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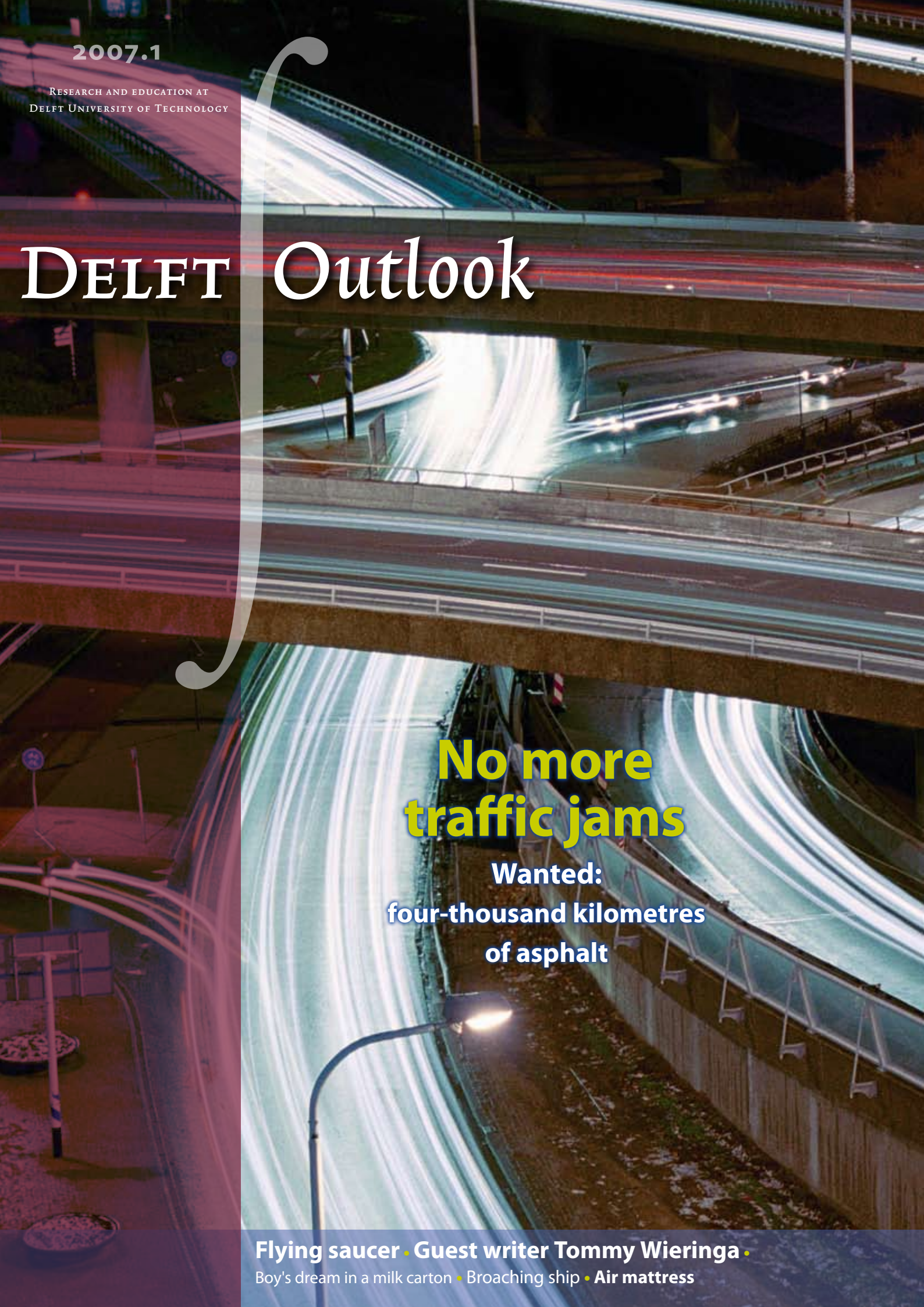
Research and education at
Delft University of Technology

Delft Outlook



No more traffic jams

Wanted:
four-thousand kilometres of asphalt

Flying saucer • **Guest writer Tommy Wieringa** •
Boy's dream in a milk carton • Broaching ship • **Air mattress**

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Delft Outlook

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While the tug of war in Den Haag continues over the laying of an extra kilometer of asphalt here or there, TU Delft researchers are playing with a virtual road network of the Netherlands. They are convinced we must think bigger, and they envision another four-thousand kilometers of traffic lanes: this will require more maintenance, but it will be an economic boon for the country. TU Delft students are putting the finishing touches on the Delfi-3. Super-small student satellites are extremely popular. The American professor Bob Twiggs, inventor of the cubesat, is pleased with all the interest: "This way, aerospace might transfer some of its old bravado to the students." Joe Speedboot, the title character and hero Tommy Wieringa's novel, aims to defy gravity 'with Icarus-like energy'. In this edition, Wieringa, currently TU Delft's guest writer, explains how he modeled the character Speedboot on the artist Joost Conijn, who converted fear into a thirst for action and lust for life and flew across the desert in his self-built plane.
Daring to think big. Bravado. Thirst for action and lust for life. As articulated in the theme of Wieringa's guest writership: desire.

