2010.4

Research and education at
Delft University of Technology

Delft Outlook

Thin cells

New light on solar energy

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IN THIS EDITION OF DO

Delft Outlook

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Money is essential to being able to conduct quality research, and now that the government is slowly restricting the flow of funds, collaboration with the business community has become more important than ever. Assistant Professor of Industrial Design Engineering and one of the finalists for the Delft Entrepreneurial Scientist Award, Jouke Verlinden, believes that science and industry must work very closely together. This issue of Delft Outlook also takes a look at TU Delft's valorisation of knowledge in places further afield. Our reporter travelled to China to find out how Delft engineers are contributing to the sustainability of the country's cities. Do you want to see what is happening at TU Delft without having to board a plane? Why not visit the new Science Centre during the Christmas holidays. For a sneak preview, check out the virtual tour in this issue.
On behalf of the editorial team at Delft Outlook, I would like to wish you a successful and joyous close to the year.

Frank Nuijens
Editor-in-chief
Delft Outlook


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COLOPHON

cover photo
Sam Rentmeester/FMAX

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Chairs on show

The Faculty of Architecture's celebrated collection of designer chairs is once again on display to the public. In September, the 300 chairs were put on exhibit in five rows, one above the other, next to the faculty of Architecture's library. Firefighters were able to save the chairs from the burnt-out ruins of the former faculty building, after fire had all but razed it to the ground. The exhibition gives the faculty an opportunity to highlight the historical importance of the collection. The permanent exhibition was officially opened on 5 October.

Surgery training

TU Delft's own doctor at IDE, Sonja Buzink, has been asked by the European Association for Endoscopic Surgery (EAES) to set up a training programme. Her doctoral research showed that highly specific training courses are needed for surgical operations involving on-screen image-based technology. Studies show that doctors with considerable expertise in a particular image-based technique, such as colonoscopy (inspection of the large intestine with a flexible endoscope), do not necessarily perform any better than a beginner when asked to perform a different kind of procedure such as laparoscopy (abdominal keyhole surgery). Dr Buzink reveals that laparoscopic surgery demands an entirely different set of skills, as well as other aspects of eye-hand coordination.

Dr Buzink obtained her doctorate under the supervision of former surgeon, Professor Jack Jakimowicz.

For further information, please contact Dr Sonja Buzink, s.n.buzink@tudelft.nl.

Calling all alumni

TU Delft, together with the association for former members of the Delftsch Studenten Corps, has taken the initiative to produce a written history of Delft in the Second World War and the role played during wartime by students and teachers at what was then known as the Technische Hogeschool. This exceptional period in the history of TU Delft and the Delft student community deserves to be recorded in detail. In this way the motives, experiences and lessons of those who did their part during this dark period can benefit present and future generations and do justice to the memory of those who resisted the occupying forces.

The account of this period will be based on scientific research from available sources and publications, compiled by historian Dr Onno Sinke in close cooperation with the Netherlands Institute for War Documentation (NIOD).

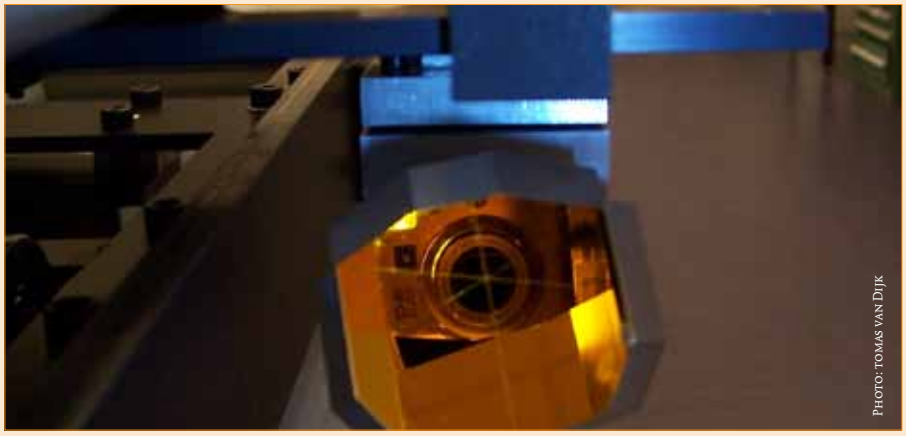
While a number of publications have appeared which deal with certain episodes or aspects of wartime in Delft, Dr Sinke would very much like to gain access to authentic material, which has not yet entered the public realm, to supplement the available source material; this could take the form of reports, diaries, writings distributed on a limited scale, farewell letters, personal memoirs and so on.

TU Delft therefore appeals to its alumni, in particular those who experienced the war firsthand or those who have come into possession of relevant information through their parents or others, to contact Dr Sinke at onnosinke@yahoo.com or on +31(0)6 24271379.

We thank you in advance for your cooperation.

Professor Jacob T. Fokkema
Former Rector Magnificus

Optical measuring tape



Measuring distance with a laser - through the air - has never before been achieved with such accuracy: up to 100 metres down to the very last micrometre.
At first it didn't seem like that much of a challenge, reveals Dr Nandini Bhattacharya (faculty of Applied Sciences), who supervised the doctoral research of Dr Moxi Cui. After all, the research group had already gained experience of using lasers to measure distance. The femtosecond laser they used emits ultrashort light pulses with a length of 40 microns, at 15 centimetre intervals. The distance is measured by counting the pulses and by adjusting the reflected light until it interferes with the other half of the split beam. This results in precision down to the wavelength of light (0.4 micrometres). The technique has been developed with the aim of positioning satellites in relation to each other with the greatest possible accuracy.
But refraction in the air made matters considerably more complex. The refractive index depends on temperature, pressure and humidity and varies according to wavelength. It was only once Dr Cui reconstructed the refraction – by calculating the refractive index for each of the 18,000 frequencies in the laser pulse – that he arrived at the correct interference. By doing so he was able to measure the length of a 50-metre corridor down to an accuracy of 1 or 2 micrometres.
Dr Bhattacharya reckons that is a world record.

For further information, please contact
Dr Nandini Bhattacharya, n.bhattacharya@tudelft.nl

Isotopes

The Delft Reactor Institute has been granted permission by the Dutch Ministry of Health to supply radioisotopes for research involving cancer patients. The Ministry has agreed to pay the 450,000 euros needed to make the necessary modifications to the reactor. Professor Bert Wolterbeek, of the Reactor Institute, expects the Delft reactor to be able to back up the production of the existing reactor in Petten by the spring of 2011, by which time all of the necessary permits should be in place.
The Reactor Institute will not supply radioisotopes as standard but only if the production at the high flux reactor in Petten fails to meet demand. The maximum production level of the Delft reactor equates to 1000 patient doses a day, which is sufficient to meet the demand in the Netherlands.

For further information, please contact
Professor Bert Wolterbeek, h.t.wolterbeek@tudelft.nl

Party for Ockels

The Superbus, a project initiated by former astronaut and Professor of Aerospace Engineering, Wubbo Ockels, had its first trial run at a test track in Lelystad on 17 September. Professor Ockels has a vision of the future in which these electric vehicles race at a speed of 250 kilometres an hour over special Superbus lanes throughout the country, each bus with 23 passengers on board. At present the bus can reach speeds of 80 kilometres an hour.
Professor Ockels had another reason to celebrate this autumn. In October, he marked the 25th anniversary of his spaceflight as an astronaut, which put the Netherlands on the map as a spacefaring nation. Current affairs magazine HP/De Tijd has decided to celebrate this notable occasion with a popular-scientific glossy magazine, fittingly entitled Wubbo. This one-off publication features items on space travel, the future, sustainability, and of course Wubbo Ockels himself.

Fingerprint

The authenticity of an etching can be established by looking at the imprint it leaves on the paper. The pattern of horizontal and vertical lines turns out to be unique for each silk screen. This means that the origins of traditional paper can be traced, even without a watermark, thus allowing us to determine, for example, whether an etching by Rembrandt was produced during his lifetime or much later.
The new technique was developed by Dr Mark van Staalduinen, and co-supervisor, Dr Jan van der Lubbe (faculty of Electrical Engineering, Mathematics and Computer Science). The method is based on a scan or X-ray of the paper. A computer recognises the lines it contains and orients the so-called chain lines vertically. The precise distance between them, in combination with the density of the vertical lines, is unique for every silk screen.
"It is a powerful technique," asserts art historian Dr Chris van Stolwijk, of the Van Gogh Museum, who was a member of the thesis committee. "But it will only work once we have a large database that allows us to make comparisons. Scanning tens of thousands of sheets of paper will take a lot of time and money."

For further information, please contact
Dr Jan van der Lubbe, j.c.a.vanderlubbe@tudelft.nl

Electron spin record

"Our discovery opens up a whole new field of research," says Dr Ronald Hanson, in response to the flood of congratulations he received on the publication in Science of an article he co-authored with Gijs de Lange. Researchers at the Kavli Institute for Nanoscience (part of the faculty of Applied Sciences) demonstrated how they could use a series of microwave pulses to protect the quantum state of an electron against interference from its direct environment. A series of over 100 tiny pulses extended the lifespan of the spin by a factor of 25. The researchers estimate that this is long enough to complete 10,000 operations on a quantum computer. Such a computer has yet to be invented, but the limited lifespan of an electron spin had already been identified as a major barrier to building such a machine. That obstacle has now been removed. The researchers have succeeded in doing so working at normal room temperature with a thin layer of synthetic diamond that contains a number of free electrons.

For further information, please contact
Dr Ronald Hanson, r.hanson@tudelft.nl

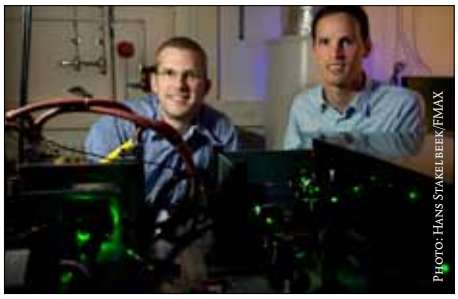


Photo: Hans Stakelbeek/FMAX

Magnetic minibars

Hotel minibars could well end up being the first market for a spectacular, newly discovered material property. Dr Nguyen Thanh Trung (faculty of Applied Sciences) has developed an alloy which makes an unprecedentedly high leap in temperature when it enters a magnetic field. This phenomenon, known as the magnetocaloric effect, can be used in a clever cycle to bring about silent refrigeration. A company is already interested in using the discovery to produce magnetic refrigerators as early as next year. Notoriously inefficient minibars could well be the first application of this noiseless cooling method.

For further information, please contact
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Super superconductors

Researchers at the high voltage laboratory have succeeded in significantly reducing the energy loss in a superconducting power line. A superconducting power line (at 3,000 amperes and 50,000 volts) is not allowed to generate more than 1 watt per metre of warmth per phase. Dr Oleg Chevtchenko and Roy Zuijderduijn managed to take this 'a level lower' with their new cable, explains Professor Johan Smit, of the faculty of Electrical Engineering, Mathematics and Computer Science. Losses in a superconducting cable can consist of heat leaks and electromagnetic radiation. The researchers have minimised the radiation by wrapping tight-fitting, 3-millimetre wide strips of superconducting material around a hollow core. The cable is cooled by liquid nitrogen flowing through this core.
Prof. Smit is unable to reveal the exact size of the loss, as the contract with German-Danish cable manufacturer NKT stipulates that such information remains confidential. TU Delft is collaborating with the firm to develop a high-temperature superconducting cable (HTS), which in years to come will replace one of the three 6-kilometre cables between the north and the centre of Amsterdam.

For further information, please contact
Professor Johan Smit, j.j.smit@tudelft.nl

Photo: Tomas van Dijk

Space travel

"You shoot almost vertically into the air at between three and four times the speed of sound. After around five minutes you will reach an altitude of 100 kilometres. At that point you are in space and you will experience weightlessness. You can see the curvature of the Earth, the darkness of space and you will have a spectacular view of the entire Caribbean."
Former Dean of Aerospace Engineering Ben Droste (2003-2007) describes how tourists will experience the space trips that he and his business partner Harry van Hulten plan to launch from Curacao starting in 2014. Mr Droste says he has secured funding from Curacao Airport Holding to enter into an initial contract with technology firm XCOR Aerospace. This will result in the production of a small spacecraft, to be called the Lynx. Droste believes he needs a total of between 70 and 80 million euros from financiers to fund the complete acquisition of the craft and the construction of a special spaceport. KLM already bought tickets and will be partnering with Droste's company Space Experience Curacao.

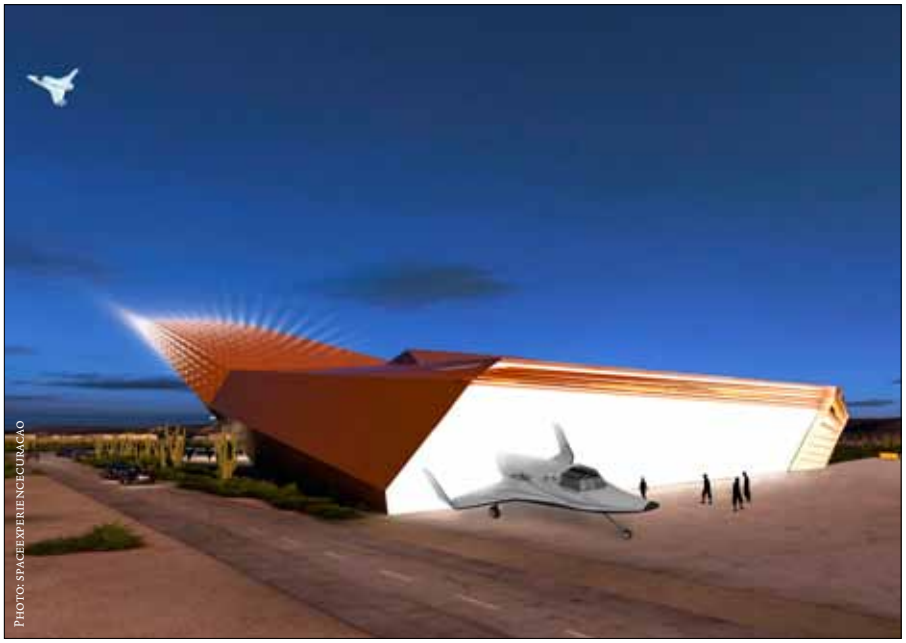


Photo: Spaceexperience Curacao

Building ecologically in China

Researchers from TU Delft are trying to help with the construction of an ecocity in China, but cultural differences are turning the project into a hornets' nest.

