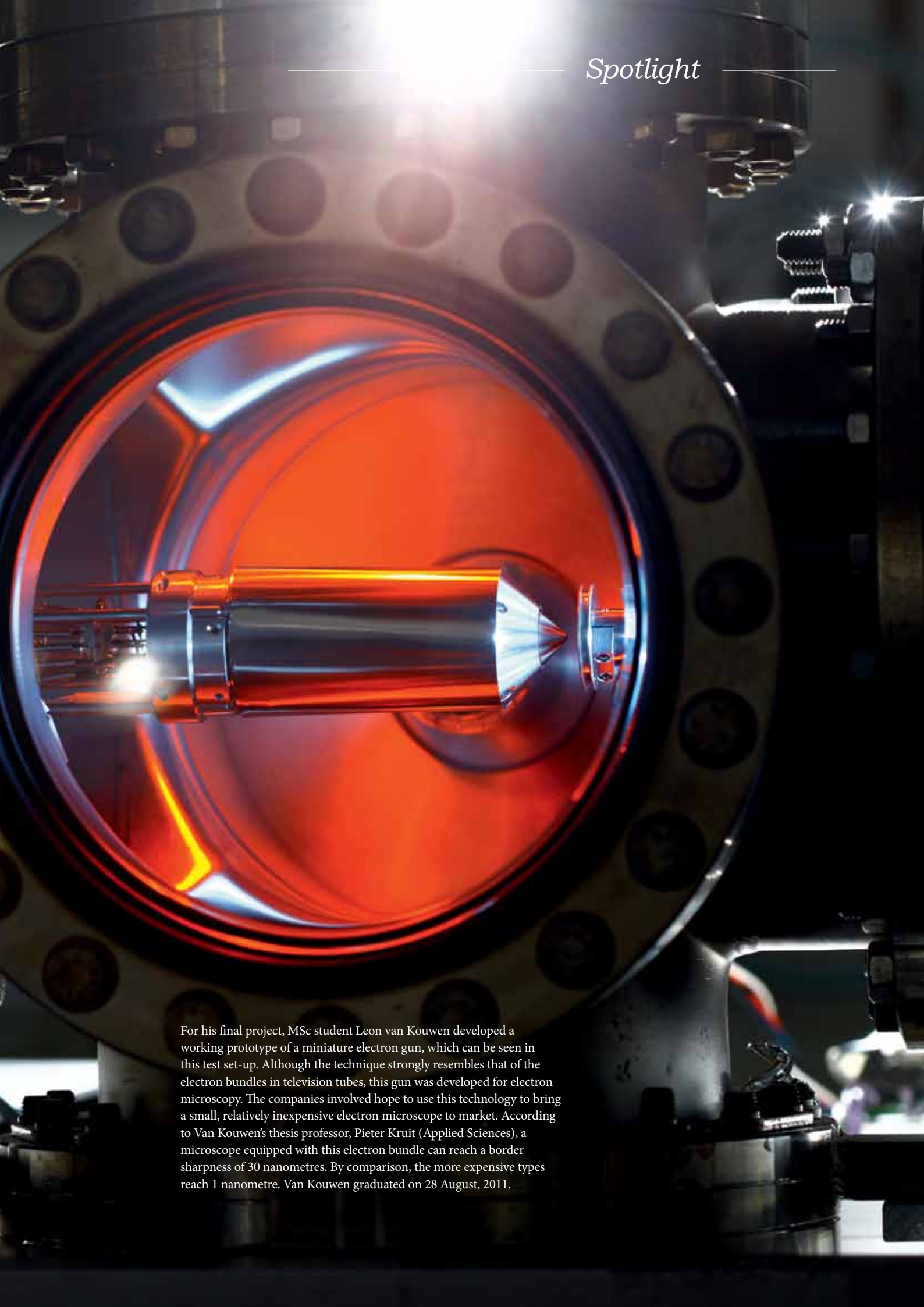


Photo: Sam Rentmeester/FMAX



For his final project, MSc student Leon van Kouwen developed a working prototype of a miniature electron gun, which can be seen in this test set-up. Although the technique strongly resembles that of the electron bundles in television tubes, this gun was developed for electron microscopy. The companies involved hope to use this technology to bring a small, relatively inexpensive electron microscope to market. According to Van Kouwen's thesis professor, Pieter Kruit (Applied Sciences), a microscope equipped with this electron bundle can reach a border sharpness of 30 nanometres. By comparison, the more expensive types reach 1 nanometre. Van Kouwen graduated on 28 August, 2011.

Graduate school: *don't be too patronising*

Graduate school is coming. Better supervision and instruction must ensure that fewer PhD students drop out and that they obtain their doctorates within four years. Professors are extremely sceptical about the curtailment of their authority.

One in four PhD students at TU Delft drop out and many take longer than four years to complete their doctorates. In a 2005 survey conducted by the Delft post-graduate association, Promood, candidates stated that the most significant reasons for their delays were lack of supervision and unclear definitions of their PhD projects.
The survey revealed that problems arise primarily in the final stages of research, and particularly among non-European candidates. Candidates also have difficulty making a timely start on publication, or the students have already moved on to work elsewhere before completing their dissertations.
These problem areas however are not the only motivation for TU Delft to establish a graduate school. There is also a lack of reliable management information about PhD candidates. The university also feels that the position of TU Delft as a post-graduate institution can be improved, regarding both Master's students and the business community.

The TU Delft Graduate School

The TU Delft Graduate School will comprise eight faculty graduate schools (one per faculty), each with its own graduate programmes and subject-specific doctoral instruction. PhD students will be allocated a mentor, will form a peer network, and their degree certificates will state that they have passed through the graduate school. PhD supervisors will also be assisted in their recruitment and selection activities.

Each graduate school will be supported by a faculty graduate office, where a member of staff records the progress of each candidate throughout their degree, as well as recording their PhD agreements and 'Go/No-go' moments. The graduate office also provides information about teaching programmes and support in progress interviews, while maintaining a website about the faculty's graduate school and conducting exit interviews with all departing PhD students. In addition, there will be a coordinating University Graduate Office, which will handle the central intake of candidates (on 1 September), record PhD students' progress, coordinate any general training courses that are common to each faculty, design a website, and provide information about the

Photos: Hans Stakelbeek/FMAX

PhD office at the faculty of Mechanical, Maritime and Materials Engineering (3mE).