Frans Godfroy
Editor-in-Chief

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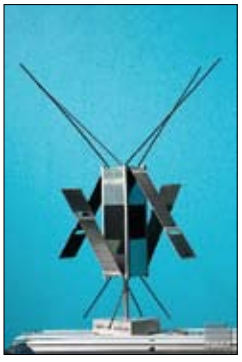

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COLOPHON

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editorial staff
Frans Godfroy (*editor-in-chief*),
Maarten Keulemans (*deputy editor-in-chief*),
Jorinde Hanse & Katja Wijnands (*managing editors*),
Saskia Bonger, Tomas van Dijk, Maaike Muller,
Joost Panhuysen, Sam Rentmeester (*image editor*).

office
P.O. Box 139
NL 2600 AC Delft
The Netherlands
T +31 15 278 4848
F +31 15 278 1855
www.delftoutlook.tudelft.nl
e-mail delftoutlook@tudelft.nl

contributing writers
Guus Berkhout, Dap Hartmann, George van Montfort,
Rutger Ockhorst, Angèle Steentjes, Jimmy Tigges,
Afke van der Toolen en Robert Visscher.

subscriptions
Anke Stronks
subscriptiondo@tudelft.nl
T +31 15 278 4848

translations
Margareth Clegg, Marcus de Geus, David McMullin

design & typesetting
Cok Francken – MultiMedia Services, TU Delft

photography
© TU Delft, tenzij anders vermeld

printing
DeltaHage BV, The Hague

editorial council
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prof.dr. J.W. Drukker (industrial design engineering)
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Air mattress

Sleeping on a floating bed. Time magazine selected architect Janjaap Ruijssenaars' sensational creation as the 'Best Home Invention 2006'.

Ruijssenaars perfected his floating bed six years ago. He uses repulsion magnets: one located in the floor, one in bed. The corners of the bed are held in place by four tethers attached to the ground.

The technical construction proved to be complex, but not impossible. Ruijssenaars managed to reduce the magnetic field above the bed to be practically zero. He also ensured that the mattress remains floating forty centimeters above the ground, that it can support nine-hundred kilograms and can easily be transported.

More information: www.universearchitecture.com.

Illustration: MSc Janjaap Ruijssenaars

Stomach-recumbent bike

Aerospace Engineering student François Geuskens hopes to break the world speed record for *human powered vehicles* while reclining on his stomach. His super-fast *pronebike*, a recumbent bike that you ride while laying on your stomach, must reach a speed of 90 kilometers per hour.
Stomach-recumbent bikes are faster than normal (back) recumbents, the student insists. "This is because you don't need to look over your feet or knees, and the frontal area is smaller, which means there is less air resistance. Moreover, recumbents that you ride while laying on your back are bad for your circulation, because your legs are positioned higher than your head."
Geuskens designed the bike himself. It's a 'shop-window mannequin for technology', says Geuskens, who hopes his invention will help make young people enthusiastic about technology. The bike weighs less than thirteen kilograms, which is about twice the average weight of a professional racing bike. In November, Geuskens' *pronebike* became an integral part of his final graduation project.

Photo: Hans Stakelbeek/FMAX

Meer informatie: François Geuskens, 06-22858926
francois@nlbike.nl, http://pronebike.nlbike.nl/

Helmets for the Chinese

Dr. Johan Molenbroek of the Faculty of Electrical Engineering, Mathematics and Computer Science has measured and mapped the faces and heads of two-thousand Chinese.

Asians use the measurements of Western heads when manufacturing all kinds of products. This is perfect for exporting products, but in their own countries, millions of Asian people are walking and riding around wearing ill-fitting sunglasses and headwear. You might think this would be a simple problem to solve, but the head and face measurements of Chinese, Taiwanese and other Southeast Asian people have never been properly established.

Molenbroek - together with his colleagues in Hong Kong - is currently working on the 'Size China' project. The ultimate aim of this government-sponsored project: well-fitting helmets, glasses and other headwear for the Chinese market.

In 2006, the researchers designed a measurement system that uses a three-dimensional laser scanner. A team of Chinese researchers then measured the heads of two-thousand Chinese in various regions of the country. This year all the head and facial measurements will be analyzed and made freely accessible via the Internet. Design tools will also be developed.

Photo: Size China

The World Heath Organization is also interested in the project: it recently asked Molenbroek to write a project proposal for better-fitting facemasks to protect against the Sars virus.

More information: Johan Molenbroek, tel 015-2783086, j.f.m.molenbroek@tudelft.nl, www.Sizechina.com.

IN·BRIEF

Look mom, no wings!

A revolutionary passenger plane, preferably without a nose or a tail. Or at least that is what researchers at the recently founded Delft aerospace department 'Delcraftworks' want to eventually design.

The Faculty of Aerospace Engineering's daring project aims to drag the aerospace sector out of the mire. For decades, the initiators say, nothing essential has changed in the design of passenger planes.

"An airplane should be tailless," said project leader Meine Oosten, "because the tail accounts for much of the air resistance. Preferably, a plane should be nose-less as well. And then all you would have left is the wing. What shape that wing would be, we don't know yet. It could be in the shape of a boomerang, ellipsis or a flying saucer."

The challenge is to render the wing steerable. To do this, it is necessary to be able to control the airflows around the plane. By using small suction devices built into the wing to suck away the air in certain places, the researchers believe they will be able to vary the wing's resistance and lift, which would therefore make it steerable.

More information: Meine Oosten, 015-2786388, m.p.oosten@tudelft.nl.

Illustration: TU Delft, Aerospace Engineering

Earplugs with brains

Wearing earplugs all day and still being able to talk with your colleagues. This will soon be possible when wearing special earplugs devised by TU Delft alumnus Engbert Wilmink (44), which only dampen the noise if it becomes too loud. This year the earplugs will start being sold in stores, the techno-starter expects. Wilmink's variable noise-dampening device is as small as a pill, and the custom-made earpiece is made of silicon otoplastic. The damper is equipped with a microphone. If the noise levels rise too high, the microphone emits a signal, which causes the noise-dampening valve in the earplug to close. The noise can be dampened from five to twenty-five decibels. Even though the technology is not yet fully developed, many companies have already expressed interest in purchasing the earplugs. Smart thinking, because Wilmink expects to sell millions of his hearing protector sets. "In Europe alone, there are some 60 million people whose jobs involve high noise levels."

More information:
Engbert Wilmink,
ewilmink@xs4all.nl.