Tomas van Dijk

"The city consists of built-up bubbles, like concentric spheres, surrounded by lots of greenery. People move around by PRT [personal rapid transit: small automated electric vehicles, ed.]. There will also be an international campus that will form a living laboratory for research into intelligent networks."

Using futuristic images, Professor Martin de Jong, of the Next Generation Infrastructures (NGInfra) research programme, describes to a select group of Chinese administrators the contours of the planned ecological city of Pingdi, on the edge of the metropolis of Shenzhen in southeast China.

Whereas urban development is primarily an academic exercise in The Netherlands, creating a city of millions of people in no time is nothing remarkable in China. Shenzhen, which is directly opposite Hong Kong, is a stunning example. Since the city was given Special Economic Zone status in 1979, it has grown from an insignificant fishing village to one of the world's leading cities, and home to 14 million people.

At the request of Tang Jie, one of the deputy mayors of Shenzhen, researchers from TU Delft are helping to consider how the city can develop further in a sustainable manner. The city has grown thanks to a polluting and labour-intensive manufacturing industry, and suffers from traffic congestion and contaminated air, soil and water. Pingdi is intended to be a test case in how things can be done differently.

The plan is for a densely populated, environmentally-friendly city to be created in this 50-square kilometre suburb, surrounded by nature and attractive to clean innovative companies and knowledge workers. The population of this future 'ecocity' – a buzzword in China, of which the country officially has many dozens – is set to grow from its current level of around 50,000 to 500,000 or even a million.

De Jong, who as well as being an assistant professor at the faculty of Technology, Policy and Management (TPM), is also a full professor at Harbin, located in northern China, and in charge of the Pingdi project. "It is fairly unusual for a large city like Shenzhen to approach foreign academics for such a prestigious project," he says. "The city had already involved Chinese firms, but did not think their plans went far enough. They then clearly decided to give the commission to a group of mugs in the Netherlands," he laughs.

'Creating a city of millions of people in no time is nothing remarkable in China'

For the academics in question, there could hardly be a better testing ground in which to research urban infrastructures of the future, the central theme of NGInfra. "This project is worth its weight in gold. We were looking for a major project in which we could demonstrate our knowledge and where we could experiment," explains NGInfra scientific director, Professor Margot Weijnen (TPM).

In November, academics from TU Delft presented their vision for Pingdi at the Next Generation Infrastructure Systems for Eco-cities Conference in Shenzhen. They appeared with their partners from the Harbin Institute of Technology, which has a branch in Shenzhen (the HIT Shenzhen Graduate School), and with architect and TU alumnus Neville Mars of the Dynamic City Foundation.

Journey of discovery

If Shenzhen really does want to work together with the scientists – the project is still at a very early stage – then the researchers will primarily have to help in the development of new business models and administrative structures. By way of example, Professor Weijnen mentions the obstacles in setting up a smart grid, an intelligent and flexible electricity network. "At the moment, the China Southern Power Grid does not allow decentralised generators to return electricity to the network. Their business model is still based on the need to sell as much electricity as possible. There is also friction with the telecoms industry, whose cooperation is needed as well, but which regards the electricity company as a newly emerging competitor."

There is another challenge: Pingdi will have to collaborate with neighbouring areas in order to prevent pollution-creating industries from being set up just outside the city, which could otherwise lead to pollution reaching Pingdi. This kind of 'cross-border' development would also be a novelty. "This is a huge journey of discovery," laughs Weijnen. Her colleague, Professor Ernst ten Heuvelhof, takes a more cautious line: "It's difficult enough to get a large project up and running in the Netherlands, never mind in China. Because of the cultural differences, nobody here understands what is happening."

Weijnen does not believe it will be a drama for her research group if her plan hits the rocks. "This project is teaching us how the game of relationships and interests, known as Guanxi in Chinese, is played."

Guanxi may sound poetic, but it is a source of headaches for many western engineers. The 'game', and the politics of Chinese industry, leads to many misunderstandings and differences of opinion between western and Chinese government bodies.

Tjerk Reijenga, the director of the Chinese department of the Architectural firm KOW in Shanghai, recalls for example seeing at close hand how a major engineering firm from the Netherlands lost a commission for the construction of an ecocity at the last moment. The company had won a competition for the design of the ecocity of Caofeidian (in the Tangshan province), and assumed that it would be hired to flesh out the details of the design. However, it was a Swedish company that won the order, following a visit by the King of Sweden.

'Let's give the commission to a group of mugs in the Netherlands'

One of the main speakers at the conference, Slavis Poczebutas, of the Arup building consultancy, talked about his company's involvement in drawing up the plans for the ecocity of Wanzhuang near Beijing. Some 30,000 people live in 40 villages in the area, which covered 80-square kilometres. "You are taken on for the project, and it then transpires that they have already drawn up a master plan that involves the complete demolition of everything." Poczebutas wanted to preserve valuable

In just thirty years, Shenzhen has grown from a fishing village to a city with millions of residents. And the end is not yet in sight.

Photo: Tomás van Dijk

agricultural areas and certain buildings. Ultimately, the Chinese adopted his ideas only in a few small experimental areas.
Poczebutas is rather cynical about the sustainable ambitions of the Chinese. "There are no real ecocities in China, just small-scale sustainable projects." Nevertheless, the country is attempting to build in a more sustainable way. Cities have recently started to be judged in terms of not just their economic growth, but also their sustainability. "But the standard business model for cities, which is aimed at achieving the 12 to 13 percent economic growth rate per year that Beijing wishes to see, is much easier for them to implement," says Dirk Bekkering, who was employed with KOW China until recently.
"In order to attain such a level of growth, cities are selling their rights to build in new areas to project developers. The project developers in turn put up factories and blocks of flats as they see fit in these areas as fast as possible, in order to quickly cash in. Given that property prices are shooting up, the main priority is to build quickly."
Architect Neville Mars of the Dynamic City Foundation describes the building craze as "the world's most aggressively profiteering environment". He believes the fast rate of growth makes long term planning difficult.


Photo: Tomas van Dijk

The Delft plan calls for protecting the culture and architecture of the Hakka people, a minority group, thus giving the ecocity its own distinctive character.

Background colour

If it is not proving possible to build ecocities elsewhere, why should Shenzhen succeed? Perhaps because the current business strategy will lead to a dead end in the reasonably short term. The city is beginning to burst at the seams. "On top of which," says Professor Wang Dong, of the HIT Shenzhen Graduate School, "employees are asking for higher wages and are less willing to work as hard." In his opinion, the city will become less attractive to industries that are low on innovation and low on value. Shenzhen therefore needs to concentrate on innovation and on becoming more attractive for people with good qualifications. This vision is shared by Deputy Mayor Tang. "Pingdi must focus on Research and Development. It will be a very green and pleasant place to work." It is not just economic necessity, but also pride that plays a role. "Shenzhen has an exemplary function in China when it comes to economic growth. A third of all the world's laptops come from here. We now have to set the example as an ecocity."
This is music to Professor Weijnen's ears: "I really think that Shenzhen wants to make something of this. This is also evident from the critical questions that they ask."

'Because of the cultural differences, nobody here understands what is happening'

Still, it comes as something of a shock when a Chinese delegation unveils its plans during the conference. It shows a corridor of industry linking Pingdi with other industrial areas. The drawings may be green, but that does not mean anything, as Mars knows. "Green is their standard background colour," he laughs.
Weijnen says to her colleagues: "It seems as if they are extrapolating their old plans. We have to make sure now that we are sticking to the same script."

Ecocity Pingdi must be a magnet for attracting highly educated knowledge workers.

De Jong explains what he thinks the problem is. "The Chinese would prefer to put up high-tech buildings and campuses in the remaining green areas of Pingdi, and to forget about the polluting and dilapidated built-up areas. But they have never expressed a clear view on this. If they go about it in this way, Pingdi will never be an attractive city for knowledge workers. The built-up areas have to be transformed. It's time for them to lay their cards on the table."

'There are no real ecocities in China, just small-scale sustainable projects'

Two days after the conference, De Jong explains once again what Pingdi can do in order to become a sustainable knowledge city. This time, he is at the city hall. The head of the Shenzhen Urban Planning Bureau is also present. He smiles, "This is a very risky project. It seems as if the foreigners are more enthusiastic about Pingdi than we are." He also wants the group from Delft to present a prognosis during the following meeting for the economic growth that the ecocity will generate.

There are mixed feeling afterwards. But it does at least look as though the researchers have reached the next stage of the game.

How do you build an ecocity?

Pingdi is not a blank canvas. The area consists of industrial areas and is also home to a large group of Hakka, a local minority. The researchers want to preserve the Hakka architecture as much as possible in order to give the area a strong cultural identity. Moreover, it is a point of interest to them to see how one can carefully edge complex systems like cities, which develop their own dynamics, in a certain direction.

But Dr Wim Ravesteijn of TPM is under no illusions. "China has social objectives, but the importance of the individual does not count for anything at present," he says. "If the government thinks that residents have to go, then they have to go, especially if they are not official inhabitants of the city. This is still a dictatorship."

How is Shenzhen intending to deal with the building work and the residents? Deputy Mayor Tang Jie gives a somewhat cryptic answer: "The plans [of TU Delft, ed.) are academic in nature. We're trying to shape them in our project. However, Shenzhen was designed as an industrial city. No plan has yet been decided upon."

Ravesteijn sees no reason to abandon the project. "That would be taking things too far. We are all conscious of the ethical aspects. We are involved in internal discussions on the matter."

De Jong is assuming that if people are forced to leave, they will be compensated. "We have to break away from the defensive European argument that nothing should change, he says. "Most people will be better off when the ecocity is built. Currently, they have a miserable existence as factory workers. The ecocity offers them the opportunity to work in the service sector."

Experimental showcase

When it opened for business in September, the Science Centre was still unfinished. According to Dr Michael van der Meer, the Centre's director, it will never be finished. "We are a showcase for the science carried out at TU Delft. And science is never finished."

MAAIKE MULLER

With enormous patience, Jasper is attempting to find the ideal curvature and thickness for an aeroplane's wing. He and his fellow classmates are visiting the Science Centre to learn about technology and about TU Delft itself. In the Amazing Technology hall, he stands beside a white aircraft that shoots up like the weight in a "Test Your Strength" fairground attraction when the wings are shaped correctly. He changes their shape using sliding controls on the screen in front of him.

Later this year, he will have to specialise by opting for a particular package of courses at school, a "profile". For him it's a fairly easy choice, as he has already decided he wants to take mainly technical subjects. "I really like technology" he says, while keeping his eyes glued to the screen.

Helping school pupils choose a profile is one of the Science Centre's objectives. But it is not the only one. "We want to be a showcase for TU Delft" says director Michael van der Meer. "We show people what TU Delft is doing, and tell them about science and technology." People should not expect to find old steam engines or microscopes in this Centre, which is the successor to the former Technology Museum. "We don't look back at the past, instead we focus on what we are doing right now."

The displays in the Amazing Technology hall reveal the enormous amount of design and construction work going on at TU Delft. Here, you can find student projects like Nuna, a solar-powered racing car, and the submarine bicycle Wasub. Even more fundamental research is also on display, such as the study into superconductivity being conducted by Leo Kouwenhoven's group. "TUTube" (TU Delft's

Photo's: Sam Rentmeester/FMAX

Old steam engines and microscopes have no place in the successor to the former Technical Museum.

Amazed by the futuristic c,mm,n car, which must provide an answer to mobility problems.

In the Construction Lab, visitors can construct a building.

own version of YouTube) on the touch screens near various exhibits displays informative films about the display and the associated research.
According to its website, the Science Centre will have a real "WOW!" factor for visitors. One of the director's personal favourites is the copy of the Simona flight simulator. The simulator is still bolted down, but "once we are allowed to get it moving, it will be very spectacular", says Dr Van der Meer.
He is also very impressed by the three-dimensional projection room, where clouds and protein structures can be studied, as well as any 3D designs that people bring along. "Right now, the most popular exhibit is the Bouwlab." Situated behind a fence, this exhibit features a yellow and black chequered movable floor, on which visitors can build various structures. A member of staff then presses a button to start one of the three programmed earthquakes, at which point everyone can see which group has built the strongest building. "The supervising students often have their work cut out trying to keep the groups under control."