A PhD supervisor must retain ultimate responsibility at all times.

graduate school. The University Graduate Office will also provide a careers advisor and a psychologist for PhD candidates.
The implementation of the credits system seems clear: 15 credits for courses covering general skills, such as presentation, setting up research projects and job applications, and an additional 15 credits for subject-specific trainings in the form of lectures and workshops relating to the students' research fields.
Lastly, certain practical skills will be acquired, such as supporting undergraduates, making conference presentations and securing research project funding. These also earn 15 credits. This will be 'on the job' training.

These requirements will apply to new PhD students from September onwards, but existing PhD students will also be able to take modules that are given in the third or fourth years.
Lucas van Vliet, a professor of Image Analysis and member of the Applied Sciences Management Team, believes that the graduate school could be a great addition, but he also says it is "old wine in new wineskins", adding that "twenty years ago we set up modules for PhD students in two research groups in different faculties which were then adopted and expanded by the national Advanced School for Computing and Imaging research school."

According to Prof. Van Vliet, the Foundation for Fundamental Materials Research and the faculty of Technology, Policy and Management (TPM) already offer course content dealing with skills like presentation and communication. Project manager Stella van der Meulen agrees, although she points out that half of the PhD students at TU Delft are not associated with a research school.
"I have also heard that not all modules are comparable," she says. "And TU Delft is striving to achieve a uniform quality level."
According to Van der Meulen, most of the subject-specific 15 points will be taken in the research schools. "The Graduate School's generic 15 points may be taken for example in TPM, the Human Resources department, the FOCUS Centre of Expertise in Education, or externally."
In practice this will be no more than six months' training. "There is a menu of options, in which the PhD supervisor and preferably also the day-to-day supervisor consult with the candidate to identify possible courses. These could be four general courses and three subject-specific options."
The university wants to make the existing introductory course mandatory. This three-day course sets out what a PhD at TU Delft entails, and what students can expect from their PhD supervisor and from the institution. TU Delft also wants a mandatory careers orientation workshop or training course. A faculty or head of a research project will manage a teaching budget of €7,500 for each PhD candidate.

www.graduateschool.tudelft.nl <<

'Eliminating bad practices'

The PhD student association Promood has been involved in the preparations for the graduate school and is pleased with the new initiative. "It is a means to achieve uniformity among PhD courses," says Theo van Ruiven, himself a PhD student at TPM. "It's all about eliminating bad practices."
The graduate school will also strengthen the position of the PhD students, since it will be made clear what entitlements they can expect and what is expected of PhD supervisors. This may make it easier for PhD students to approach their PhD supervisors if something is wrong.
At present PhD students are often afraid to do this, particularly those from non-European countries. "It's a fragile relationship," says Van Ruiven. "After all, the PhD supervisor is the one who is going to assess you."
Van Ruiven doesn't believe the new requirements depart much from current practice, at least not if that is good practice: "Because you're already teaching, already going to conferences, and you can already go to summer school."
In his view, the faculties will be introducing minimum requirements, and there is also space for subjects tailored to the individual. All in all, little will change if the PhD course is good to start with. Van Ruiven: "The changes will be mainly administrative: everything will be better recorded."

Scepticism

Professor Barend Thijsse has sounded out his colleagues and reports serious scepticism among the professors about possible erosions of their autonomy. Late last year the professor of Materials Science was asked to take part in discussions about the graduate school credits system. According to Prof. Thijsse, many professors now feel that they are more managers than researchers: "They feel that they can no longer make decisions about funding they have brought in themselves, and that they're working for a boss." He says this is difficult for the professors to swallow.
"And now the graduate school is going to tell them how to deal with their PhD students?" Project manager Stella van der Meulen observes that professors must also account for how they work.
"They seem to see that as a raw deal," she says, "but accounting for yourself on a regular basis is pretty normal, after all."
Prof. van Vliet points out that a PhD supervisor must retain ultimate responsibility at all times. "Don't be too patronising," he says. "At the end of the day you need to deliver researchers who can operate independently."
Van der Meulen agrees with that: "We certainly don't want to patronise, we want to offer support. If PhD supervisors deal well with their PhD students then they shouldn't notice the graduate school much at all. But if a PhD supervisor only speaks to their student once a year, then we'll certainly intervene, as once a year isn't enough." (SB, CvU, JW)

Life after Delft

Solution oriented

"It actually started long before I graduated," says Rik Grashoff, reflecting on the way he initially got into politics. At secondary school he was already on the student council. Later, while studying at TU Delft, he served on the committee of the student union VSSD for a year, and was a member of the faculty council of Civil Engineering and one of the founders of the national student union, the LSVb.

Photo: Sam Rentmeester/FMAX

Following his varied, politically active days as a student, Grashoff received his degree in Civil Engineering and began gaining experience as a structural engineering consultant. In the early 1990s, he joined the recently established political party, Groenlinks (GreenLeft), and was asked to sit on Delft City Council and, later, the Rotterdam City Council too. "An opportunity like that only comes along once, so you need to grab it with both hands," he says

Grashoff is a great proponent of solution-oriented thinking: "Politics is about participation, but it's also about the end result. I like playing the game, but I do it to achieve something. I want to achieve concrete results." In Delft, Grashoff served as an alderman for eight years, holding portfolios in spatial planning, traffic and transport, the environment and inner city policy. "That role allowed me to build on my background," he says. "I was able to combine my knowledge of administrative processes with my professional expertise."

In Rotterdam he took on the Participation and Culture portfolio. "That really took some getting used to, but luckily I had my administrative experience to fall back on," Grashoff explains, adding that his technical background proved unexpectedly useful in this role. "Cultural affairs often concern buildings, money and organisation. So my technical expertise proved useful after all."

Grashoff is now a member of the opposition in the Dutch House of Representatives. And that, he says, also took some getting used to: "As part of the local authority I could decide and steer a lot of things myself." As a Member of Parliament, Grashoff sees his self-confessed "obstinate independence of mind" as quite a Delft-like trait: "I try to avoid getting too caught up in the issues of the day. If I see something noteworthy on TV, I don't immediately start asking questions about it in the House." He prefers to make an effort to understand the issues. "I only get involved when I am 100% committed," he says. "Take my question in the House about antibiotic-resistant bacteria: I'm aware that this has been an issue for years. You can work out for yourself that something isn't right there."