Photo: Engbert Wilmink

Street music

Street music gains a whole new meaning in the graduation project of Jildw Albeda (Industrial Design). Albeda, who is also a drummer, designed a 'musical instrument' for on the street. Children can play their own tune by jumping back and forth on the transparent paving stones. These paving stones light up and make the sound of a tram or horn-honking car.

More information:
Jildw Albeda, jildw@dds.nl, www.jildw.nl.

Remote controlled plants

The expensive water content meters used in pot plants will be a thing of the past in a few years time, thanks to Professor Gerard Meijer and visiting staff member Dr. Max Hilhorst, of the electrical engineering department.
The researchers' 'Aquatag' costs less than five cents each. Hilhorst and Meijer used the same principle as the wireless and battery-free RFID-*tags*. These tags, which contain a chip that transmits identification codes, are currently used to prevent shoplifting in stores, but owing to the resonation ring on top of the tags, they are also extremely sensitive to liquid. By employing a so-called impedantion sensor, Hilhorst has adapted the chip cards to measure water levels. The electrodes in the cards are then continuously turned on and off, thus measuring the liquid in the pot. Thanks to this chip, plant growers can use a hand meter to retrieve information about the water content in the pot from a distance. He can therefore easily determine if and how much he should spray. The new system will save growers a lot of money. The water level meters currently used cost at least one hundred euro each.

More information: max.hilhorst@mmi-innovations.nl.

IN·BRIEF

Eternal asphalt

Highways that need only be closed for maintenance a few times each century. It seems this will be possible in the near future, thanks to a new TU Delft method for designing 'made-to-measure' asphalt
Dr. Tom Scarpas and PhD candidate Niki Kringos (structural mechanic section, Faculty of Civil Engineering & Geosciences) will model the deterioration of asphalt on the computer, with the thought being: 'if you fully understand the material, you can improve it'.
Kringos is striving toward a completely new way of designing asphalt: "In a year or two we'll hopefully have a databank set up: this will include the stones that are available to us, which are our bitumen. And then you design your asphalt mix on the computer."

More information:
Niki Kringos, 015-2785519, n.kringos@tudelft.nl.

Photo: Nout Steenkamp/FMAX

IN·BRIEF

Photo: Sam Rentmeester/FMAX

Gale force 10

The Faculty of Aerospace Engineering has a new wind tunnel, which includes a ventilator, weighing twelve-thousand kilos, that is one of the largest in the Netherlands. Workers are currently assembling the TU's eighth and largest wind tunnel. By the end of this year it will be blowing gale force 10 winds, along with bobsleds and scale-model wind turbines.

Projection porcelain

The potters at *Koninklijke Porceleyne Fles* (Royal Delft Porcelain) have been making Delft Blue ceramics for hundreds of years. But they will soon be doing this in a niftier way than ever before. Industrial designer Bart van den Berg developed the 'Blue Brush' for his final graduation project. The design tool allows the ceramic sellers to project their designs on the porcelain.

"Simply by using a digital projector located under the table, the sellers can quickly show their customers all kinds of different designs. This gives him a good idea of what the buyers wants," Van den Berg says. And the customer can immediately see what his unique, earthenware object will look like when it comes out of the kiln.

The Blue Brush also greatly reduces the workload of the porcelain painters, who, based on conversations and old designs, use a pencil to sketch the design on the pottery. If this sketched design is not what the customer wants, the painter must start over again.

More information: Bart van den Berg, b.vandenberg@gmail.com, studiolab.io.tudelft.nl/skin/bluebrush.

Photo: Sam Rentmeester/FMAX

Measuring the Delft qubit

Researchers at the Kavli Institute have devised an ingenious method for measuring qubits, the building blocks of a quantum computer.

The research group, led by Professor Hans Mooij, published an article about their method last January in the scientific journal Nature Physics. For years, measuring quantum objects, such as qubits, was an infernal challenge. An electron in a qubit can simultaneously be found in two shells located around the atomic nucleus, but while you are measuring this, the electron chooses one of the two shells. It is like opening a malfunctioning camera to see if the film is loaded correctly: your question is answered, but you can throw away the film, and as for the new role of film, you still can't be certain if it's loaded correctly. The TU Delft qubit is an angular loop, etched into a chip. Such a loop generates a magnetic field, which you can measure. Existing measurement methods disturb this field in such a way that the quantum state of the ring is altered. But by using this new approach, this is no longer the case. Roughly speaking, the loop is connected to the resonator. The resonator is then measured, not the loop itself. Consequently, the effect that the measuring has on the loop is minor enough as to not have any negative consequences for the quantum state.

This new measurement method could be very important for the ultimate aim of all qubit research: a quantum computer of such speed that it renders all existing computers obsolete. Or at least to be used for very specific calculation problems, such as finding prime numbers.

More information: Professor Hans Mooij, j.e.mooij@tudelft.nl, tel: 015-2786153.

Traffic paradise remains out of reach

Wanted: four thousand kilometres of tarmac

What Holland needs is a paradigm shift. We're at least four thousand kilometres of traffic lane short of even beginning to cope with congestion. While the government has been working on plans to sink more money into extra rush-hour lanes and the occasional stretch of tarmac, a team of researchers has been drawing a picture of the economically ideal road network for the country. Their findings are pretty shocking: "We have simply been thinking too small by several orders of magnitude."

Maarten Keulemans

Maaike Snelder lives in a strange world where you can get into your car in Rotterdam and drive to Amsterdam in thirty minutes along a ten-lane motorway cutting straight through the country's Green Heart. Rush hours belong to the past, and congestion has become an extremely rare phenomenon. Notorious problem roads such as the A12, A2, and A13 have been given four to five lanes in each direction; the A4 has been widened and has finally been extended into Rotterdam. In the south a ten-lane motorway lets you dash between Breda, Tilburg, and Eindhoven, and in the east the jumble of half-finished bits of motorway has been assimilated into a new traffic artery, a tarmac speed track reaching from Den Bosch all the way to Apeldoorn and beyond.