Not finished

Dr Van der Meer was presented with the key to the former Faculty of Mining Engineering (his new "museum building") in September 2009. According to the schedule, the building was to be renovated and the exhibition installed all within the space of one year. "We hit our deadline, which I think is a fantastic achievement" says Dr Van der Meer. "But it's not finished yet" he admits.
"After all, science is never finished, it is in a constant state of flux. In the same way, this museum will keep moving to keep abreast of developments at TU Delft." In addition, the working procedures used mean that things are either not finished or do not work properly straight away. Many of the exhibits are student projects. For instance, students developed the software for a serious game. At the end of their course they still hadn't managed to iron out all the bugs. "You can demand a fully functional product when you are doing business with a company, but not when you are dealing with students. So we decided to pay the students to carry on and finish their work."
The Science Centre is certainly not a traditional museum. When compared to science centres like NEMO (in Amsterdam) and Museon (in The Hague), the Centre at Delft is certainly the odd one out. Delft makes no attempt to explain such things as chaos theory, for example. In the Science Centre, students and researchers are part of the exhibition, as it were. "People communicate better than objects" explains Dr Van der Meer. "So we use students and researchers to show what is going on at TU Delft, and what kinds of people work here." For instance, next to the Bouwlab, there is a "living structures studio". Third-year Industrial Design Engineering (IDE) and Architecture students use this facility to

'It's not a traditional museum'

construct interactive installations and buildings, while members of the public wander around and ask questions.
"When I enrolled for this minor, I did not think we would be the showpiece of TU Delft" chuckles Joost van Lieshout, a third-year IDE student. With the possible exception of ear-splitting shrieks from happy children that occasionally echo down the corridors, he and his group are thoroughly enjoying their six-month stint in the Science Centre. "We are working on a playground toy shaped like a sleeping animal. It starts to play when children are around." The students just grab a few passers-by in the corridor when they need test subjects on whom to try out their latest ideas."
This space is also being used by a PhD student who is creating an interactive pavilion capable of adapting its shape to the season and to the number of visitors. "Another PhD student will probably be joining the staff of the Gamelab. She will use serious games to carry out research into collaboration and leadership" says Dr Van der Meer. The visitors will be participants in the study, but they will also be able to see what the researcher is doing, and why.
"That's exactly what we want, our goal is to be a meeting place" says Dr Van der Meer. "It will be exciting to see whether our new concept will actually work. That too is an experiment."

SCIENCE CENTRE EXHIBITS

3 Research in progress

Students work on projects in public workspaces 2 , allowing the general public to talk to them about their research topics. Some students use visitors as test subjects for their projects.

Hyperbody studio
Architecture students working on hyperbodies: buildings that respond to their environment by changing form or content.

SCIENCE CENTRE EXHIBITS

4 Educational workshops for school pupils

At the Science Centre, TU Delft students give workshops to primary and secondary school pupils as a means of introducing them to the world of technology. The workshops can help students choose their subject clusters. Each year, around 10,000 participants attend the Delft workshops.

Gamelab
The gamelab offers the public the chance to try out new 'serious games', such as 'Dyke Watcher' (find problems with a dyke) and 'Simendo' (key hole surgery with two forceps and a camera.

4
Green Choice hydrogen cart
Students build a cart that runs on hydrogen.

5
Superconducting train
Thanks to extremely cold superconducting magnets, a train is able to hover above the rails and glide with virtually no resistance to the end of the 19-metre track.

No You Tube but TU Tube
Each exhibit has an interactive monitor tor that shows film clips on how the experiment works and the technology behind it.

7
Nuna solar vehicle
Five-time winner of the World Solar Challenge.

Entrance to the Science Centre
Mijnbouwstraat 120

Steering simulator
Two participants have to keep between the yellow lines of a slalom course. One of the stuur steering wheels uses force feedback to help the driver, the other does not.

Discover

The Science Centre is not a museum where you passively view past inventions but a place where you can discover new technologies currently being developed at TU Delft. The Science Centre is geared specifically towards pupils aged between 9 and 16.

Earthquake research
Try to build a stable tower. With the press of a button, the floor begins to tremble (measuring a maximum of 7.8 on the Richter scale). Modify the design if the tower collapses.

Faculty Room 8
The Science Centre provides rooms for meetings or presentations. In the Faculty Room, the wing of a Dakota aircraft serves as a conference table.

VR theatre with 3D-scanner
View research projects that use 3D visualisations and make a 3D-scan of your own head.

Biolab
Work on bacteria or biofuels.

Sports studio 9
New sports equipment and materials.

Robotics workplace
Play with robotics' exhibits.

Film auditorium
Films about scientists and their research.

Aerospace films

Flight simulator
The flight simulator is a smaller version of the large flight simulator (Simona) located in the faculty of Aerospace Engineering.

Pattern recognition 11
Catch balls falling out of a series of 5x5 holes in the ceiling. This exhibit is designed to make pattern recognition by computers more transparent.

Axe bow
The exhibit measures the difference in acceleration between a conventional bow and the new axe bow.

Moving without wheels
Achieve your best time in this vehicle that rides without wheels. This was one of the entries for a design competition for Mechanical Engineering students.

Design your own aircraft wing 12
You vary the wing curvature and thickness, and the computer calculates the lift and drag. The exhibit tilts a model aircraft based on the performance of the wing design.

SCIENCE CENTRE EXHIBITS
1 Exhibits: Objects, installations and machines

The central hall is full of recently developed objects 13 at TU Delft. These are the results of student projects or research. Visitors are invited to sit at any of the exhibits.

SCIENCE CENTRE EXHIBITS
2 Demonstration of exhibits

Visitors can experiment with a range of exhibits, which have been built based on current TU Delft research projects. The Science Centre aims to show technology in action rather than using dummy exhibits that mimic a scientific phenomenon.

Photo's: Sam Rentmeester/fmax

‘Don’t lose sleep over funding’

Assistant professor Jouke Verlinden, from the faculty of Industrial Design Engineering (IDE), is one of four finalists competing for the Delft Entrepreneurial Scientist Award. While completing his studies in the United States, he became aware of how important external funding was for scientific research.

Saskia Bonger

How keen are you to clinch the title of Entrepreneurial Scientist 2010?

“I feel extremely honoured to be in the final four. I never expected it. But I’m in two minds about it. I’d love to win, yet at the same time I’m aware that the other nominees are all professors or assistant professors with VIDI accolades under their belts. They’ve already matured, as it were, and are at the top of their respective research fields. I’ve only just begun, and this faculty is also relatively young. I only started working as an academic in 2000. I studied computer science at TU Delft and completed my thesis project at Georgia Tech, in Atlanta. I then worked in industry for a while.”

Who is Jouke Verlinden?

Jouke Verlinden studied computer science at TU Delft from 1988 to 1993. He completed his thesis at Georgia Institute of Technology. In 1993, he began working in industry where he spent the next seven years. He was a software engineer at Intersystems for a brief spell before moving to TransOpen to take up a post as director of the innovation lab. Two-and-a-half years later, he became senior interaction designer and project manager at Informaat. Since January 2000, he has held the post of assistant professor at the Faculty of Industrial Design Engineering. He plans to complete his PhD in 2011. Verlinden is married with two children, aged four and seven.

The United States is a considerable way ahead of us in terms of accessing funds.

“During my time there, I learnt that external money is very important for research. In that sense, returning to the Netherlands was a bit of an eye-opener. Computational sciences using parallel computer algorithms, virtual reality, simulations, software engineering, etc; it was all happening in America. One day, the private sector wheeled in a device worth 200,000 dollars for conducting research into virtual reality. The money was donated to the lab with the message: ’we’re happy for you to do whatever you want with it as long as our name’s on it’. When I returned to the Netherlands armed with these stories, people found it difficult to comprehend. And they still do. If I want to embark on a research project, the first thing I’m asked is: can you use desk top research, can you do it without expensive experiments? My answer is ‘no’, at which point I turn to the private sector or apply for a grant.”

Nevertheless, it’s a different situation now then when you came back from the US in the early 1990s. Over the past couple of years, enterprise and valorisation have become inextricably bound to scientific research. The researcher now has to market his research and capitalise on it whereas beforehand the government would just hand over a sum of money.

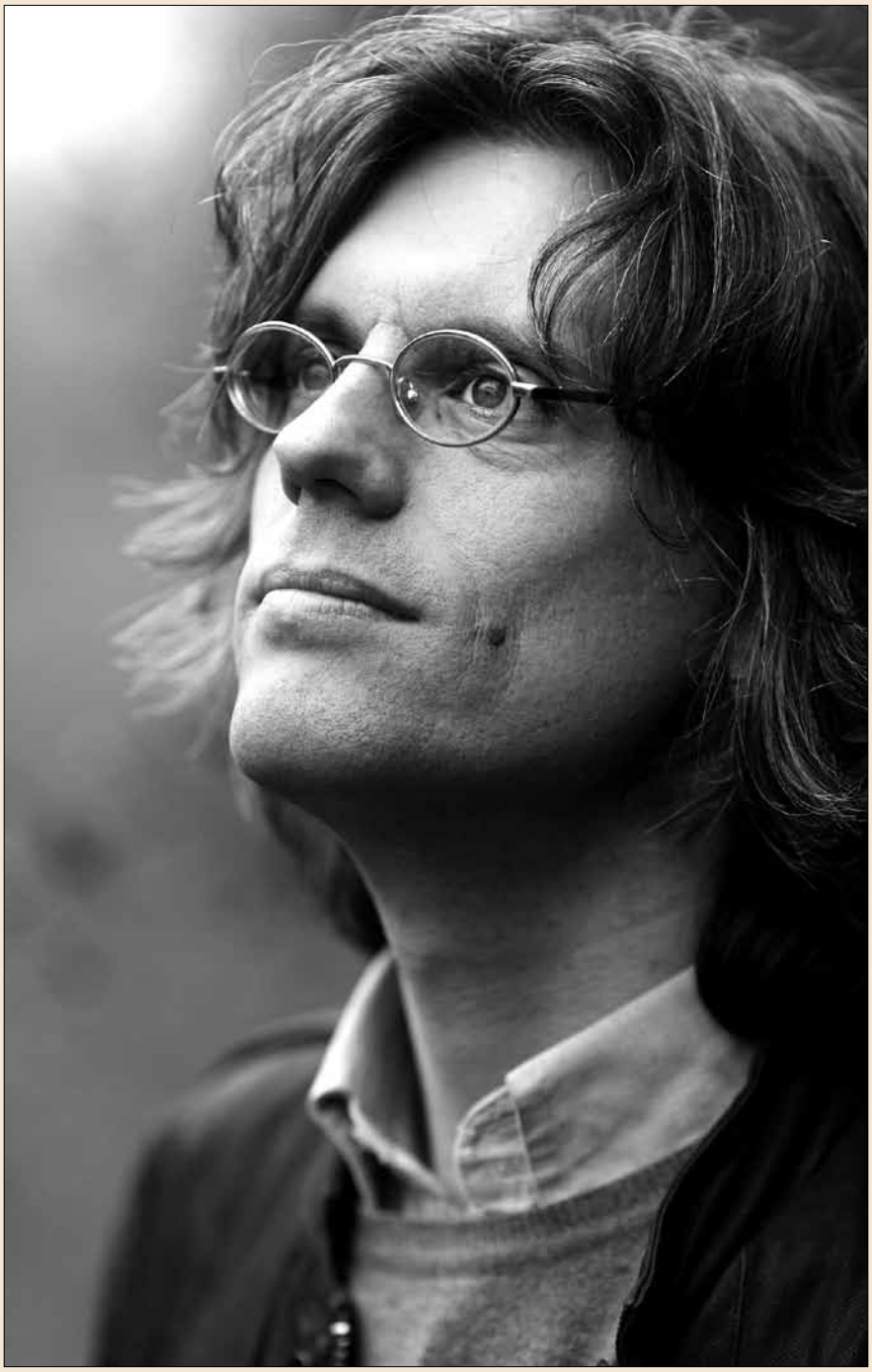
“You certainly notice a shift, yes. For example, here at IDE, we have valorisation officers focusing specifically on this area. It’s very well promoted. But in practice, when carrying out the research, there’s still a degree of friction and it’s unclear whether collaborating with a company actually works. People also often find it difficult to know where to start. My advice is to look through the yellow pages and just start calling. If you keep trying, you’ll eventually speak to someone who’s interested in your idea.”

Some professors bemoan the fact that the valorisation side of things leaves them very little time for the actual research.

“You see that a lot in Germany where the only people involved are the professors and the PhD students – no middleman. The professor markets the research project and the PhD student carries out the work. The Anglo-Saxon model, on the other hand, has an intermediary layer of lecturers who set the parameters. In most cases, one person is allocated the task of sourcing the funds. At TU Delft, the professor isn’t expected to secure all the external funds alone. I’m not a professor and I still get involved.”

You were nominated for the Award by Delight Interactive Solutions, a techno starter that created a design table based on your patent. They call you a visionary, an investigator, an entrepreneur. Why don’t you wish to pursue research based on this patent yourself?

“I’m still involved on a regular basis – not on the payroll, but as an advisor. I’ve thought about doing it myself but this is really the students’ idea and work. There is still the issue of how I can gain greater stakeholder status, but I’m staying pretty pragmatic at



'It's my long-held belief that science and industry must work very closely together'

the moment. Right now, it's more important that I complete my PhD in the next couple of months than that I have an 8 or 20 percent stake."

How important is it for scientists to be entrepreneurial?

"It's my long-held belief that science and industry must work very closely together, certainly in the field of Industrial Design Engineering. Industrial design boasts a long tradition of applied research. It's only logical to make the connection with industry but somehow there's still a palpable distance there. Nine times out of ten it's graduates who provide the connection while completing their studies outside the faculty. If they don't, they will never find a job in the outside world."

Can you give an example of how you collaborate with industry through students?

"An example of a completely new device is the sailing simulator, which we designed for Innosport. It looks like a large tub fitted with a range of sensors. Professional sailors, of course, know which ropes to pull during a race, but how do you cope with wind, waves and the competition? The Olympic team coaches wanted to be able to simulate races to find answers to these tactical questions. We completed the sailing simulator within two to three weeks. A group of fanatic students from architecture, aerospace engineering and industrial design engineering worked on the project full-time."

What is augmented reality?

"This is a question related to my thesis. Augmented reality is the art of combining digital images with the physical reality. There is a wide range of ways in which to do this. The method I use, and which I hold the patent for, is to project information onto a physical object using a number of projectors. This is a technique widely used in museums and theatres. But it is also useful for designers as it gives them a better insight into the aesthetic and functional aspects of a design."