Grashoff's responsibilities include membership of the Parliamentary Commission of Enquiry into the Financial System, which was set up to look into the crisis measures taken by government during the financial crisis of 2008/2009. The Commission's final report is due in December. As for the future, Grashoff prefers to leave the question open. "Chance certainly plays a part in the development of a career," he concludes. (MvdM)

The view

Deep sea mining

Brilliant lights pierce the darkness of the deep sea. Sunlight no longer penetrates at depths of three to four kilometres. Robots, ponderous as tanks, heave themselves along the sandy sea floor, extending excavator arms towards the lumpy deposits, their cutting heads rotating to grind the stone that the machine then sucks up with a hose.

Back on the surface, operators sit in the control room of a floating production platform. Clad in harness-like outfits and sitting in subdued light, they control the deep-sea robots. Nearby the ore, stones and mud from kilometres deep arrives on board, splattering violently onto gratings where the ore is separated from sand and stones. The ore is then loaded onto shuttle ships for transport to the docks - sometimes hundreds of kilometres away. The sand and stone meanwhile is returned to the sea floor through a long pipe.

According to 'professor of dredging', Professor Cees van Rhee (3mE and CEG), we may well obtain half of our copper and nickel from the ocean floor in this way by 2030. Demand for these metals is rising, as yields from conventional mining continue to fall. Consequently, the mining industry will follow the oil and gas industries in turning to the sea. "In any case, there's so much sea on our planet that it's only logical that most of the resources are there, too," Prof. Van Rhee observes laconically.

He expects to see mineral extraction concentrated in places where the tectonic plates are moving apart. At these sites, where hot water rises from below, chimney-like deposits rich in minerals build up on the sea floor.

According to Prof. Van Rhee, the Netherlands is ideally qualified to develop the tools for these deep sea mining operations, which involve a combination of dredging, offshore and submersible technologies. All three are areas in which the Netherlands has leading companies, including IHC Merwede, Heerema, Gusto, Seatools and Fugro. Prof. Van Rhee envisages these companies carrying out exploration work and supplying specialised equipment for major mining concerns (which the Netherlands does not have).

The dredging industry also needs to innovate. The dredger builders can already feel the hot breath of their Chinese counterparts breathing down their necks. Prof. Van Rhee expects the competition for the relatively simple dredging operations to become fiercer. Innovation will be essential to stay ahead of the competition. And, he says, Dutch industry must also be on the lookout for fresh challenges, of which offshore mining is a prime example. (JW)

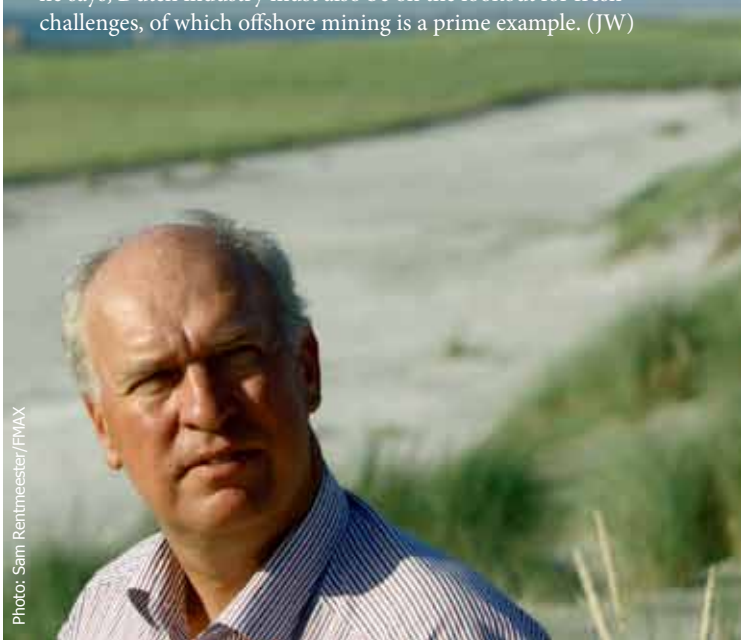


Photo: Sam Rentmeester/FMAX

Clean air

Earlier this year Virus Free Air stood at number 99 in the MKB Innovation Top 100. The aim of Managing Director Eliane Khoury is as clear as it is ambitious: to be the market leader.

Photo: Sam Rentmeester/FMAX

"I always say: if God closes a door, he opens a window". Eliane Khoury's tips for starting entrepreneurs all have their roots in a positive attitude to life. "If you have passion and a good idea: go for it. You just have to take the plunge. And don't take no for an answer."

Khoury has heard "no" plenty of times herself. The Israeli took a Master's degree in biochemical technology at TU Delft, specialising in ionic wind. She found it a fascinating subject and, having a practical turn of mind, began to search for an application.

She knew she had found it after watching a TV documentary about a hospital in Nijmegen that had been closed down following a series of infections: "I thought, 'I'm going to purify the air using charged particles'. Applications exploiting ionisation were already on the market, but our method was different. The particles we use are not drawn to 'earth', but are caught within the purification system instead."

Her supervisor advised her to draft a proposal for a dissertation on the subject, but she wasn't keen on doing a PhD. The next suggestion was to draft a proposal for TNO, the independent research organisation. But that prospect didn't satisfy her either, as she much preferred the idea of setting up a business of her own. Having tested her Virus Free Air idea using electrodes, sewing needles and an empty Coke bottle, she then approached TU Delft, which, at the time, decided not to get involved with her patent application.

Undeterred, in 2007 Khoury launched Virus Free Air on her own. In 2008 she took a seven-month break due to personal reasons, but by March 2009 she had set up her own company, and seven months later was in a position to hire her first employees. Today her company employs eight people.

Now that testing on the first product, the Aspra, is complete, and Khoury is confident enough to make a number of health claims, the time has come for her to deploy two full-time sales agents to promote the product. Meanwhile, Virus Free Air's research and development department is working on the second of Khoury's inventions, the Corona Air, which will feature an even more advanced air filtration system.

Khoury works 16 hours a day, seven days a week, to achieve her goal of becoming the market leader. Her record as a businesswoman certainly inspires confidence. In the late 1990s she started importing cheap Indian contact lenses to Israel. When her father's building company ran into difficulties in 2000, she advised him to take on renovation work, as a supplement to new-build projects. He wasn't keen on the idea himself, however, so Khoury decided to set herself up in that business instead. The outcome: the renovation of an entire street in the old centre of Haifa.

Khoury is a little disappointed with the way business is done in the Netherlands. "This is supposed to be a trading nation, but everything moves so slowly. It takes ages to get an appointment to speak to someone, and then there are all the endless meetings. Everything goes so much faster in Israel, although of course that isn't necessarily better." (SB)

www.vfatechnology.com

Spending money

The Dutch minister of Econonmic Affairs and Innovation, Maxime Verhagen, has presented the outline of his new research funding for top economic sectors. Most professors reacted positively.