To motorists and truck drivers alike, Snelder's world is paradise come true. On average, it takes road users 17 percent less time to get to their destination, and travel distances are cut by 8 percent. While many of her motorways are wide enough to induce agoraphobia, some roads are no longer there. An example is the A7 that used to run along the dam separating the former Zuyderzee from the North Sea, and which has been abandoned for lack of traffic. Snelder's version of the Netherlands is a good sight cheaper, too, for although the upkeep of all those wide motorways requires a little more money, this is compensated by the fact that considerably less money needs to be spent on fuel and car maintenance and that motorists spend less office time stuck in traffic. All together the savings amount to 124 million euro a week, in other words, 18 million euro a day, or 738,000 euro an hour, or 200 euro each second. Easy money.

In fact, Snelder's world has only one snag, which is that it exists only on paper. Snelder's supervisor, Prof. Henk van Zuylen doesn't expect this to change any time soon. "This is not the type of concept society has been waiting for. Proposals like this simply don't appeal to the us." After all, Snelder's multi-lane motorways would be running right across picturesque villages and cutting straight through our most beloved beauty spots.

Therefore, the New Netherlands put forward by Snelder should be seen as a calculated thought experiment. The experiment started when she was doing an internship as an econometrics student from Rotterdam University at TNO Mobility and Logistics in Delft. "Everybody is always wondering how things could be made to run better. So, I thought it might be a good idea to try and ▸▸

Photo: Sam Rentmeester/FMAX

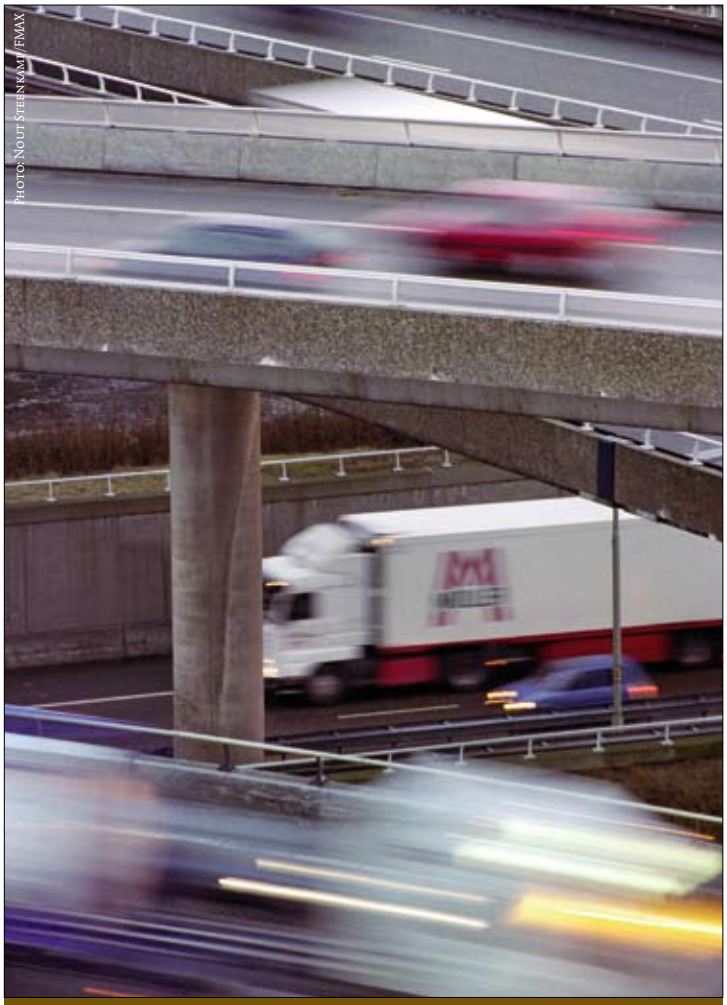


Photo: Nout Steenkamp/FMAX

… Or will it go quiet?

Is Holland heading for a traffic meltdown? The jury is still out on that one. Last year the Dutch Central Planning Bureau (CPB) studied four scenarios to see what we can expect until 2040. In three scenarios traffic congestion did not increase after 2010, but stabilised at roughly the 2002 level. In one scenario the pressure on the national road network decreased.
On the one hand the CPB expects that our wealth will increase, as will transport and mobility, but on the other hand there are such factors as the ageing population, additional road capacity, and the stabilisation of the number of cars per household.
What the end result will be depends mainly on the population. Should the population increase to 19.7 million in the year 2040, which is the upper range predicted by the CPB, we can look forward to a 70 percent increase of the number of congestion hours. In the event of the (slight) decrease to 15.8 million the CPB expects at the other end of the scale, the number of traffic jam hours will decrease by 70 percent.