How does it work?

"Take, for example, this 3D print of a tractor. Augmented reality would enable you to project headlamps onto the image to see where they need to be fitted. This is an ideal way to give clients – people who don't necessarily have an expert understanding of spatial concepts – a

clear impression of the design. I study how augmented reality affects the discussion between client and designer, or end-user and designer. Does it lead to better decision-making and better designs? It's a known fact that outsiders, in particular, exert a significant influence on the design process. Take, for example, the client commissioning the new tractor. The client is shown nice pictures by the design company but finds it hard to imagine what it will look like in reality. They simply don't have the spatial skills and understanding that designers are trained in. Nevertheless, they still want to see a good result."

Without knowing exactly what that is.

"The key to being a good scientific entrepreneur is being prepared to turn the industry's practical question into a knowledge question that is technically challenging. Take the sailing simulator. We were not asked to 'build a sailing simulator', but rather 'what do we need to ensure we win more medals?' I'm currently in talks with someone who works for the Government Buildings Agency that furnishes the royal palaces. A major problem here is the fabric wall coverings. This is a huge investment, but just try coming up with a pattern for it. It's a bit late deciding something doesn't look right once it's already in place. Augmented reality allows you to project a design onto the wall beforehand. This is a research project for a graduate or postdoc. If there is no knowledge question involved, I pass it onto a company."

The dictionary gives the following definition for 'entrepreneurial': 'Not afraid to take on difficult or risky projects, adept at tackling problems'. I don't imagine that's everyone's forte. Or is entrepreneurship something you can learn?

"A scientist needs to possess these qualities from the start. It's no use staying in your room just talking to people within your own circle. You need to get outside, talk with people in industry, visit secondary schools. Everyone is capable of this to a certain extent but some, more than others, need the challenge of the situation to take it a step further. You can read numerous books on how to access funds but at the end of the day, you just have to go out there and do it. Don't lose sleep over it. Of course, everyone has their own aptitudes. My own reference point for how scientific research should be practiced is America. I've never experienced the comfortable safety net of government funding. Instead, I have a long list of small and large subsidies that I managed to secure myself."

Did you notice a drop in contract funding due to the global financial crisis?

"I noticed its effects in Germany. I've held lots of talks with big German car companies. My experience is that they are turning down Dutch research projects but continuing on as normal with German ones. I learnt this to my cost two years ago when I'd almost managed to convince two companies to channel big sums of money into my augmented reality projection project. They wanted six set-ups as soon as possible, but suddenly the contacts dried up and I wasn't able to make any further headway. I've since heard that they are still going ahead with the project but the contract has gone to the German competitors. In the Netherlands, I work with a lot of small and medium sized companies. It's on a somewhat smaller scale and these projects are still going ahead."

How can an entrepreneurial researcher guarantee his scientific independence?

"I've never had any problems in that area. There is very little competitiveness within our sector. I know people in the pharmacology sector who don't appear to enjoy such a healthy relationship with industry. In our case, it's all very open and amicable."

What are your future ambitions?

"I'd like to explore further the field of prototyping and social sciences. And I've enough material to write at least another three books on 3D-printing and augmented reality. It's all about decision processes, about reaching an understanding, a consensus or even a conflict. I'm currently conducting research with the Royal Academy of Art in The Hague, and with Leiden University, to study how artists work with augmented reality and what designers can learn from them. Being design engineers, we traditionally try to keep as much distance as possible between ourselves and the art world. But the way in which artists work with technology goes a lot further than what design firms do. I'd like to have an artist in residence here. I think it would be good for someone with a different take on the process to observe what it means to manufacture and design."

Besides your academic work, you also play an important role in employee participation. You are chairman of the Faculty Personnel Committee. Why did you choose to take up this post?

"I believe it's important that all departments are represented in some shape or form. I'm also interested in learning more about the university's administrative processes and having a say in how the faculty develops. I see the Personnel Committee as the faculty's watchdog, its conscience. It takes up a whole day in the week but I feel it is my duty. It's important that people are treated well and that we think carefully about the research we undertake and the kind of infrastructure we have in place."

How do you relax in your spare time? Your LinkedIn page says you like jazz improvisation, tango and dance.

"I play the saxophone. For a while, I even thought about studying at the conservatory. My father was a jazz pianist, which meant I was privy to the scene early on – including the drinking culture and the continual hustling for gigs. Eventually, I came to the conclusion that the life of a professional musician wasn't for me. But I love making and listening to music. My parents never forced jazz on me but I ended up falling in love with it quite unwittingly. I used to fall asleep listening to John Coltrane. Tango has the same improvisation appeal as jazz; neither follows any fixed rules. My wife and I have been dancing tango for years. I haven't played as much since my children were born. It's quite difficult to mute the saxophone. Once I've completed my PhD, I'm going to pick it up again."

The Entrepreneurial Scientist Award was presented on Tuesday 23 November. The proud recipient was Professor Freek Beekman of the faculty of Applied Sciences. Beekman is conducting a study into instruments for medical research and diagnostics, which are being launched onto the market by the company MILabs. *Delft Outlook* published a detailed article on his research in issue 3 of 2010.

Sparks leap between two magnesium electrodes 300 times a second. At a voltage of 3,000 volts and a peak current of 350 amperes, the electrodes evaporate. They emit magnesium particles ranging from 5 to 20 nanometres in diameter, which are carried away by flowing gas (argon mixed with a little hydrogen). These magnesium particles clump together during the filtering process, forming one micrometre granules. Tobias Pfeiffer is producing these extremely porous microparticles in an effort to develop a storage system for hydrogen gas. Hydrogen binds reversibly to the metal, forming a magnesium hydride. The spark technique was developed in the Nanostructured Materials research group (ChemE, Applied Sciences) by Tobias Pfeiffer's predecessor, Dr Vincent Vons, who was awarded a PhD on 27 September 2010 for his thesis, entitled 'Spark Discharge Generated Nanoparticles for Hydrogen Storage Applications'.

Photo: Sam Rentmeester/fmax

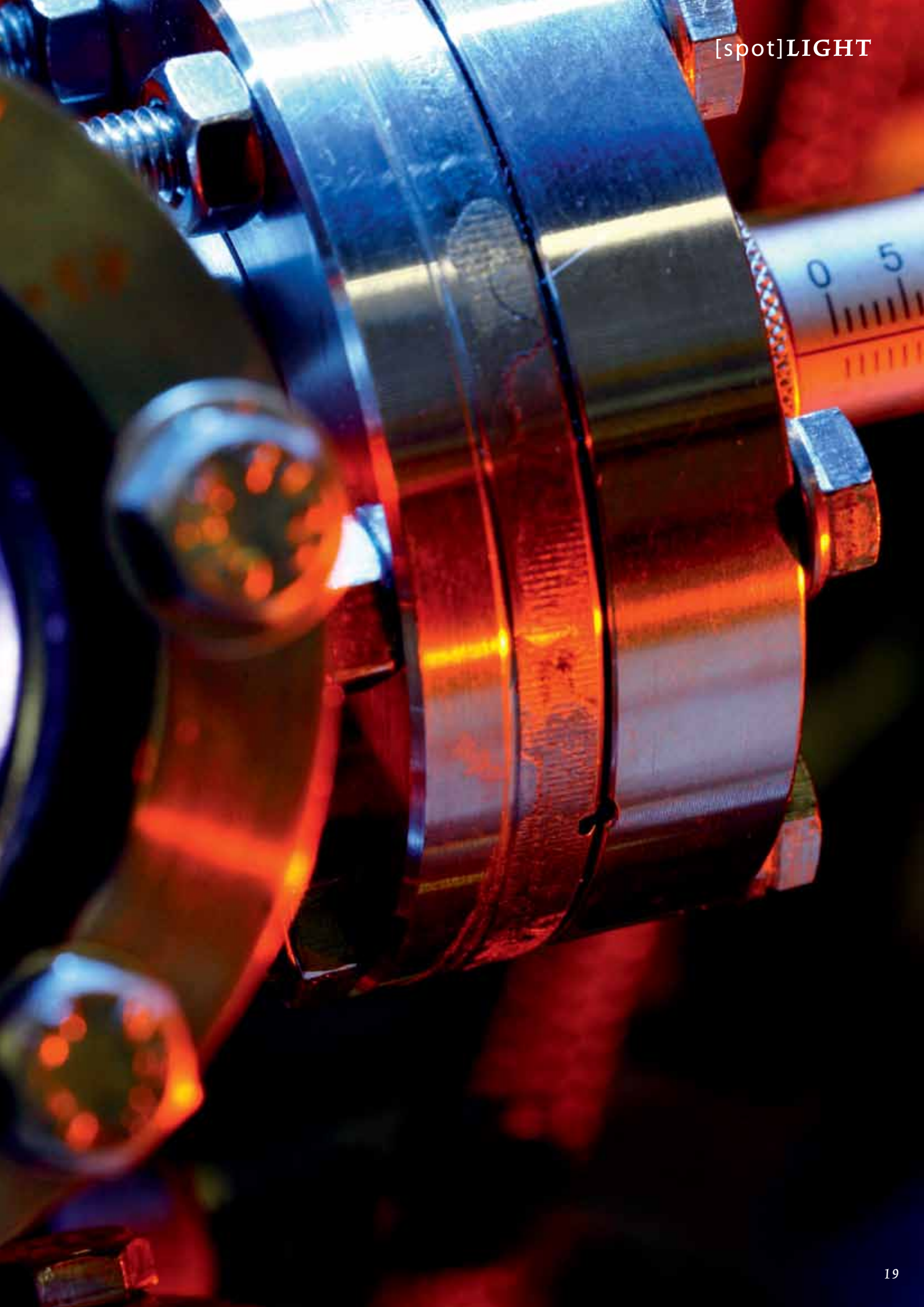


PHOTO: HANS STAKELBEEK/FMAX

Prof.dr. Gerard van Bussel

"Gerard has an extremely wide range of focuses and interests"

ENTHUSIASTIC

Professor Gerard van Bussel has played an active role in wind energy research since 1977. He graduated in mathematics and physics from Radboud University Nijmegen and went on to take up a post at TU Delft. In 1995, he obtained his PhD in the aerodynamics of wind turbine rotors. He conducted research at the faculty of Aerospace Engineering and then moved to Civil Engineering and Geosciences, before returning to his original area of expertise in 2005. He has also been a guest researcher in Japan on a number of different occasions. He is responsible for the wind energy based programmes at the Netherlands' three universities of technology (3TU) in Delft, Eindhoven and Enschede and is chairman of the Board of Studies for the Master's in Sustainable Energy Technology. He also develops courses for EUREC, the association of European Renewable Energy Research Centres. Van Bussel is a board member of the European Academy of Wind Energy (EAWE).

SASKIA BONGER / CONNIE VAN UFFELEN

In the Masterpiece series, a professor and a student or PhD student (present or past) answer the same questions, creating a double portrait in the process.

How would you describe your colleague?

VAN BUSSEL: "Sander is a smart, industrious young man who is very career-oriented. In 1999, he began his PhD research into the efficient use of wind energy in the built environment with me acting as his supervisor. Very little was known about this field at the time. The emerging consensus was that the shape and position of a building, including its relation to other buildings, could produce useful energy in combination with special wind turbines. Sander took up the challenge of designing the experimental set-up himself. He used a variety of different research methods and combined the results in a clear and coherent way. He displayed a real spirit of perseverance. And I'm seeing this same determination and drive again with his company. He's not afraid of a challenge."

MERTENS: "Gerard is brilliant at enthusing people. He articulates things well and has an extremely wide range of focuses and interest."

What have you learnt from him?

VAN BUSSEL: "I've learnt the crucial importance of ensuring the right person is assigned to the right type of PhD research. Not only in terms of academic background and qualifications but also character and skills. Sander had built up a wealth of expertise and skills during his days in Haarlem and Delft and his years working for Stork as a junior researcher. He was already familiar with the ins and outs of designing a research project and his breadth of experience proved to be of great importance."

MERTENS: "During my PhD, I learnt to persevere, to keep searching for evidence, to try to better articulate my findings and record them quicker. This is how you discover new things. I've always been a researcher but Gerard has helped me become a more rounded scientist."

Does this kind of academic relationship allow you to say what needs to be said or do issues of hierarchy stand in the way?

VAN BUSSEL: "If a PhD student embarks on a project within an existing line of research, it is your duty as supervisor to steer them in the right direction. But in Merten's case, we were dealing with a new research area. So, we decided to sit down together to figure out how best to tackle it."

MERTENS: "Hierarchy isn't an issue here. I'm not one to mince my words. If something bothers me, I like to get it off my chest. There were times when I felt that Gerard had too little time for me, and I told him as much. Perhaps it's a question of priorities. We have an open relationship and it works well."

What is his most impressive characteristic?

VAN BUSSEL: "Sander has a healthy dose of determination. He started a company in a tricky niche of the market. This was very brave and

Dr.ir.ing. Sander Mertens

"Sander is not afraid of a challenge"

Determined

Photo: Hans Stamhuis/FMAX

MASTERmind

Sander Mertens studied mechanical engineering at what was then the Technical College in Haarlem (now Inholland University of Applied Sciences), specialising in the wave load analysis of offshore drilling platforms. He then went on to study physics at TU Delft, graduating in 1996 in the stochastic properties of wind. He began working as a consultant for Syntens Innovation Network before conducting research for Stork Project Engineering. He obtained his PhD in wind energy in the built environment and was employed as senior consultant and manager for DHV engineering consultancy's wind group until 2007. Being extremely innovative, he then joined forces with his wife to set up their own company, a wind consultancy firm called Ingreenious. In 2009, they launched Windchallenge to promote the development of a windmill in the built environment. Mertens also likes to pursue his love of waves and currents in his spare time as a sailor and kite-builder.

impressive given it's a completely new ball game. I have great admiration for him."
Mertens: "His ability to enthuse people, which fuels his power of persuasion and conviction. He's a joker, full of life."