The Dutch newspaper NRC Handelsblad explained that according to Verhagen's proposal, investments in research will be made tax-deductible for businesses, with a yearly national maximum of 500 million euros. Secondly, an equal sum will be reserved as an innovation credit fund. Credits are to be repaid with returns on investment. No cure, no pay.

"Selecting top sectors assumes a rationality in choices that doesn't exist," says Professor Alfred Kleinknecht (TPM). "How can 'The Hague' know which sectors will be the fastest horses? They don't. Instead, they chose to support the established industry. Outsiders and basement innovators get passed by."

Verhagens ten 'top sectors' cover most of the Netherlands' major industries, including energy, water, chemistry and infrastructure. Not surprising then those professors from these sectors reacted positively to Verhagen's proposal. "It's a good thing that water-related research continues to be supported," says drinking water expert, Professor Hans van Dijk (CEG). "Water has righteously been a vanguard for years because of the Dutch reputation and knowledge in this area."

Harbour specialist, Professor Tiedo Vellinga (CEG), thinks that making research investments tax-deductible will make it easier for industry and commerce to invest in research. But, he says, researchers must take the initiative and approach business partners. Electrical power expert, Professor Lou van der Sluis, is also positive about the proposal, but he points out that at the same time smaller research funds from Agency NL have been terminated. Prof. Kleinknecht: "Fiscal deduction for R&D spending is in principle a good choice. No economist would counter that."

The other measure, the 500 million credit facility, is a good idea as well, Prof. Kleinknecht believes, reminding him of a technical development credit implemented in 1953, "which functioned very well for a long time until some moron discarded it some 15-20 years ago."

According to Prof. Vellinga, the TU can benefit from the credit facility as long as it is actively setting up projects with trade and industry. "Working with industry is getting more and more important," adds Prof. Van Dijk. "We've been doing that for years." Prof. Kleinknecht does however see a counter-plea: "The existing tendency toward applied research at the expense of fundamental research is getting stronger. In the short term the returns will be more, but less in the long term." He also signals the danger that the TU will hire itself out as a consultancy bureau, "making itself obsolete in the long run."

Rector Magnificus, Professor Karel Luyben, says the university should "keep its back straight" and not do small jobs for industry. But he admits that his personal views have not (yet) been translated into an ethical code. He also admits it will be hard for cash-strapped sections to refuse money from industry. Rector Luyben knows that some sections can hardly pay their staff since contract funding has declined. "Our aim is not to make money," Luyben says suddenly, "but to spend it. Of course we should do so wisely, accountably and with results. But spending is what we're here for." (JW)

‘Doing more with less’

“Major global issues like sustainability and poverty reduction require radical innovations,” asserts Professor Prabhu Kandachar (Industrial Design Engineering). Emerging countries with high poverty rates are becoming centres of innovation. “It is the very limitations in these countries that lead to interesting innovations.”

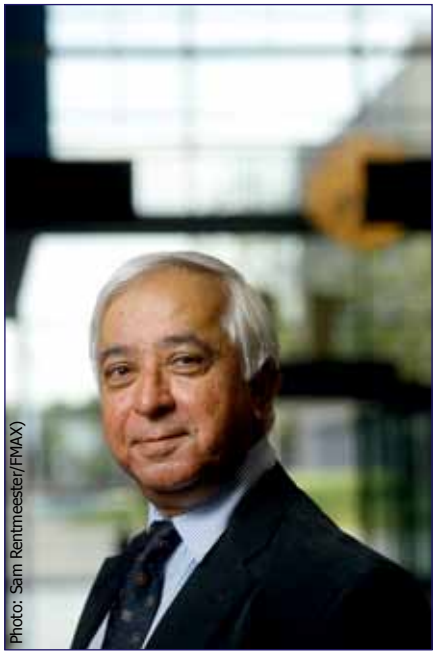


Photo: Sam Rentmeester/FMAX)

Professor Prabhu Kandachar: “It requires a different approach, but there are plenty of opportunities for doing socially responsible business in emerging markets”

Whereas the West was previously the primary source of innovation, the past few decades have seen a shift towards emerging countries like Brazil, India and China. Globalisation, robust economic growth, and large-scale investments in education, science and technology have been cultivating the soil for innovation in these countries, albeit in a completely different environment from that of the affluent West.

Over 3 billion people currently live on less than two euros a day. Many live in developing countries, struggling against all kinds of limitations, including poor infrastructure, inefficient material resources and a shortage of professionals. At the same time, the rising middle class is generating an increasing shortage of energy, materials and food.

Professor Kandachar: “Sustainability and poverty reduction are two complex issues. Focusing on innovations that ‘do more with less’ offers hope. It is the very limitations in these emerging countries that lead to interesting innovations. Examples include innovations driven by Western companies but developed in emerging countries, strategies in which innovative ideas first become successful in emerging countries and are then deployed throughout the rest of the world and innovations arising within the countries themselves.”

‘It is the very limitations in emerging countries that lead to interesting innovations’

‘Inclusive’ innovations

In the 1970s, Prof. Kandachar became interested in the social aspect of sustainability, particularly with regard to “inclusive” innovations. “Inclusive innovations exclude no one,” he says. “They are not focused solely on the average person, but on everyone.”

He later explained the relationship between millennium development goals and the design profession, coupling expertise and experience in Industrial Design (IDE) with the 80% share of the world population that is less fortunate – the “base of the pyramid”.

Prof. Kandachar: “This is a large market for other, affordable products tailored to local needs.” This approach resulted in more than 100 projects in which the social aspects were considered as well as the technical ones.

Prof. Kandachar pays particular attention to healthcare, as it is intertwined with many other global issues. As an example, he mentions a project in India, in which an IDE student supported the further development of a new type of prosthetic leg: “It costs only $ 25 and is ready for the customer in half a day. This is astonishing: in the West, it would cost thousands of dollars and you’d have to wait several months for it.” According to the professor, limitation is an advantage in this context. “In poor countries people must survive with limited resources. They are very innovative, but in a different way than we are accustomed to. This offers opportunities for business. Scaling up these local innovations requires cooperation with Western businesses. For example, Danone is doing this with a yoghurt factory in Bangladesh. It requires a different approach, but there are plenty of opportunities for doing socially responsible business in emerging markets.”