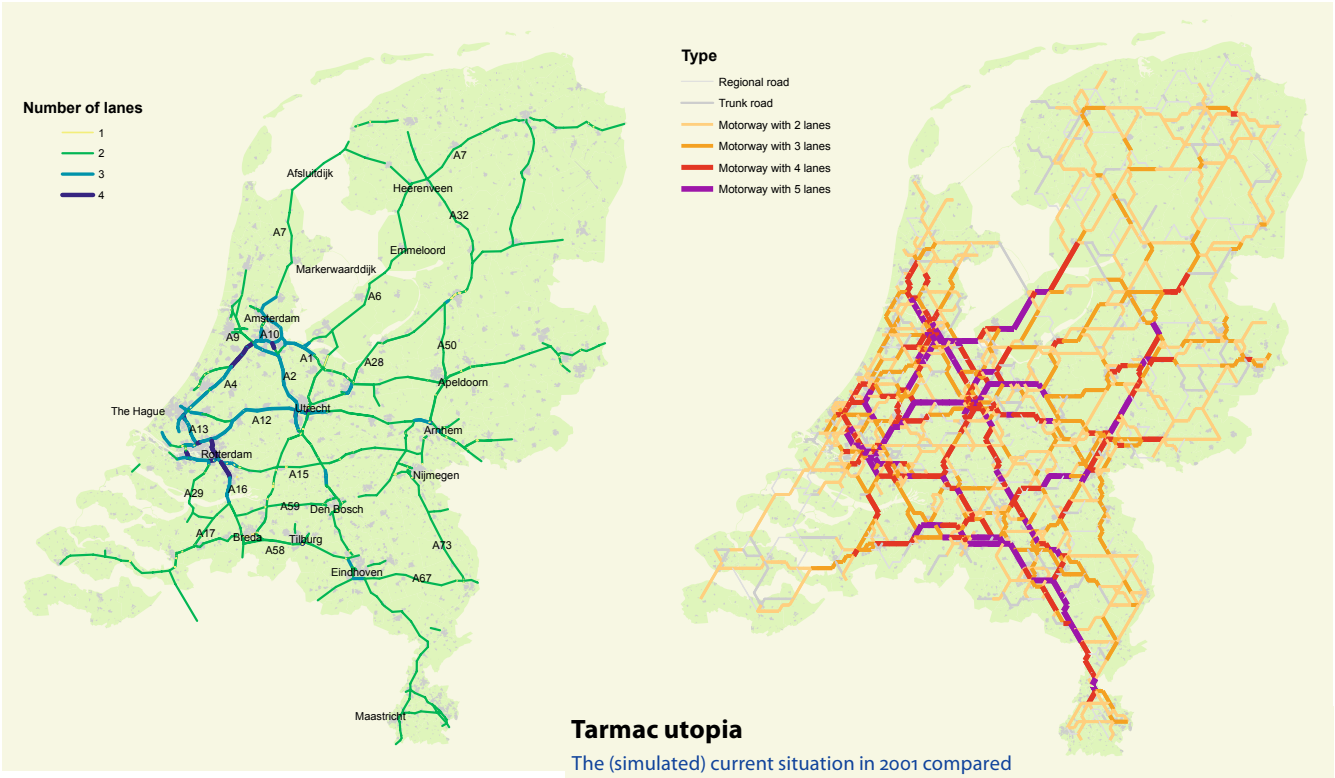
work it out," Snelder says. She then came up with the outrageous concept of simply removing every motorway in the Netherlands and redesigning the whole lot from scratch. What would an optimised roadmap of our country look like?

Car heaven

In the mean time, her contrary ideas have gathered support. Snelder's rebellion against the existing roadmap has been noted by the department of transport and planning of TUD (Civil Engineering and Geosciences), where Snelder hopes to gain her Ph.D. in about three years' time with supporting funding from TNO. Not surprising really, considering that Snelder's approach entails a refreshing reversal of accepted traffic science. Normally speaking, traffic experts tend to start looking at the supply side, i.e. the existing road

What would happen if all the Dutch motorways were to be removed? What if the road network were to be redesigned from scratch?

network, and the current set of rules. Not so Snelder, who focuses on the demand for road transport. Her car heaven is what you would end up with if motor traffic were given a free rein.
It's an eye opener, according to Prof. van Zuylen. "The Dutch way of thinking is to follow existing patterns. Each little piece of land has been allocated to a specific purpose, each square metre of motorway has to be fought over. There is certainly a case to be made for abandoning this strategy and experimenting with an entirely new approach."
Together with Prof. Dr. Albert Wagelmans (Erasmus University Rotterdam) and Prof. Ben Immers and Jeroen Schrijver of TNO, Snelder and van Zuylen hope to be able to present the new road network in scientific publications.
Snelder prepared her ideal road map using smart mathematics. She started by covering the map of the Netherlands with a grid of small triangles measuring three by three by three kilometres, representing imaginary motorways. Snelders then had the country's population travel along the road grid, based on Dutch traffic data provided by the Netherlands Institute for Spatial Research.
She was soon able to start discarding bits of motorway that were in little or no demand. She introduced pay-as-you-drive schemes where fewer people using a stretch of road meant that motorists had to pay more. At the same time, she started widening the most heavily used roads. The ideal



Tarmac utopia

The (simulated) current situation in 2001 compared with the ideal situation (showing kilometres).

	Current situation		Snelder	
	Road kilometres	Traffic lane kilometres	Road kilometres	Traffic lane kilometres
1 lane	21.860	21.860	3.973	3.973
2 lane	4.116	8.232	7.038	14.076
3 lane	642	1.926	2.642	7.926
4 lane	92	368	1.417	5.668
5 lane	2	10	973	4.865
Totaal	**26.712**	**32.396**	**16.043**	**36.508**
				+ 4.112 traffic lane km

road map of the Netherlands was beginning to take shape. "After about twenty optimisation runs it had reached its optimum state, where little or no change occurred."

The resulting dream of economy shares some remarkable similarities with the real world. Major connections such as the A1, the A2, the A6, the A12, and the A15 spontaneously reappeared. On the other hand, the experiment also produced a road that has been the subject of major controversy, the A3 between Rotterdam and Amsterdam, straight through the country's Green Heart. This is the proposed road that finally ended up being scrapped in the late nineteen sixties after a fierce public debate. "In fact, there is more than a bit of logic in

200 Euro every second. Easy money

having a direct connection between the two largest cities in the country," Snelder says. "At least, there is from a traffic point of view."

Draconic

If there is anything to be learnt from the map Snelder has produced, it must be that our country had better learn to live with congestion. Ideal traffic conditions appear to be achievable only through positively Draconian measures such as cutting through nature reserves or building suspended traffic lanes over existing roads. "I'm not a great fan of tarmac," van Zuylen says, "but this experiment shows that the optimum of economy is still a long way out of our reach. The simple fact is that our country needs road transport, and lots of it. The Ministry of Transport is far too hesitant in spending money on the traffic infrastructure. We really are thinking to small by several orders of magnitude."