And his worst?
Van Bussel: "It took some time before we found the right structure for his thesis. He had very clear ideas about how he wanted to structure his story and we, the supervisors, did not agree. The end result was an unprofessional-looking thesis, which he distributed among very few people for review. It was only later that we found out he had approached a publisher to spruce it up. He should have mentioned this to me earlier. The business man in him had taken over."
Mertens: "I sometimes feel he has too many irons in the fire. He wants to be able to do everything. This is a result of his enthusiastic nature."

What is his most significant achievement?
Van Bussel: "Having found his way so remarkably in such a broad field of research. In doing so, he has paved the way for many future PhD students."
Mertens: "His professorship - that really is an outstanding achievement. He's been here 28 years, witnessed the early beginnings of wind energy at TU Delft and was given the use of a fabulous wind tunnel. He's a mathematician who can articulate with great ease and who doesn't get bogged down in all kinds of complex arguments."

What is your biggest blunder to date?
Van Bussel: "A lot of people would say not having studied at TU Delft. I don't agree. I wanted to come here – I was mad about aeroplanes at the age of fifteen. But my father was put off by a talk given during an open day where visitors were warned of the number of students who failed. So, I went to Nijmegen to study mathematics and physics. The broad scientific training I gained there stood me in good stead for Delft later on where I had little trouble putting this knowledge basis into practice."
Mertens: "Writing my PhD in 'Word' format. That really was monumentally stupid. It would freeze in formulas and at one point I couldn't open the document at all. I was also fiddling around with the layout and tables for ages. I now use Latex, which I highly recommend."

What is the greatest challenge at the moment in your specialised field?
Van Bussel: "The entire energy production process has to be made sustainable within the next 40 years. This will require huge amounts of wind energy. Around 100,000 new jobs will be created in Europe. Not only will we need to train a new generation of technicians, we will also have to train 1,000 new ▸▸

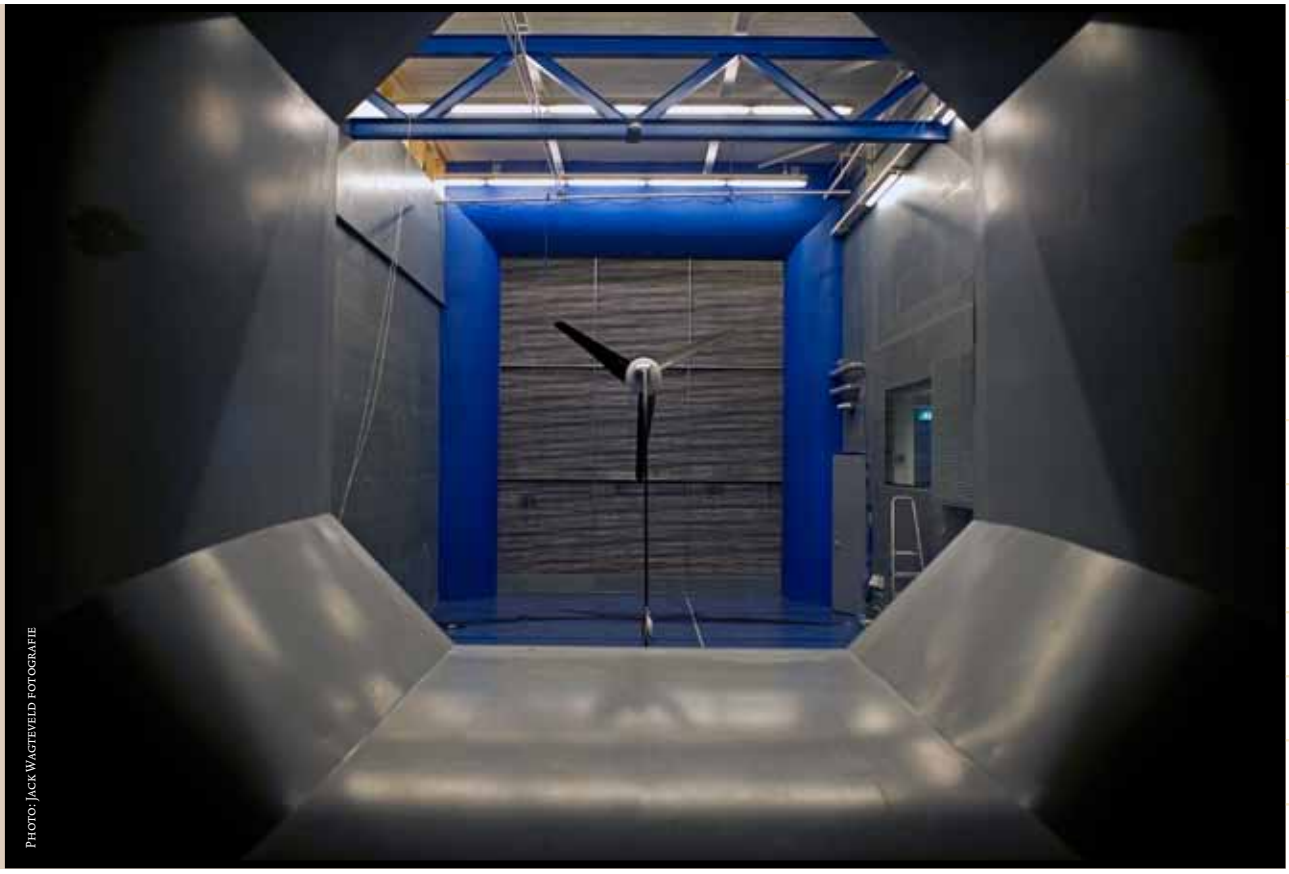


Photo: Jack Wagteveld fotografie

Windmill in the windtunnel.

Married/co-habiting/children
Mertens: Married with two children
Van Bussel: Married with three children

Favourite website
Mertens: Google
Van Bussel: Nu.nl and www.ewea.org

Best book
Mertens: Life and Teaching of the Masters of the Far East by Baird T. Spalding
Van Bussel: The no-nonsense guide to globalization by Wayne Ellwood

Wished he had invented
Mertens: Don't want to be one of those 'if only I'd…' people
Van Bussel: Senz umbrella, the Vacuvin

Admires
Mertens: People with great perseverance
Van Bussel: Professor Theo van Holten, 'genius and inventor'

wind engineers each year in Europe alone, of which a couple of hundred will be here at TU Delft. The challenge in terms of research is in developing enormous new offshore turbines, which are robust, reliable and smart enough to ensure they almost always keep turning. If we succeed, we'll be able to harness a quarter of our electricity from the sea."
Mertens: "Listening to the endless barrage of misconceptions. You hear people complaining that sustainable energy runs on subsidies, but that's not true. Fossil energy has many more hidden costs and subsidies. Fossil energy should be a lot more expensive given the large amounts of coal needed to generate this form of energy, and the miserable working conditions Chinese labourers have to endure while excavating it. There are also a lot of external costs involved with fossil energy that are not calculated into the price: the greenhouse effect, raising dykes, the increasing number of weather-related natural disasters."

Under which circumstances would you resign?

Van Bussel: "Reduced funding from The Hague is already making it difficult to sustain current levels of staffing. It there are further cutbacks, we will reach breaking point. I have great admiration for our teaching staff, who invest all their time and energy into providing quality teaching while trying to conduct research, but this situation is clearly not sustainable. And not enough people are aware of this."
Mertens: "The main motivation for moving into industry was all the 'political griping' I simply didn't agree with it. Different departments and branches were supposed to cooperate with one another but didn't want to. It was dampening my enthusiasm. And then eventually a situation arises where you think: 'This is going to take far too long. I don't want to end up in a position where I'm thinking, if only I had …' Running your own business is very demanding but I'd much rather take that leap of faith than become an 'if only' person."

In which areas can TU Delft not afford to economise?

Van Bussel: "Experimental facilities. This is Delft's unique selling point. Universities working with desktop research are two a penny. Experimental facilities are the key to solving the major problems facing us over the next 20 years. It's easier to close down facilities than fire people, but once you've closed them, that's it, you never get them back."
Mertens: "We need to stay committed to innovation. Administrators need to be open to risk-taking." ◂◂

Long-awaited sunrise

Is solar energy finally going to make its long-awaited breakthrough? More and more signs are pointing that way. Even Professor Miro Zeman, who has been active in solar cell technology for twenty years, is expecting the price performance ratio to improve dramatically over the coming years.

Jos Wassink

"Solar energy will be competing with electricity for customers as early as 2015," solar energy expert, Professor Wim Sinke, predicted last year in NRC Handelsblad, a Dutch newspaper. Prof. Sinke is affiliated with the ECN energy research centre and Utrecht University. According to the NRC, the rapid fall in solar panel prices - which surprised even Prof. Sinke – stemmed from the globalisation of the solar market. Six months later, this trend became manifest when the Al Manhal group, based in Abu Dhabi, invested600 million euros in a silicon plant (known as 'The Silicon Mine' or TSM) in Geleen (province of Limburg). The Silicon Mine is now the third such plant to be established in Limburg, after Scheuten Solar (Venlo) and Solland Solar (Heerlen). A pilot plant for manufacturing thin, flexible solar cells is also operational at Nuon Helianthos in Arnhem.

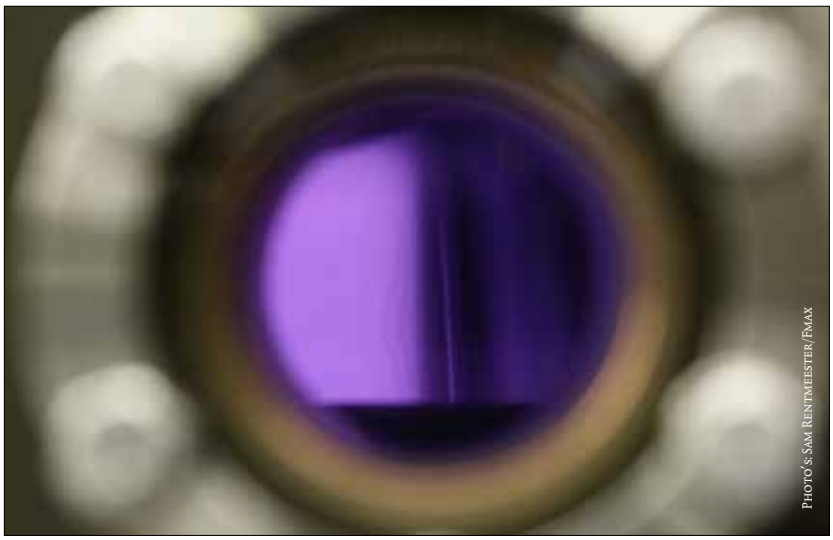
'amorphous silicon has no crystalline structure'

Professor Miro Zeman is also seeing lots of new developments in the photovoltaic world (solar cells). Prof. Zeman heads the photovoltaic materials and devices research group (which includes solar cells) at TU Delft's faculty of Electrical Engineering, Mathematics and Computer Science. "Three or four years ago, we saw a huge growth in the production of crystalline silicon solar cells, which led to a shortage of crystalline silicon. As early as 2005, the PV industry was using more silicon than the electronics industry." This had two effects: more silicon plants were built, but the shortage in resources forced solar panel manufacturers to improve the efficiency of their solar cells. Three years later, the situation is such that efficiency has actually improved and there is once again a ready supply of silicon available. Consequently, Zeman expects to see a marked improvement in the price performance ratio of solar panels.

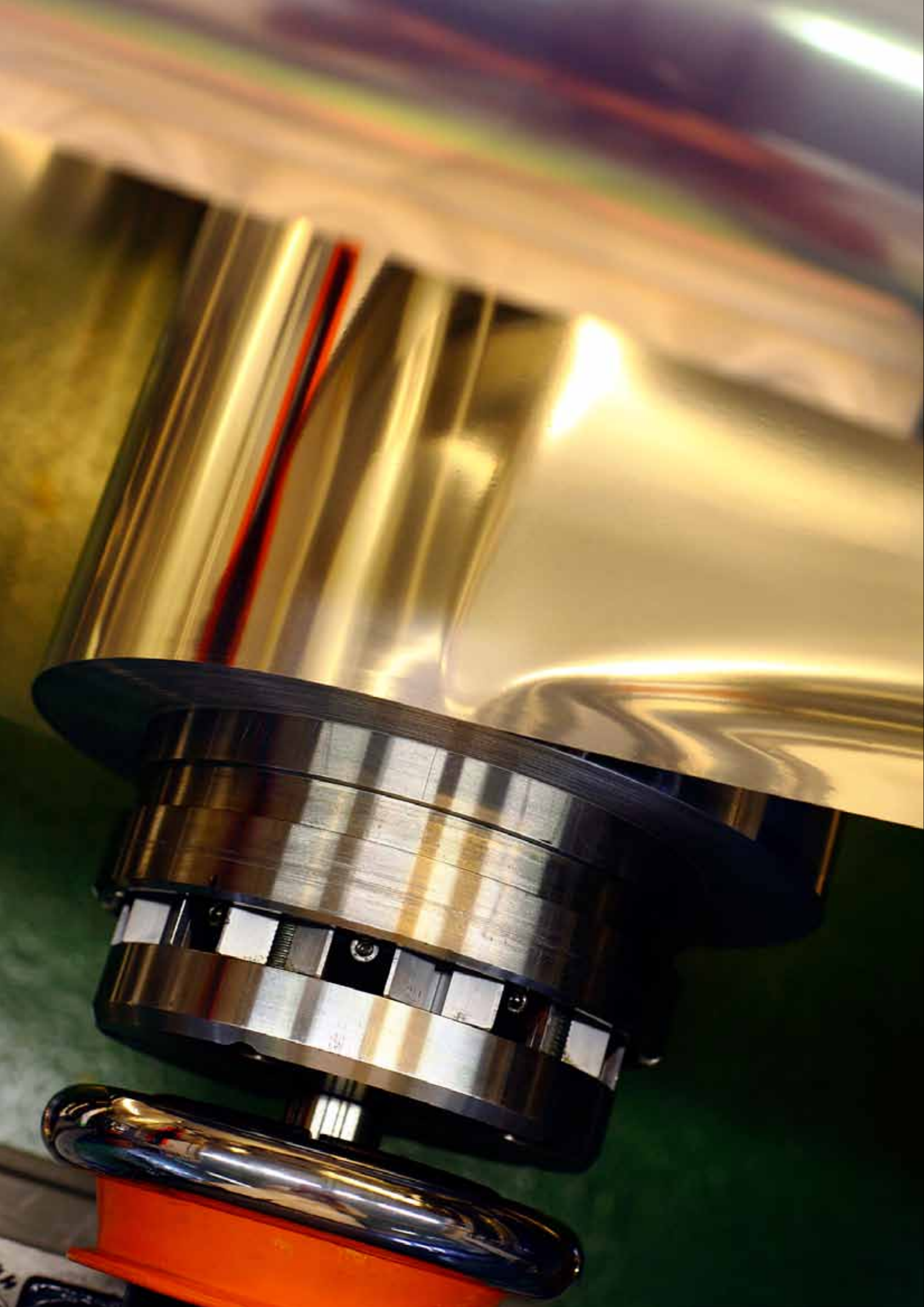
Research

A modest man, Prof. Zeman lists his group's research activities in an unassuming manner, before going on to talk enthusiastically about the new deposition machine, Amigo, which was recently installed in the DIMES lab. The new machine ▸▸

Heliathos produces solar cells on a roll.