The IDE student is now investigating possibilities for bringing the prosthetic-leg innovation to Mexico. (PW)

Who is Prabhu Kandachar

Prabhu Kandachar is a professor of Industrial Design Engineering at TU Delft. He focuses on product development using sustainable materials and manufacturing technology. He received his Master of Engineering degree and PhD from the Indian Institute of Science in Bangalore, India. His career in the Netherlands began in 1975, in the department of Materials Science at TU Delft. His work there included developing environmentally friendly technologies for processing aluminium. From 1980 to 1995, he worked in various technical and management positions at Fokker, emphasising product development and sustainability. From 1995, he has worked at the TU Delft’s faculty of Industrial Design Engineering. Prof. Kandachar will speak about his research at the Alumni Symposium.

‘Dig deeper for fundamental insights’

“Technology is the only way to solve world problems in the fields of sustainability, energy and raw materials”, says KNAW president Robbert Dijkgraaf. “TU Delft is in a position to provide an important contribution.”

Robbert Dijkgraaf, president of Royal Netherlands Academy of Arts and Sciences (KNAW) is amazed that the scientific world is still failing to dedicate all its efforts to researching how we can treat the earth responsibly. “We are happy to do everything we can to develop weapons or to put people on the moon. But we fail to apply the same urgency to search for fundamental solutions for world problems regarding energy, food, water and the climate. Here, I am not talking about short-term solutions. We need to be prepared for the long haul and really invest in fundamental research. ‘Therefore, we must dig deeper for fundamental insights. This is a responsibility that institutes such as TU Delft must not run away from.”

According to Dijkgraaf, Dutch science is still doing very well. “Worldwide, we account for about three percent of the total scientific impact. That is a significant percentage and this gives us a great responsibility. A country such as China invests vast amounts of money to find solutions for problems that affect the world. The West and the Netherlands can do more.” According to Dijkgraaf, 2012 will be a special year, because it will then be twenty years since the UN Conference on Environment and Development was held in Rio de Janeiro. “Next year, we will look at how far we have come with answers to climactic, environmental and poverty issues and what science has done to help.”

Cross-fertilisation

Dijkgraaf is positive about how Minister Verhagen of Economic Affairs, Agriculture and Innovation is tackling innovation. The government has designated nine top sectors in which the Netherlands has a strong position in the world. To further expand this position, entrepreneurs have formulated an action agenda per sector, together with a representative from science and a top civil servant. The plans were presented to the Minister in June. “It is good that he let representatives from the business world, government and science formulate plans together first. During the presentations of the top teams, scientists from the different sectors clearly indicated that, besides research with practical and economic value, there must also be sufficient room for fundamental research. This demands a fine harmonisation from the government. Besides large-scale initiatives for innovations, it is important to maintain a long-term vision. We may not neglect creativity and good ideas. History has shown that these aspects are the feeding-ground for solutions.”

Dijkgraaf does not see the different viewpoints of business people, government and science as a confrontation, but rather as a cross-fertilisation. “If it is good, a chemical reaction will occur. Something must start to bubble, so that we can stimulate each other. Healthy science cannot thrive without the stimulus of government and business. We can only do our work if we have support from society.” (PW)

Photo: Henk Thomas

Robbert Dijkgraaf: “We may not neglect creativity and good ideas.”

‘Worldwide we account for about three percent of the total scientific impact’

Who is Robbert Dijkgraaf

Robbert Dijkgraaf studied physics and mathematics in Utrecht, interrupted his study for a year at the Gerrit Rietveld Academy and then devoted himself again fully to science. In 1989, he was awarded his PhD under Nobel Prize winner Gerard ’t Hooft. Since 1992, he has occupied the mathematical physics chair at the University of Amsterdam. He has been a university professor there from 2005. Since 2008, Dijkgraaf has been President of the Royal Netherlands Academy of Arts and Sciences. In addition, he is engaged in research in the fields of string theory, quantum gravity and the interface of mathematics and particle physics. In 2003, he was awarded the NWO Spinoza premium for this research, the highest scientific distinction in The Netherlands.

Programme on 7 October

Marina van Damme grant

The Marina van Damme grant is awarded annually, to a talented female graduate of the TU Delft whose parents are not academically educated. Dr Marina van Damme (1930) was one of the very few female students at TU Delft in the 1950s. Later on she became the first woman to obtain a doctorate from Twente University. With this grant in her name she wants to give young female engineers the opportunity to broaden their studies and/or gain an international perspective.

Research presentation: Where does the rain come from?

In the Netherlands we incline to say that it originates in the sea. However, recent research by TU Delft PhD student Ruud van der Ent brought new insights. Precipitation in the Netherlands indeed mainly comes from the sea, but the precipitation in China can be up to 80% dependent on land evaporation (from Europe and Asia). His model for example also shows that the Amazon rain forest is for over 50% responsible for the rainfall in Peru, Bolivia, Argentina, Uruguay, Paraguay and southern Brazil, where it feeds rivers and enables agriculture. In a similar way the rainforest in Congo is export tons of water to other West-African countries. For the paper 'Origin and fate of atmospheric moisture over continents' that he wrote together with co-authors prof.dr.ir. Huub Savenije, dr. Bettina Schaefli and dr. Susan Steele-Dunne he was proposed by the KNMI for the 2011 WMO (World Meteorological Organization) Research Award for Young Scientists and also won this award.

Research presentation: Emerging Markets & Inclusive Innovations

Primary challenges of 21st Century, Global Sustainability and Poverty, are complex fields. How to continue to provide a high quality of life for a predicted world population of nine billion, without exhausting the Earth's resources or irreparably damaging its natural systems? How is the global landscape of innovations responding to these world challenges? What is the role of Ethics? Touching briefly upon investigations based on Base-of-the-Pyramid strategy at Delft, this presentation explores this new frontier of inclusive & sustainable innovations. See also the interview on page 24.

Coach café

Are you on the lookout for new ideas for your future? Then why not visit the Coach Café? There you can get tips from and bounce ideas off of professionals and fellow alumni. This will give you a better insight into your own talents and the options open to you. You can use this to set out the course of your career, while working on your professional network at the same time.

Research presentation: Targeted molecular therapy

An understanding of how diseases develop down to the molecular level will enable drugs to be tailor-made with the result that therapies will become more effective. TU Delft is developing fast microscopic and spectroscopic technologies to study individual molecules and how they interact. We are using modern bioinformatics to develop algorithms that will give us an understanding of the contribution that molecules, cells and organs make to physical function – and sometimes dysfunction. Special target-seeking molecules are being developed that will enable radioactive substances to be targeted at tumours precisely, thus reducing or even completely avoiding damage to the surrounding tissue. Modern image processing technologies not only provide detailed pictures of organs and how they are functioning; by quantifying anatomical structures and function, they can also reveal aberrations.