This agrees with previous signals. For instance, the Netherlands Institute for Spatial Research published an alarming report three years ago in which it stated that without a change in policy the Netherlands were heading straight for a traffic meltdown. In 2020 the off-peak hours will be as busy as the evening rush hour is today. Passenger transport by road is expected to increase by 20 percent, with road haulage increasing by as much as 40 to 80 percent according to the Institute's report. Only two months ago [??Gaat dat kloppen met de verschijningsdatum? Zo niet, dan "Only a few months ago". MCdG] the Organisation for Economic Cooperation and Development (OECD) urged for road construction to be speeded up and for the accelerated introduction of pay-as-you-drive schemes in the Randstad area. The growth of Randstad productivity has been at a steady level of 1.2 percent for a decade, and this is considerably lower than in other European agglomerations, thanks to our traffic problems. The Ministry of Transport has published ▸▸

a Mobility Memorandum, which is to result in regional plans within a matter of months. The memorandum aims for an investment in traffic solutions of 80,000 million euro for the 2010–2020 period. Of this money, 19,000 million has been set aside for the construction of new motorway lanes and roads. However, Snelder's idealised world shows up these schemes in a different light. In her traffic paradise, the total capacity of the road network has been doubled. It features no less than 13 percent more traffic lane length than was actually available in 2001. This amounts to over four thousand kilometres, a traffic lane stretching from Amsterdam to Tehran. On multi-lane motorways, the total lane length has even been increased by 22 thousand kilometres. The current MoT target stands at one thousand to twelve hundred kilometres of new tarmac.

The difference is indeed rather disturbing, van Zuylen acknowledges. "The ministry is aiming for an increasing in lane length of about 10 percent by 2020, but our calculations show that we were in fact 13 percent short five years ago. Put simply, we're in trouble. If we consider the capacity we actually need, our road network needs to be considerably extended and intensified."

TNO researcher Prof. Ben Immers agrees that the government may be basing its policy on an illusion. And, he argues, there is a downside to simply stuffing the road network to capacity. "We are now in the process of using up the last bit of spare capacity of our main road network, by levelling traffic speed and controlling access to motorways for example. What we now see is that even small problems can have major effects due to lack of backup facilities. Any production man will tell you not to exceed 70 percent of your capacity if you don't want to make your production system inherently unstable."

Crib sheet

The map is only a rough, simplified sketch, Snelder knows. Minor local roads are ignored, and single-carriageway trunk roads are only partly included in the sketch. Snelder's experiment results in 80 percent fewer N roads than there actually are, but this result is distorted due to the road map with which Snelder compared her ideal layout of the Netherlands, and which she used to define road types. "In reality you would not just build four- or five-lane roads everywhere, Immers says. "It is very important to offer alternative routes, backup roads for when you run into trouble."

In 2020 off-peak hours will be as busy as today's evening rush hour

The map lacks accuracy on other points too. For example, it does not take into account the attractive effect that all that lovely new tarmac will have on motorists, nor did Snelder include the cost of bridges, tunnels, and viaducts. The map doesn't address such problems as noise, air pollution and lack of space either. Nonetheless the map may still be useful as a kind of crib sheet for the real world, Snelder thinks. "Some differences are helpful, others aren't. We might well be able to spread out our network map and point out where the priorities

A distorted view of Holland

Know your country. This is what the Netherlands look like, or at least, what the country would look like if one were to measure distance by the time it takes to travel by car from Amsterdam. This 'tempographical map' was produced a few years ago at the TUD Faculty of Architecture by Marijn Schenk and Bart Reuser, now both partners of Next Architects. "The idea was to visualise how traffic in the Netherlands works," says alumnus Michel Schreinemachers, who also worked on the project.

From a traffic point of view, Holland is a pretty strange, haphazard country, according to Schreinemachers. "We're lacking a number of superhighways. In Germany there is a hierarchy of long-distance autobahns, followed by trunk roads and local roads. We have nothing above our main network of roads. In fact, our motorways are simply trunk roads."

Source: Next Architects, Amsterdam

should be, or give advice like add a few kilometres here, include a rush-hour lane there."
For the time being, Snelder and her colleagues use the map in the quiet of their office for less exuberant, rather more academic work. For instance, the map adds useful information to what is known as the network design problem, a stubborn piece of mathematics notorious for its tendency to quickly become unsolvable when it turns into a so-called 'NP-complete' problem.
The map also serves a purpose as a research tool. Snelder, van Zuylen, and Immers are considering

An extra lane here, a rush-hour lane there

the idea of putting the ideal network to the test, for example by throttling one of its oversized arteries, or by removing a few main routes from the map. This could provide new knowledge for another classic traffic engineering problem: what does it take to make a road network robust? How many obstructions can it take? What can you expect in the way of capacity loss if a road becomes blocked? And, how can the robustness of the road network be improved? "The purpose of Maaike's study is to find out how a network functions without any backup options," Immers says. "We want to be better able to pinpoint the vulnerabilities of the road network."
Politicians take note, is what the TUD researchers are saying. Van Zuylen mentions the decision makers' preference for measures against rat-running. "The A13 motorway has two roads running parallel to it. One of these has been blocked off, while the other has sleeping policeman in it to discourage motorists. The upshot of it is that things come totally unstuck the moment something goes wrong on the motorway."