Photo's: Sam Rentmeester/Fmax



Professor Miro Zeman: "I see lots of new developments in the photovoltaic world."

facilitates the full automation of complete, experimental stacked solar cells, a first for the Netherlands. The professor is, however, far more taciturn about his long list of personal accolades, which include winning the 2008 Delft Entrepreneurial Scientist Award, given to TU Delft's best and most enterprising professor;' his many successful applications to the NL Agency (formerly SenterNovem),

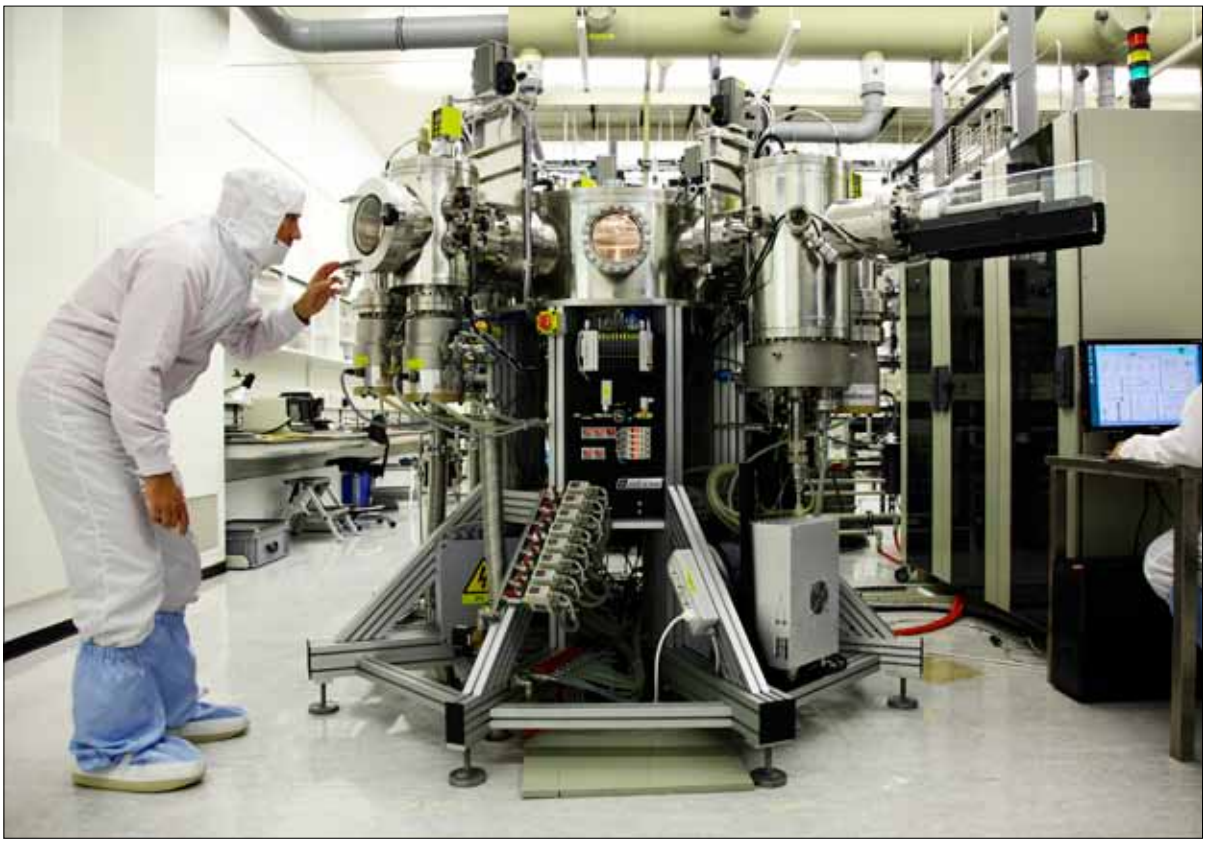
'His research concentrates on thin film solar cells'

the government department for sustainable innovation; and the long list of research institutes, industries and universities worldwide that use his ASA (Advanced Semiconductor Analysis) simulation software.
Prof. Zeman has been steeped in the world of silicon since embarking on his PhD research back in 1983 at the University of Bratislava, in Slovakia. In 1989, his expertise in amorphous silicon brought him to Delft. Unlike the crystalline silicon applied in standard solar cells, amorphous silicon has no crystalline structure. In addition to amorphous silicon, the professor also works with micro-crystalline silicon, which contains crystals, tens of nanometres in diameter, embedded in amorphous material.

Since 2009, Prof. Zeman has headed his own research group, focused entirely on solar cells. His research concentrates on thin film solar cells, a technology with great promise for future applications. Thin film cells are expected to eventually dominate the market, thanks to a manufacturing process that makes it possible to produce a much larger surface area. Thin film solar cells are "deposited" from silane gas, whose molecules consist of a silicon atom surrounded by four hydrogen atoms. High frequency radiation causes the silane molecules to disintegrate, after which the silicon attaches itself to a carrier. The growing silicon film takes on a microcrystalline structure as the dilution of silane with hydrogen reaches the optimal ratio. These kind of solar cells have significant advantages (larger surface area, cheaper to produce and less material required) over those made from silicon chips, but they also have one major drawback: lower efficiency. Prof. Zeman and his group are, therefore, constantly developing new ways to maximise the solar cell's energy yield. Ideally, he would like to see each photon produce one electron. But until that happens, Prof. Zeman and his fellow researchers are continuing to devise numerous tricks to ensure that photons are not allowed to slip away before transferring their energy to the silicon. (See box: Bag of Tricks)

Network

The longest-running partnership with industry so far is with Nuon Helianthos, an Arnhem-based manufacturer of thin film solar cells that announced last August a record efficiency of 9.1 percent. The company's managing director, Gert Jan Jongerden, describes the partnership thusly: "Any new devices are based on the solar cell architecture developed by Professor Zeman. We then develop processes that make similar devices with high performance, throughput and uptime. [Fast and reliable processes with ▸▸



Complete solar cells can be made with the Amigo.

a high energy yield, ed.]. We manufacture an industrial product in an economically responsible way. This is a real departure from the norm."
Besides Nuon Helianthos, Prof. Zeman is involved in ongoing projects with Solland, OM&T (Optical Media & Technology), the research institutes ECN and TNO, and Eindhoven University of Technology. He notes that even within the mainstream solar cell industry there is a growing interest in techniques that reduce material use and increase efficiency. Industry often uses fundamental knowledge and the ASA simulation programme as a guide for improving their products.

For more than twenty years, Prof. Zeman has been quietly working away on the advancement of solar cells within an extensive network. Whether the time has come for solar energy to make its big breakthrough and finally put an end to the marginal role it has played thus far, no one can say for sure. Jongerden sums it up simply: "The most critical factor is the price of electricity. This is determined by efficiency, system costs and durability."

Gert Jan Jongerden.

Sale threatens Nuon-Helianthos

Energy company Nuon announced in late October that it wants to jettison the Helianthos solar cell factory. The Swedish parent company, Vattenfall, has decided to pursue a reorientation, with cuts made in nuclear energy investments. The solar cell technology that Nuon bought from AkzoNobel in 2006 will therefore be put up for sale. A Chinese company, Hanergy, has been named as possible buyer.

Costs and energy yield

Thin film silicon solar cells were given their name for an obvious reason - with a thickness of 250 to 1500 nanometres, they are hundreds of times thinner than crystalline solar cells, which are one-fourth to one-tenth of a millimetre thick.

It is not easy to determine the efficiency of thin film silicon solar cells. In order to compete with crystalline solar cells and other thin film technologies, thin film silicon solar cells need to achieve 20 percent efficiency in the lab, Professor Zeman recently wrote in a science journal. Current cell efficiencies are somewhere between 12 and 15 percent. Prototype efficiencies are between 7 and 13 percent, while production modules are in the range of 9 percent. Over time, the energy yield of amorphous silicon solar cells decreases by about one-quarter, until the efficiency stabilises at around 7 percent. The costs are currently around 100 euros per square metre, although the US Department of Energy is aiming at less than half that amount. By comparison, the large scale production efficiency for crystalline solar cells is around 15 percent. Within just five years, the costs have decreased from 500 euros to 220 euros per square meter.

Bag of Tricks

Bouncing photons

A thin film solar cell is made by depositing the silicon on glass or foil that has been coated with a layer of transparent conducting oxide (TCO). Added to this is a layer of p-type silicon, an intrinsic absorbing intermediate layer, and an n-type layer. Together they form just half a micrometre of silicon. A silver or aluminium layer is then applied behind the n-layer to act as a reflector and electrode. When a photon detaches an electron from the silicon, the prevailing electrostatic field transports it to the n-layer. Various methods have been devised to capture light particles as efficiently as possible in the intrinsic silicon layer. One way is to fit the glass with diffraction grating, a periodic structure which splits light into several beams spaced 500 nanometres apart. The grating diffracts the incident light, resulting in higher absorption in the cell. Moreover, the increase in the light's angle of incidence ensures that less light is able to escape through reflection at the rear of the cell. These two aspects together increase the total absorption in the cell and therefore its efficiency (by 14 percent). The absorption can be further increased by coating the rear wall with silver nanoparticles approximately 0.1 micrometers in diameter, which diffracts the reflected light. Replacing the silver rear wall with a succession of different silicon-based layers of carefully selected thicknesses (experts talk about a photonic crystal) increases the reflection without causing losses in the silver electrode.

Light resistant

The efficiency of a thin film solar cell drops initially by 20 to 40 percent due to damage in the material caused by sunlight. Dr Gijs Elzakker (a PhD student of Prof. Zeman) recently discovered that the decline in efficiency can be limited to 11 percent. He found that he could limit the decline in absolute efficiency of the cell from 9 percent to 8 percent (instead of 7 percent). Van Elzakker achieved this by diluting silane (from which the silicon is deposited) with large volumes of hydrogen. Although this slows down the growth, it makes the cell more resistant to light.

Tandem cell

Diluting the silane has another effect: it changes the structure of the formed silicon from amorphous to microcrystalline, which carries very different properties. The combination of amorphous and microcrystalline silicon is optimised in the so-called tandem cell - a combination of two thin film solar cells layered on top of one another. The upper cell with amorphous silicon (bandgap 1.7 eV) is particularly sensitive to blue and green light. The lower cell with microcrystalline silicon (bandgap 1.1 eV) is particularly sensitive to yellow and red light (including infra-red).

The tandem cell is regarded as the high-tech solution for thin film solar cells. Last summer, Dr Jan Gilot, of TU Eindhoven, presented a plastic tandem cell with 7.5 percent efficiency. Earlier this year, the German company Leybold Optics, located near Frankfurt, announced a stable efficiency of 10.3 percent for their tandem cells with amorphous and microcrystalline silicon.

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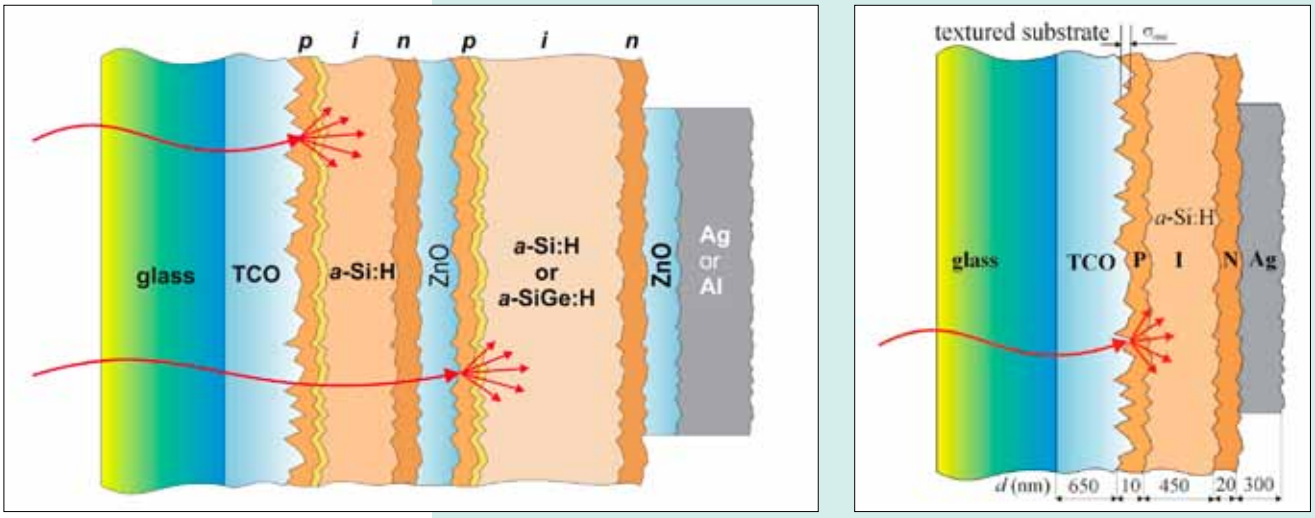


Schematic cross section of a single thin film solar cell (right) and a tandem cell (left).