Research presentation: Waste based biorefineries

There is a strong trend to develop a biobased economy. This economy is based on biomass, usually sugars derived from crops or lignocellulosic material. In such a society it is needed that all primary production is valorised, also the agro-residuals, food waste and other undefined organic (industrial) waste. Environmental biotechnological processes offer the potential of this waste valorisation. They are based on enrichment cultures and can deal with variable substrates.
The processes are based on microbial ecology and can produce products that play a role in microbial ecology. This makes it possible to work on large (bulk) scale and in a continuous process, leading to relative low costs. Currently we are working on several processes that could be used. One process is the microbial production of PHA a microbial storage polymer. We have developed a process employs a mixed microbial community that has better characteristics then the current process based on sugar as substrate and a genetically modified microorganism. This effective conversion of undefined organic substrates into an easy separateble, multifunctional product will be a cornerstone in the further development of the biobased economy.

Research presentation: Climate research

While a lot is known about the inner workings of the climate system, much remains to be studied to reduce the uncertainties in future predictions of climate change. Nonetheless, even given these limitations, we have to prepare ourselves for the effects of climate change. Is climate change a good driver of innovation? Asking the question, is answering it: yes. To increase our knowledge, we need new technologies. To cope with climate change, we need new technologies – and since climate change is global: the market is out there, waiting to be explored.

Alumni Symposium 2011

The alumni symposium on Friday 7 October will start off with a debate between leading political, business and academic figures. Everyone present will be welcome to join in the discussion, which will be about the need for and purpose of the Rutte cabinet's new innovation policy that involves the nine leading sectors designated by the cabinet.
After the debate, the guests will be treated to an extensive buffet and entertainment, and there will also be an opportunity to renew contacts with 'old friends' and to do some networking.
In the second part of the symposium, four leading academics from TU Delft will be presenting their innovative research; the presentations will be the subject of the discussions that follow. For you, this will be a chance to gain a deeper insight into a number of interesting and innovative research projects with which TU Delft is involved, as well as to get to know other people who share the same interests.
Participation in the Alumni Symposium 2011 is free of charge. You can register before 1 October at www.tudelft.nl/alumnisymposium2011

Location: Aula Congress Centre, Mekelweg 5, 2628 CC in Delft.

16.00 - 17.00	**Opening drinks**						
17.00		Opening by Executive Board					
17.15		Keynote speaker - science					
17.30		Keynote speaker - politics					
17.45		Keynote speaker - business					
18.00		Panel discussion hosted by Menno Bentveld					
18.45	**Dinner and information fair**	Presentation of Alumnus of the Year award					
19.45	**Network cafe**	Lecture: How do I set up my own business?	Presentation of Marina van Dammeprijs	Research presentation **Targeted molecular therapy** (Sasa Kenjeres and Bert Wolterbeek)	Research presentation **Climate research** (ao clouds) (Herman Russchenberg)	Research presentation **Base of the Pyramid** (Prahbu Kandachar)	Research presentation **Waste-based biorefineries** (Mark van Loosdrechts)
20.30		Lecture: How do I set up my own research project?	Coach cafe	Followed by table discussion	Followed by table discussion	Followed by table discussion	Followed by table discussion
22.00	**End of programme**						

Alumni Symposium: Focus on innovation

Archiprix International award goes to Simone Pizzagalli

Simone Pizzagalli, an alumnus of the faculty of Architecture, has won first prize in the prestigious Archiprix International 2011. Pizzagalli previously won the Dutch Archiprix for 2009. This latest award recognised his thesis project, 'Spaces, Poetics and Voids', a design for a prison in Shoreditch High Street in London. The Archiprix International 2011 was jointly organised with MIT in Cambridge (US). The Archiprix International organisation is a network of talented young architects from around the world. Every two years 1400 universities are invited to submit their best final thesis projects. The jury for the 2011 award assessed more than 300 projects from 70 countries, shortlisting 24 of these projects, before awarding prizes to eight eventual winners. selecteerde de jury 24 projecten, waaruit weer acht winnaars werden benoemd.

Friends

Alumni who want to support TU Delft students and academics and strengthen their professional and personal bond with the University, can become a 'Friend' of the University Fund. Objectives are the three Ts: Technology, Talent and TU Delft. Funds provided by Delft alumni have been used for a variety of purposes, including: promising research via Daden voor Delft (In Action for Delft), network activities such as the Alumni symposium and supporting talented students from the Talent Teams.

Further information: www.universiteitsfonds.tudelft.nl.

Photo: Sam Rentmeester/FMAX

The public transport terminals of the future

From 19 to 30 September, students from the faculty of Architecture will be organising an exhibition, titled 'Station Centraal', focusing on the ongoing metamorphosis of major transport terminals in Belgium and the Netherlands. Scale models, drawings and pictorial material will be on display in Architecture City's Oostserre. A symposium will also be held on 21 September, with the theme 'Station Architecture of Belgium and the Netherlands'. Speakers will include Koen van Velsen (Railway Architect), Jan Benthem (Benthem Crouwel Architects), Wim Gideonse (Major Station Project Manager with ProRail) and Paul Rutte (Director of NS Poort).

www.stationcentraal.eu and www.twitter.com/stationcentraal.