Vehicle tax

For the time being, the real-world Holland will have to make do with partial solutions like extra traffic lanes in some places, and rush-hour lanes in others. Government plans include a new method for taxing road users. Vehicle tax is to go, to be replaced by a pay-as-you-drive scheme. "Under the new legislation, a sales rep driving his diesel-powered car along the Amsterdam ring road during the morning rush hour will be charged more than someone up north driving a low-pollution car to work outside the rush hour" is how the Ministry of Transport puts it in a leaflet.
It all adds up. In 2002 researchers of CE consultants in Delft, the Vrije Universiteit Amsterdam, and 4Cast consultants in Leiden calculated what the results would be if pay-as-you-drive were to be introduced together with, on a limited scale, toll roads. The conclusion was that, on top of the proposed traffic lane additions, 'only' 400 kilometres of traffic lane would have to be added until the year 2020.
Another weapon in the fight against congestion that is rapidly gaining popularity among traffic engineers is the use of buffer zones, large staging areas on and near motorways where motorists will have to wait their turn in order to take the pressure off the roads – a bit like queuing up for a fairground attraction. These intentional traffic jams will take some getting used to, van Zuylen admits. "However, people will understand that there is little point in simply jamming a road." Better to just park the car, is what van Zuylen would say. "It saves fuel and aggravation. At least you'll be able to sit and read the paper, have a bite to eat, or shave."

More information: Maaike Snelder, maaike.snelder@tno.nl; Prof. Dr. Henk van Zuylen, h.j.vanzuylen@tudelft.nl, +31 (0)15 278 2761; Prof. Ben Immers, ben.immers@tno.nl, +31 (0) 15 269 6811.

Photo: Sam Rentmeester/FMAX

Experiments in the mind

It was the great Albert Einstein who gave the thought experiment its current place in the exact science toolbox. Traditionally, the thought experiment was the prerogative of philosophers, but when Einstein was working out his two theories of relativity, he did so using imaginary voyages at the speed of light and in a lift that accelerates endlessly. By now it has become established practice for exact scientists to experiment in the mind. There is Erwin Schrödinger's thought experiment with its famous cat that is both alive and dead at the same time, Edwin Abbott visualised the fourth dimension by contemplating the two-dimensional world of Flatland, and Max Tegmark mused on quantum suicide (result: the universe would split and Tegmark would remain alive).
Some months ago a British group of ecologists and climatologists tried to imagine what would happen if humankind were suddenly to disappear from the face of the earth. Among other results, the outcome of this thought experiment was that after fifty years 80 percent of all buildings would be overgrown, global warming would continue for at least a thousand years, and after a short reign of mice, rats, and dogs, the animal kingdom would recover.

A smart use of high-pressure carbon dioxide may make a special class of eco-friendly solvents known as ionic liquids much more attractive to the fine chemical industry. Researcher Dr. Maaike Kroon has demonstrated that, on paper at least, the savings can be astronomical.

Dap Hartmann

Carbon dioxide switching puts ionic liquid on the map

The ideal solution

The pharmaceutical industry is suffering from a bad public image. It uses up large amounts of energy and produces more waste than any other type of industry. On average, each kilo of useful product produces between 25 and 100 kilos of waste, and requires from 50 to 200 megajoules of energy – enough to boil 150 to 600 litres of water. In fact, the production of drugs generates a thousand times as much waste as the petrochemical industry does, and it uses twenty times as much energy.

The main culprits are the vast quantities of solvents used by the fine chemical process industry. Most of the chemical reactions take place in organic solvents such as methanol and acetone. Separating the reaction product from the solvent uses up lots of energy and produces lots of waste.

It will hardly come as a surprise that researchers have been looking for years to find more eco-friendly alternatives. Ever since the nineteen-nineties, much of the research effort has been directed towards the so-called ionic liquids. These liquids could well turn out to be the green alternative to organic solvents.

Ionic liquids are salts that are liquid at room temperature. They consist of large, asymmetrical ion carrying positive and negative charges that remain liquid because they do not easily form crystal lattices. This also gives them a great advantage over organic solvents: ionic liquids do not evaporate. As soon as a negative-charge ion (anion) escapes, the positive charge of the remaining liquid pulls it back in again. This means that no solvent is wasted and that the air does not get polluted.

Another major benefit is the versatility of ionic liquids as solvents. Chemicals normally dissolve only in a solvent whose molecular structure is closely related. For example, fats dissolve readily in alkanes (saturated hydrocarbons) because both are apolar, and cooking salt dissolves in water because both molecules have a positive and a negative pole, which makes them both polar. But what if you want to make a polar chemical react with an apolar chemical? This is where ionic liquids come in useful. "Ionic liquids can dissolve both polar and apolar chemicals," says Maaike Kroon. "They enable chemicals that wouldn't normally mix to be brought together in a single phase to allow them to mix at a molecular level and react with each other."

Art

The number of possible ionic liquids is practically unlimited, as any combination between a positively charged ion (cation) and an anion produces an ionic liquid. The art lies in finding combinations with the right properties. "By now some 250 ionic liquids have been researched in depth," Kroon explains. "We are trying to find the link between the structure of such a salt and its properties. It will enable us to design custom ionic liquids with properties that enable it to do exactly what's needed." The main properties involved are solubility and thermal and electrochemical stability. Kroon: "You're looking for an ionic liquid that is not volatile, flammable, or poisonous, and which breaks down naturally."

To make an ionic liquid useful to the chemical industry, is is also essential to know which chemicals do and which don't dissolve in the ionic liquid. "I have developed theoretical models that will let me design an ionic liquid in which the reagents will dissolve whereas the reaction product will not. The product will simply come floating to the surface, where it can easily be separated."

This could be the green alternative to organic solvents

Naturally, the industry's interest in the use of ionic liquids as 'green solvents' has been increasing. But things can get even better. The disadvantage of the current processes with ionic liquids is that they

Molten salt

The first ionic liquid was discovered in 1914 by a Latvian chemical engineer, Paul Walden. This was ethyl ammonium nitrate, which has a melting point of 12 degrees Celsius. Walden called it a 'molten salt'; the term 'ionic liquid' wasn't coined till much later.