FOCUS

The sentinels of Holland's spatial planning

In their heyday, Wytze Patijn, Jo Coenen and Mels Crouwel expanded the influence and prestige of the Chief Government Architect, despite the fact that they themselves were no longer designing any buildings. Government architects caught between vision and frustration.

JOOST PANHUYSEN

Wytze Patijn, Jo Coenen and Mels Crouwel. Each of these men brought their own interpretation and distinct character to the role of Chief Government Architect. And yet they often gave the impression of being kindred spirits. All three made the observation that here in the Netherlands we have a tendency to build up areas in a hasty, reckless and uncaring manner. They wanted to see greater coordination and clearer vision, in particular from the central government.
The role of the Chief Government Architect became increasingly defined as that of an independent expert who ministers, aldermen and citizens could turn to for a considered opinion. Patijn expanded the remit of the Chief Government Architect. Coenen devised the positions of 'Government advisor for infrastructure, landscape and national heritage' that would support the Chief Government Architect during Crouwel's term of office.
The Chief Government Architects turned their attention to motorways, river landscapes, intensive farming units and wind turbines. They stressed that careful design could make a world of difference, especially if the government were to show itself to be a strong client with a keen eye for quality and clearly defined commission plans.

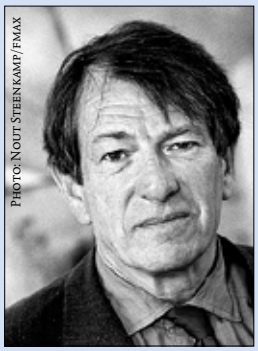
Office building of the Directorate General of Public Works and Water Management in Utrecht.

PHOTO: SAM RENTMEESTER/WWW

Drowning

In 1995, Patijn succeeded Kees Rijnboutt as Chief Government Architect. Rijnboutt had raised quite a few eyebrows with the Resident, a daring urban project in The Hague. He brought together government ministries, sought collaboration with project developers, and hired international architects, in particular. Though initiated by Rijnboutt, the iconic Resident buildings, were not actually realised until Patijn took office. Patijn believes that one should not serve longer than five or six years as Chief Government Architect. "Otherwise, you run the risk of becoming an institution," he explains. "Chief Government Architect is a position that confers influence and the key is to get out before you start to view this influence in terms of power."
When Patijn took office as Chief Government Architect, he initially felt as though he was drowning. "The nature of the work is so different from that of an architect that it took a while before I had a grip on the situation," he recalls. "There's no time to acclimatise, however. You have to get down to work immediately."
The renovation of historical buildings, the ▸▸

PHOTO: SAMI RENTMEISTER/FMAX



Wytze Patijn.

Jo Coenen.

Mels Crouwel.

construction of new prisons and courts, architectural memoranda, large urban planning programmes, dozens of commissions from the Government Buildings Agency to visual artists. Upon taking office in 1995, the Chief Government Architect was faced with a considerable number of projects.
After graduating from Delft University of Technology, Patijn first worked for the City of Rotterdam for a few years. "But I discovered that central government is a whole different world. Less decisive than a local government body, but more focused on policy and politics." Patijn received wide-based support from the start: not only from the people in the Chief Government Architect's offices but also from the Director-General of the Government Buildings Agency, his immediate boss. In 1996, Patijn commissioned the artist Ria van Eyk to design a carpet for the Central Hall in the Royal Palace in Amsterdam. Inspired by a photo of the Milky Way, Van Eyk created a 'celestial' carpet as a counterpoint to the 17th marble maps of the eastern and western hemispheres decorating the floor. The former Chief Government Architect is pleased with the result. "I'm proud of a great many things: for example, the embassies in Berlin and Addis Abeba, by Rem Koolhaas and Dick van Gameren, respectively. And the reconstruction of the 19th century domed prison in Breda."

'Central government is a whole different world'

His tenure as Chief Government Architect at the Ministry of Infrastructure and the Environment (VROM) spanned the terms of two ministers and two state secretaries. "The relationship with State Secretary Johan Remkes was not a particularly successful one, but that was largely down to the fact that as a classic right-wing politician he wanted to drastically reduce the government's role in the architectural field. Whereas Minister Pronk, I felt, clung too tightly to the traditional leftist approach when preparing the Fifth Memorandum on Spatial Planning, which gave the government a very dominant role. This was a great pity, as it made it easier for the government under Balkende's second term to radically decentralize spatial planning in 2004. The central government relinquished its control over spatial planning and was, therefore, powerless in the face of any ill-thought-out plans that threatened to blot the nation's landscape."
The government hoped to set a good example by commissioning sustainable government buildings. Under Patijn, for example, this led to stunning new office buildings in Terneuzen for the Directorate General of Public Works and Water Management (rijkswaterstaat). Patijn: "Built using sustainable materials – waste materials from the Directorate General – and still stylish."
Unfortunately, the Chief Government Architect was unable to exert the same degree of influence over the design for the new high speed rail link between Amsterdam and Antwerp (HSL-Zuid). It had its high points: Patijn once described the HSL bridge (designed by Benthem Crouwel Architects), which arches gently over the Hollandsch Diep river, as "a beautiful example of Dutch engineering art". Together with Tjeerd Dijkstra - Chief Government Architect in the 1980s - Patijn drew up plans to integrate the HSL-Zuid line into the surrounding landscape. However, the Ministry of Infrastructure and the Environment decided to outsource large parts of the project and, thus, aesthetics took a backseat to economic considerations.
Patijn is a strong proponent of good commissioning practice: a clear design brief is half the work. In 1999, the government, in fact, introduced an annual award, called the 'Seven Pyramids', for the best examples of architecture in this field, which was later renamed as the 'Golden Pyramid'.

Large-scale projects

Shortly before his departure, Patijn and a group of ministers launched what were known as the 'big projects', which came to characterise his successor's (Coenen) term in office. These included the Delta Metropolis, the A12, the Zuiderzeelijn rail link and the New Dutch Waterline. Coenen would soon add 'cluttering' to the nine major projects. In a TV programme, he criticized the proliferation of industrial estates along Dutch motorways. He would later conclude that designing for industrial estates presents the architect with intractable problems. It continued to be an issue for his successor, Crouwel. Coenen wanted to thrash out the big projects, which had been split up into a series of separate design briefs, in a new studio in a Jugendstil building not far from the Noordeinde Palace in The Hague. The move was frowned upon by the directorate of the Government Buildings Agency. However, the new spacious studio in The Hague's city centre soon

The building of the National Heritage Board in Amersfoort.

developed into a lively design factory and breeding ground for young talent.
Research carried out by Coenen revealed that the maglev line from Groningen to Amsterdam Central Station was not a viable design plan. "You'd have to dig up half of Amsterdam before you could lay down the magnetic rails," he concluded. The project was abandoned years later. This particular experience gave Coenen the idea of creating Government Advisors for infrastructure, landscape and (a little later) national heritage. They would be affiliated to various ministries. Coenen wanted to break down compartmentalisation.

'We were surprised at how the government organised these large projects'

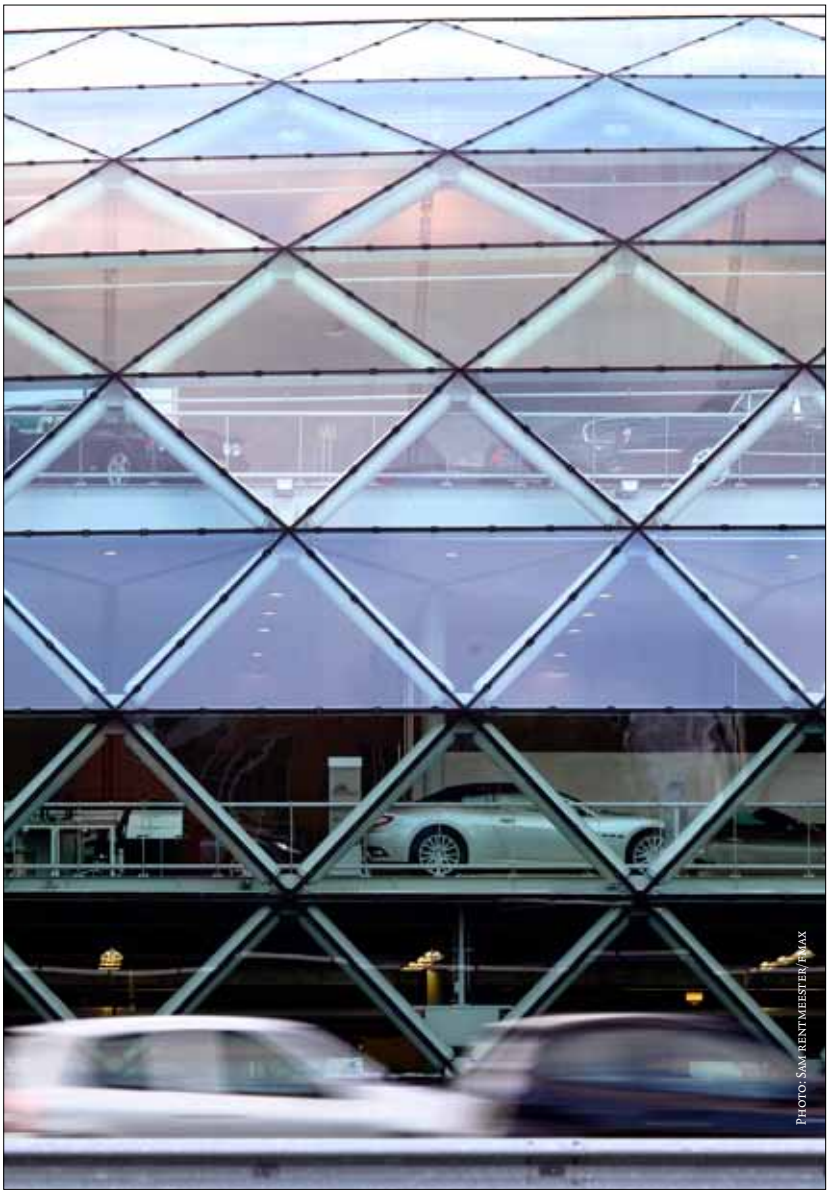
Coenen received overwhelming praise from left and right for his passion and ability to truly inspire others. A political animal or a cunning diplomat, however, he was not. He tried to repress his tendency to think out loud, which was not always appreciated in Dutch political circles. At the same time, however, his inimitable style sometimes managed to break down bureaucratic barriers. His greatest frustration lay in the government's lack of a clear vision on spatial planning.

Coenen called on Juan Navarro Baldeweg to design a building for the National Heritage Board. The Spanish architect drew inspiration from a painting by Jacob van Ruisdael: 'Landscape with a view of Haarlem'. The building, located next to the railway tracks in Amersfoort, was completed in 2009.

Architecture memorandum

Crouwel succeeded Coenen in the autumn of 2004. "Probably the best thing about taking up this post at the time was the newly formed Board of Government Advisors. Dirk Sijmons for Landscape, Fons Asselbergs for Natinoal Heritage, and Jan Brouwer for Infrastructure. This turned out to be a winning team. The Board – with the Chief Government Architect as chairman – appeared to supply a definite need. "We've issued a considerable amount of advice, which has often been heeded."
After 25 years in the business as architect and contractor, Crouwel was keen to sit on the other side of the desk: "I'm interested in all aspects of the profession." Benthem Crouwel has extensive experience working on major, long-running projects, such as Schipol and the HSL bridge. "We were surprised at how the government organised these large projects," he remarks. "Many different government bodies were consulted, even during the design phase. Each time a decision had to be made, the government official in question would have to first consult with the 'home front'. If it all got too complicated, the government would pass the matter onto the council, or someone would call for another study to be carried out. In short: we felt that the whole commissioning practice could be better organised and managed with a project team of professionals."
Even Crouwel was thrown in at the deep end. On his first day he sat down with a number of ministers and state secretaries to discuss the following ▸▸

The HSL bridge over the Hollandsch Diep river.



Sound barrier at the A2 motorway.

architecture memorandum. "While waiting for the meeting to begin, they all stood around drinking coffee and talking about spending cuts," says Crouwel, who, in his capacity as Chief Government Architect, presented two architecture memoranda. "When I took office, I was given a document on architecture policy by Bernard Colenbrander, a government official at the time and now a professor in Eindhoven. I and the studio were not particularly happy with it. So, we spent the first year working on this architecture memorandum, putting the emphasis back on best commissioning practices and the importance of an integral vision on spatial planning in the Netherlands."