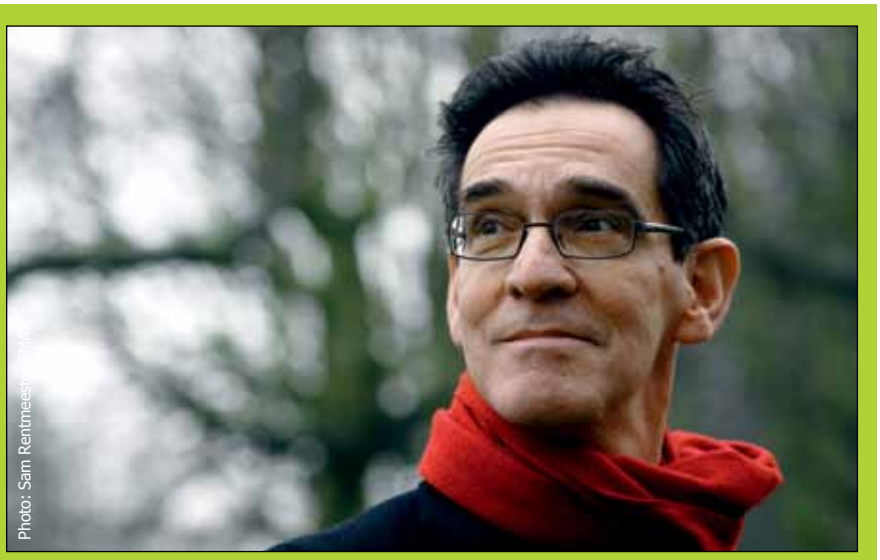


Photo: Sam Rentmeester/FMAX

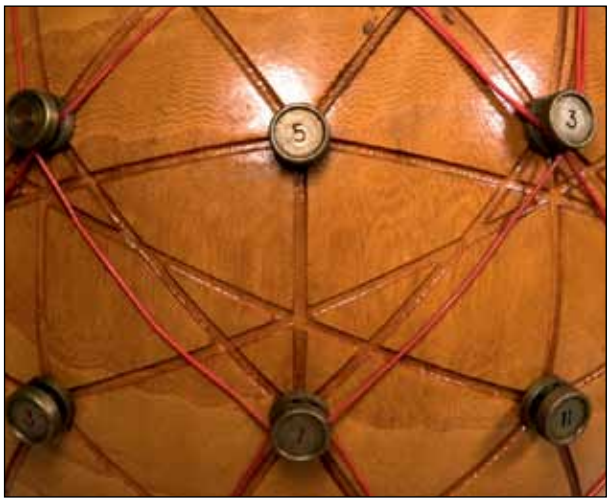
Harrie van den Akker wins Delft University Fund Masters' Prize

On Monday 5 September, Professor H.E.A. van den Akker was awarded the Delft University Fund Masters' Prize for 2011. He was awarded the prize in recognition of his outstanding teaching and research activities and his influence on undergraduate and PhD students. The prize consists of an award of €15,000, a silver medal and a certificate of appreciation from the Delft University Fund. Prof. Van den Akker was also awarded two-month sabbatical abroad. Four proposals were submitted for the award. A selection committee, consisting of professors from TU Delft and the chair of the University Fund, assessed the proposals under the chairmanship of Professor I.T. Young.

Wanted: Alumnus of the Year

Alumni who have been a source of inspiration for others or made a special contribution to technology, innovation, science and entrepreneurship, could become the Alumnus of the Year. The winner will be announced at the Alumni Symposium on 7 October. In addition to a special memento, the winner will be awarded two prizes: a cash prize of € 2,500 for personal use and €7,500 to be spent on a TU Delft research project of their choice. The jury comprises the committee of the Friends of the TU Delft University Fund, under the auspices of the Rector Magnificus. Do you know a suitable candidate for the award? Or perhaps you feel you qualify for the title of Alumnus of the Year? Submit your nomination via the website **www.universiteitsfonds.tudelft.nl** or **tudelft.nl/over-tu-delft/alumni.**

What's this?



A call to action: share your knowledge with the TU Delft Library. The TU Delft Heritage Collection includes many unusual objects, each with its own story and history, such as specially designed measuring equipment or demonstration models developed for teaching. But there are also portraits of famous professors, and collections of models and objects used to conduct scientific research. Little is known about some of these objects, including what they represent or what they were used for. The TU Delft Library regularly places items on its website about which it has insufficient information. You can join in by viewing these items and adding information. Perhaps you saw the item used in a lecture once, or you are a lover of technology and happen to know something about the object? The first of these UHOs – Unidentified Heritage Objects – about which the TU Delft Library would like information, is a brown sphere, which was probably used by R.M.M. Obermann in demonstrations during his electrical engineering lectures, some time between 1950 and 1980, and seemingly represents a model of a five-dimensional cube. You can see more photographs on the TU Delft Library blog, and send in responses. The actual object is available for inspection in the Library Learning Centre until the end of September. It will also be exhibitioned at the Alumni Symposium.

www.library.tudelft.nl/uho
tunews.weblog.tudelft.nl

Lecture by Lewin

Professor Emeritus Walter Lewin will visit TU Delft on 26 October to deliver a lecture entitled, 'Rainbows and Blue Skies'. Lewin was a professor at the Massachusetts Institute of Technology (MIT) for 43 years. Every year some two million visitors view his lectures on the internet. Bill Gates is among his many admirers. Prof. Lewin's lectures are much loved, as they are not only often humorous but can also be spectacular affairs, owing to his artistic approach and inventive demonstrations.

Aerospace Engineering, Room A, 26 October at 14.00.

You're not stuck in traffic, you are traffic

Is a kilometre charge a good idea? Are railway problems really due to leaves on the line? Will traffic control itself by 2050? And why do major projects run so incredibly over budget? A new book by TU Delft researchers, Hans van Lint and Vincent Marchau, should provide some answers. Entitled 'De file, dat ben je zelf' (You're not stuck in traffic, you are traffic, in English), the book surveys the entire field of traffic and transport. Sometimes with surprising results!

www.defiledatbenjezelf.nl

'We are all urbanists'

The Faculty of Architecture's Urbanism Week (26 - 30 September 2011) will see a coming together of the latest generation of Urbanists and the old hands. The programme includes lectures, workshops, company meetings and networking drinks receptions. Workshops on 'networking' and 'job application skills' will be given. Speakers include acknowledged experts on Urbanism, such as Adriaan Geuze (West8), Maarten Hajer (PBL), Tess Broekmans (Uhrhan), Alexander d'Hooghe (MIT) and Hubert Habid (Grontmij). Urbanism Week is intended for Urbanists with well-established careers who are keen to share their expertise with the latest batch of recruits. Members of Polis will pay €5 for a ticket, while the fee for other professionals is €120.
www.urbanismweek.nl

Propositions

The dominant role of the industrial sector in initiating research activities has transformed the industry into a puppeteer and scientists into their marionettes.
Amer Mahmood,
physics engineer

The lifetime of laptops given to PhD students is on average shorter than the duration of their PhD research contracts.
Ali Asadi Nikooyan,
biomedical engineer

Giving birth to thesis is harder than giving birth to a child, which , at least, has a due date.
Pei-Hui Lin,
engineer management & transport

When using a sufficiently high abstraction level when modelling, problems are hidden instead of solved.
R.W. Feenstra, engineer information & communication technology

The fact that everyone intuitively "understands" complexity makes conversations about this topic very difficult.
Marcel Schroijen,
aerospace engineer

A management report that raises questions is no good; a scientific publication that raises no questions is no good.
Dingeman Verwaart,
agricultural engineer

Proposition

When faced with a flood warning, residents of the Randstad should not head to their cars en masse; Instead they should jump on their bicycles to flee to higher ground.
Remy Schilperoort, civil engineer

Defense

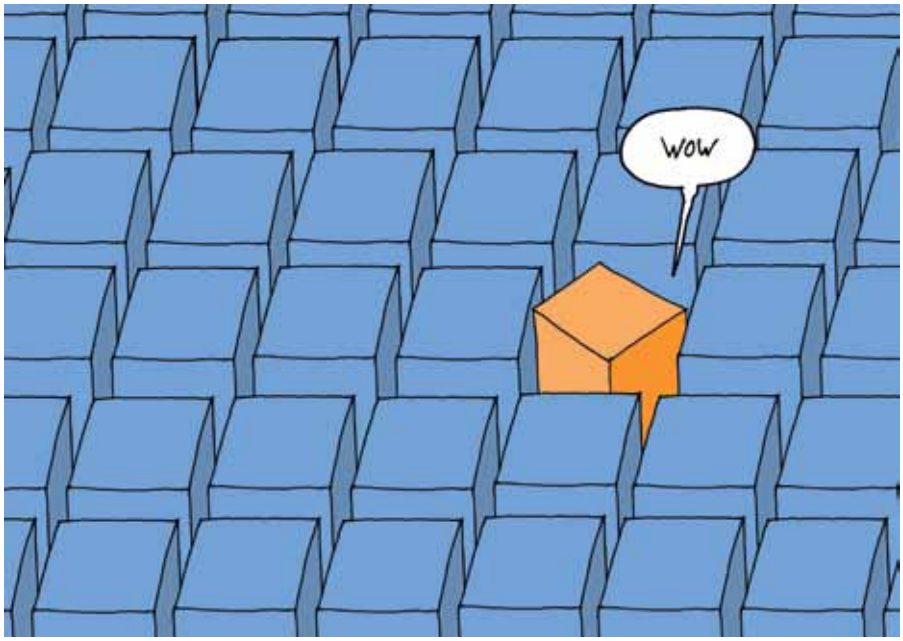
'Like most of my family, I have lived in the Randstad my entire life. It seems strange to me that nobody knows what to do in the case of flooding or a major storm. In Italy, families living near Vesuvius have families who can put them up elsewhere. Every Japanese child knows what to do in the event of an earthquake. In the Netherlands, we act as if nothing could happen. Many people think, "I'll just take the car". However, research at TPM has shown that the Randstad can become congested in no time. No, you are better off on your bike. You can reach the Utrecht Hill Ridge in a couple of hours – in the event of a disaster you will have a tailwind. This leaves the road free for people unable to cycle. In fact, we should practise this evacuation every year'.

Sound bites

"In TU Delft's position, I would not be prepared to let the rock-solid brand name of my university disappear, and to continue under the name of 'Leiden University' in future. Just like companies, we should determine what the brand name of TU Delft is worth. Presumably many billions of euros. Administrators wishing to eliminate such a name are causing enormous damage to their university and should be fired on the spot".
Ed PJ van de Heuvel, emeritus professor of Astronomy at the University of Amsterdam, in the NRC Handelsblad.

"Just recently I was thinking, "I must be crazy, sitting here bent over staring at my laptop. I'd rather be in my easy chair or lying in bed. And then I chould do something with that white ceiling. And all that typing, I've had enough of that too. I want someone sitting opposite me with whom I can talk". And that's actually possible. You can have a person who lives in Japan walk around here and converse with them."
Dr Pieter Jonker, professor of Vision-Based Robotics, in the Volkskrant, on an augmented reality system that adds virtual objects to reality.

"We've been waiting for this step forward in miniaturisation. In conventional ECG, nine electrodes are attached to the patient's chest, arms and legs. He is connected to the equipment by four wires. That is an outdated way of doing things. The researchers must still prove that just one of these new sensors can provide as complete an image of the heart as nine classic electrodes can. For now, I have my doubts."
Dr Kees Grimbergen, Professor of Medical Technology at TU Delft and at the AMC in Amsterdam, in Trouw, writing about a thin piece of artificial skin that transmits information about body temperature, muscle tension or heart rate wirelessly to a computer.



'The more a system is ordered, the more chaos is appreciated'

Marko Mihailović,
electrotechnical engineer

EYE CARE FOUNDATION

The Eye Care Foundation results from a merger between Oogzorg Wereldwijd and Mekong Eye Doctors

The Eye Care Foundation helps to prevent and treat eye conditions in developing countries.

Account number **5 25 25**

www.eyecarefoundation.nl

Algemeen Nut Beogende Instelling ANBI

CBF Keur VOOR GOEDE DOELEN

Who & where

Delft University of Technology has eight faculties, each of which is engaged in education and research in one or more disciplines. The University was founded in 1842 by King William II. With 13,000 students, 2,800 scientific staff members and 2,000 technical and administrative employees, it is the largest university of technology in The Netherlands.

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Disciplines

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Multidisciplinary Centres

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Centre for Transportation Engineering
Stevinweg 1
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Dutch Institute of Systems & Control (DISC)
Mekelweg 2
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Koiter Institute Delft (Institute for Engineering Mechanics)
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OTB Research Institute for Housing, Urban and Mobility Studies
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Open Building Working group (obom)
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Central Library

Delft University of Technology Library (dutl) supplies information and provides services, particularly in the area of the technical sciences.
It comprises a central library and twelve sub-faculty libraries housed at the respective sub-faculties and institutes.
The dutl is intended for students and staff at the Delft University of Technology. However, as the task of the library is to provide scientific and technical information at a national level, its facilities are also available to the general public. As well as all areas of technology and natural sciences, the library also contains a general collection in the social sciences, economics etc.
This relates not only to books or periodicals, but also to standards, reports, reference works and congress proceedings.
Literature not in the collection or not on hand can be obtained through Delft University's Central Library from other libraries in the Netherlands or abroad.

For further information:
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Information on facilities for foreign students:
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Liaison between business and research:
Liaison Office
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Information on research fellowships:
Mrs. M.Y.M. Spiekerman-Middelplaats
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General information on university education in the Netherlands:
Min. of Education, Science & Culture Central Information Dpt.
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(Post Graduate) Courses

Delft TopTech
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www.delft-toptech.nl

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For information on courses in the Dutch language:
Language Laboratory
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