As Crouwel was soon to discover, everyone wants to talk to the Chief Government Architect. "Before you know it, you've got nine meetings planned for the day, with no break," he says. "So, I had to start making choices. The Government Buildings Agency moved into a transitional phase, which eventually led to the architects disappearing from the organisation – something I wasn't against, incidentally. I'd devoted a great deal of time and effort to the process. And I noticed that you can sometimes achieve a lot more with one on-site visit than weeks of internal meetings. A site visit may seem purely ceremonial but that's how you meet the people you're going to be working with. It's also a question of making a few good remarks that the media may pick up on."

In his first years working for the Ministry of Infrastructure and the Environment, Crouwel had many dealings with Minister Sybilla Dekker. "She was a minister with a real heart for the building industry," he says with admiration. "Jacqueline Cramer, who succeeded her in early 2007, was more focused on sustainable energy and the environment." Having said that, Crouwel and Cramer work well together. They have managed to radically improve relations between the Ministry and the Royal Institute of Dutch Architects (the BNA). "Good personal contact with the Minister and Director-General is much more important than the political colour of a government. It shouldn't be, but that's the way it is."

'Young, promising architects should be given the opportunity to see their designs realised'

Crouwel is making some progress with regards to the strict application of the European tendering rules in the Netherlands. He believes that "young, promising architects at the beginning of their profession should be given the opportunity to see one of their designs realised". "Things have slightly improved," he adds. "For example, the Government Buildings Agency has removed a number of requirements for contractors that were not strictly necessary. This is of interest to lawyers as well, of course."

Another example of Crouwel's influence as Chief Government Architect is Happy Street, the Dutch pavilion designed by John Körmeling for the Shanghai World Expo 2010, which attracted 10 million visitors. Crouwel was chairman of the selection committee."

As a Government Architect, you're expected to do what's best for the country. This must be a heavy responsibility to bear. Crouwel: "You need to be careful you don't start thinking that you have to solve all the country's problems. You think you have a lot of influence and that you can determine how the Netherlands should look. That is complete nonsense. You're better off choosing three or four areas where you would like to see some improvement and harness all available resources to achieve those goals."

Een overzicht van belangrijke prijzen, benoemingen en andere opmerkelijke personalia van de TU Delft.

Sylvie Soudarissanane has been appointed chairperson of Promood, the association for PhD students. One of her aims is to raise Promood's profile among its potential members. She came into contact with the association by chance two years after her arrival at TU Delft. Sylvie believes that membership is a virtual necessity for PhD students, as they often have to operate in isolation and may tend to do the same in their personal lives unless they are aware of ways to meet other PhD students.

Engin Bozdag emerged as the winner of the Mozaic Award at the end of October. The Mosaic Award is an initiative by the Netherlands Organisation for Scientific Research (NWO) aimed at talented young graduates from an ethnic minority background. The prize of 200,000 euros will enable Engin to fund his own PhD research. He won the prize with his research proposal for cloud computing systems. Cloud computing enables users to make use of third-party data processes and storage.

Professor Tim van der Hagen was appointed Dean of the faculty of Applied Sciences (AS) at the beginning of September. This is the second time within a year that AS has had a new man at the helm, due to the relatively rapid and unexpected departure of Professor Raoul Bino. Professor Van der Hagen had already been deputising as Dean following Professor Bino's departure. He regards the office of Dean at AS as "a thoroughly enjoyable job in a fantastic faculty that is facing major challenges".

Professor Wubbo Ockels (Aerospace Engineering) is continuing to hit the headlines. October was the 25th anniversary of the former astronaut's space flight, which put the Netherlands on the map as a spacefaring nation. The occasion was marked with the publication of his own magazine. One month earlier, the life and work of Professor Ockels appeared in print in the biography *De zeven levens van Wubbo Ockels* ('The Seven Lives of Wubbo Ockels'), written by his daughter Gean.

Dr Ciano Aydin has occupied the Thomas More Chair at the faculty of Technology, Policy and Management since 1 September. In his new position, the endowed professor will focus on "philosophy and the applied sciences in relation to Christian beliefs". The Thomas More Chair is an initiative funded by the Roman Catholic foundation of the same name. Dr Aydin is not Catholic himself, but a member of the Syrian Orthodox church. He is a psychologist and philosopher of Aramaic descent. He obtained his PhD in 2003 writing on Nietzsche's deconstruction of the notion of substance. In 2006, Dr Aydin took up a research position at Radboud University in Nijmegen, funded by a Veni grant.

Associate Professor **Dr Laure Itard** of the OTB research institute gave her inaugural address on 30 November as lecturer in Energy and the Built Environment at The Hague University of Applied Sciences. She has held the post since 1 January 2010. Her research unit develops knowledge on how to make the energy chain in the built environment more sustainable and disseminates that knowledge throughout the sector. Dr Itard obtained her PhD in 1998 at TU Delft's faculty of Mechanical Engineering on research into wet compression/resorption in heat pumps. Until 2004 she was a software developer for installations in the field of sustainable indoor climate and energy at Deerns engineering firm. Since 2004 she has been conducting and supervising research at OTB into the sustainability of housing and installations, and the relationship between energy consumption and consumer behaviour.

Professor Henk Sips has been appointed the (acting) Dean of the faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS), as of 1 November 2010. He will hold this office until a successor can be found for Professor Daan Lenstra, who has retired. As vice-dean, Sips had overseen the implementation of the EEMCS faculty's revaluation plans, which began last June.

Professor Mark van Loosdrecht, a professor of biotechnology at the faculty of Applied Sciences, has been awarded an honorary doctorate by Switzerland's leading university of technology, ETH Zurich, in honour of his 'outstanding achievements in the field of environmental biotechnology and numerous conversions of scientific knowledge into practical purification techniques'.

[HORA·EST]

Propositions

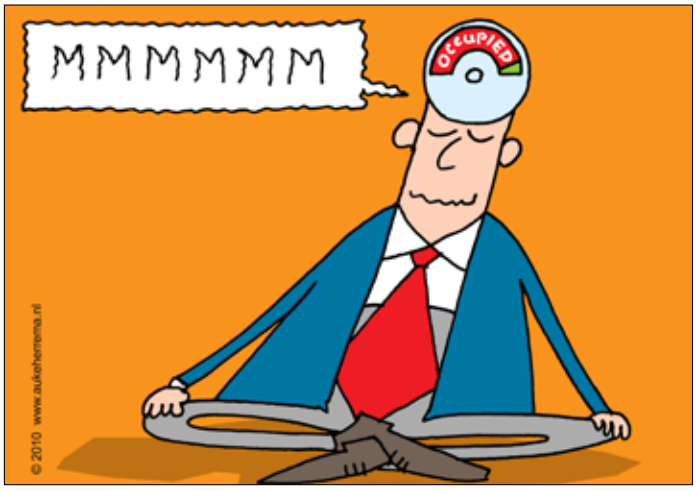
We use a base-10 numeral system because we have 5 fingers per hand. Actually, counting would be easier if human beings had 6 fingers, because 12 can be divided exactly bij 2, 3, 4, and 6, while 10 only by 2 and 5.
Luca Ghezzi,
ELECTRICAL ENGINEER

To have daring dreams, one sometimes needs to get some sleep.
Ludvik Lidicky,
TELECOM ENGINEER

The scientific evidence indicating that the orange color evokes high levels of arousal strongly suggests that the contribution of the orange uniform of the Dutch national soccer team to the magnitude of the passion displayed by their supporters, is more significant than the contribution coming from the quality of their soccer.
Esteban J. Freydell,
BIOTECHNOLOGICAL ENGINEER

A more sustainable university can be achieved by reverting to the old custom of granting PhD degrees based on only defending a list of propositions.
Stephan Hannot,
MATERIALS ENGINEER

The only private place lies inside the few cubic centimeters of the skull.
Vijay Venkateswaran,
ELECTRICAL ENGINEER



The only private place lies inside the few cubic centimeters of the skull.
Vijay Venkateswaran, ELECTRICAL ENGINEER

[Sound]BITES

"Thanks to gene or nanotechnology we can see for example that organisms are far more complex than we previously thought. Does the expansion of this sort of knowledge take away our sense of wonder, or does knowledge actually enhance the mystery?"
Endowed Professor of Philosophy Ciano Aydin in Dutch daily newspaper Trouw on whether technology is the natural enemy of religion.

"Our government is opting for flowers and food, high-tech systems and materials, water, creative industry, chemicals, pensions and social insurance schemes. (…) Whereas the power actually lies with the new businesses, the challengers."
Professor of Economics of Innovation Alfred Kleinknecht in Dutch daily newspaper NRC Handelsblad on the selection of the pharmaceutical sector as an economic focal point.

"There's no proof but it's reasonable to assume that the influence is considerable. And then I thought: if the negative influence can be so significant, how can we exert a positive effect on friction? Can't we find something revolutionary in terms of chemical technology?"
Researcher Arnoud Greidanus at 3mE Faculty in Trouw on whether a strand of pond weed attached to their boat could have slowed down the Netherlands' Rowing Four boat at the 2008 Olympic Games in China.


Sam Rentmeester/fmax

Proposition
Despite the emergence of the global village, language teaching in the Netherlands remains provincial.

Defence
"Modern modes of transport have brought us closer together and communication with the other side of the world is becoming ever easier, yet language teaching in the Netherlands – with the exception of English – still focuses on our geographical neighbours, France and Germany. At present, these countries are still our main trading partners, but this may not be the case in future. Why don't we teach our children Chinese at primary school and Spanish or Portuguese at secondary school in an effort to turn them into true citizens of the world?"

Daniel Saakes
INDUSTRIAL DESIGN ENGINEER

A TU Delft alumnus first writes a personal column, then passes the baton to another alumnus of their own choosing.

Even as a child I was fascinated by architecture, gazing up at buildings and trying to figure out how they were created. Nevertheless I went on to study business in Rotterdam for a year before deciding it wasn't for me and it was time to follow my heart. I then embarked on an architecture degree at TU Delft, brimming over with confidence. It wasn't long before I discovered that, while creative thinking was second nature to me, I wasn't destined for a career as an architect. When we were told to design a villa, everyone arrived with futuristic models abut I turned up with a sketch of a farmhouse with a few modern touches. Not exactly what the lecturer had in mind. But in the end I was awarded 8 out of 10 for the precision and attention to detail in my model.

The switch to real estate and housing was quick and painless. It was the middle way between business and construction, better suited to my temperament and a subject that I graduated in with the greatest of pleasure. I wrote my thesis at an Amsterdam real estate agency, where I stuck around for a few more years as a fledgling project developer. I had a thoroughly enjoyable time there and even went on to set up my own independent operation in the sector for a brief spell. But deep in my heart I wanted something else.

Now I am the owner of Fromanteel, a brand of watches and accessories for men. Together with a business partner, I decided two years ago that it was time for a change. We got to know each other around nine years back when we worked for RedBull as Student Brand Managers during our undergraduate years. We had great fun marketing those cans of energy drink and dreamt about how good it would be to do the same thing for ourselves, and for a product for which I have a passion: watches. We succeeded in hooking up with a Swiss watch studio and it was time for action. Now we have just launched our second collection of timepieces and are extending the brand with our first leather wallets.

The name Fromanteel comes from a family of clockmakers who had a workshop on Dam Square in the heart of Amsterdam around 400 years ago. They were the first to fit a pendulum mechanism in upright clocks. You could see it as the iPad of its time. It's a history that hardly anyone knows about and which we like to reflect in the fine details of our designs. Take our packaging for example: a sackcloth pouch with a lacquer seal. It's that kind of detail that sets us apart from other brands of watches. We embrace the challenge of thinking outside the box and producing an instantly recognisable product with its own unique appeal.

Entrepreneurship suits me down to the ground: working tirelessly at the helm of your own company, steering your own course, switching between product design, marketing, PR and sales. The responsibility rests on your own shoulders and it is intriguing to see how the market responds to what you yourself have created. Before I finish, I can't resist the temptation to let everyone know where they can find us: www.fromanteel.nl, and you can also follow us on www.facebook.nl/fromanteel.

Martijn van Hassel studied real estate and housing at TU Delft. He is the founder of Fromanteel watches. This was the final instalment in the series of Alumnus columns.

App for disaster victims

Tomas van Dijk

Aid workers often make the mistake of intuitively helping the first victims they come across instead of checking to see if there are people in more immediate need of help. Towards the end of the 1980s, in an effort to remedy this problem, the Swedish traumatologist Professor Tore Vikström devised the EmergoTrain System: a game that enables aid workers to simulate disaster relief efforts. Cardboard ambulance drivers, nurses, doctors and victims are stuck to a white board using magnets. Each of the 'victims' carries information on their condition (breathing, consciousness, blood loss and heart rate). The decision as to which victim should be helped first leads to heated arguments among the players.

Martin Boosman, from the serious gaming company, e-semble, which develops training software for aid workers, thought he could improve on the EmergoTrain characters by placing them in a virtual environment with a map of the area that included hospital locations. It was not a success. Players became glued to their computer screens. Gone were the heated arguments and raised voices and the only cries to be heard were from the virtual victims themselves.

Boosman racked his brains for a solution to making the game more realistic while still maintaining a virtual environment: "We wondered whether it would be possible to replace the white board with a large computer screen and started looking into the biggest screens on the market. We ended up getting stuck on this one train of thought."

An enormous computer screen eventually proved too expensive and impractical. It was at this point that Boosman asked Steven van Campen to help out. Van Campen, who originally graduated in aerospace engineering, was now embarking on a Master's degree in Industrial Design Engineering (IDE) and had come to Boosman with an idea for his IDE thesis.

"Van Campen thought it would be a lot more logical to fill the white board with lots of little screens," Boosman says, smiling. In the young engineer's modified game, each cardboard puppet has been replaced with an iPod-touch, for which Van Campen has developed a special app. This really brings the game to life; not only has it brought back the heated arguments, but the puppets' vital signs are also more dynamic as they respond to the help they receive, or do not receive, as the case may be.

Further information:
www.e-semble.com
www.emergotrain.se

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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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:
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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

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