Ionic liquids were initially used as electrolytes (in wet and dry batteries) and for electrolysis purposes. However, some useful applications remained undiscovered at the time, such as the production of metallic magnesium from magnesium chloride ($MgCl_2$).

In 1833 Michael Faraday managed to make metallic magnesium through electrolysis of liquid magnesium chloride. The problem is that the melting point of $MgCl_2$ is 714 degrees Celsius. The electrolysis of $MgCl_2$ in water is not an option, because magnesium immediately reacts with the water to form magnesium hydroxide, $Mg(OH)_2$.

In an ionic liquid, magnesium chloride dissolves at room temperature. Electrolysis can then be used to produce metallic magnesium. This saves a lot of energy and produces no harmful vapours. Nevertheless, magnesium is still being produced by melting magnesium chloride. Obviously, this takes place mostly in countries where electricity is very cheap, such as Scandinavia.

25 Years old and a Ph.D. with honours

At the tender age of 25 Maaike Kroon boasts an impressive scientific record: ten scientific articles, thirteen conference papers, a patent, and of course, her Ph.D. which she gained with honours in two years.
Kroon began her study of chemical technology and bioprocess technology at TUD in September 1999. She gained her bachelor's (2002) and master's (2004) degrees with honours as well. She did laboratory research at Purac, did conceptual process design at Shell, and completed an internship at Toshiba (in Tokyo). She also attended an honours track in innovation management at the faculty of Technology, Policy, and Management. In December 2006 she gained her Ph.D. supervised by Dr. Cor Peters and Prof. Dr. Geert-Jan Witkamp, the latter of whom has referred to Kroon as "the brightest student I have ever met".
Her current place of residence is Barcelona, where she will spend a year delving into nanotechnology. Afterwards she will to Delft, where she has been given a position as lecturer.

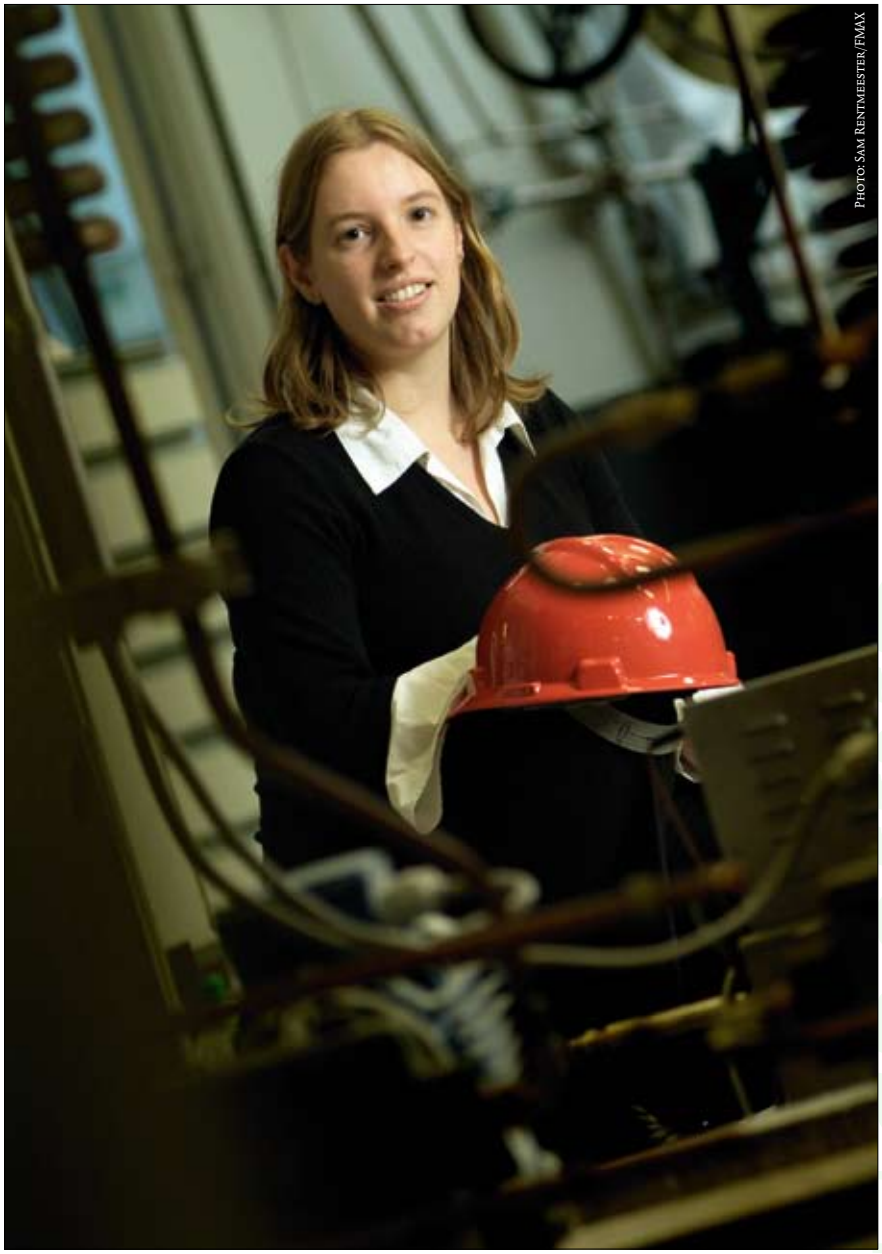


Photo: Sam Rentmeester/FMAX

are slow, which is caused in particular by the fact that several production stages are involved, with some time-consuming intermediate stages (see illustration on pages 14-15).
Maaike Kroon has discovered a way of speeding up the reaction process. During her promotion research she developed method in which the reactions and separations take place in a single homogeneous solution. Since all the reactants are dissolved in a single phase, the reaction rate increases considerably. This makes the use of 'green solvents' a lot more attractive.

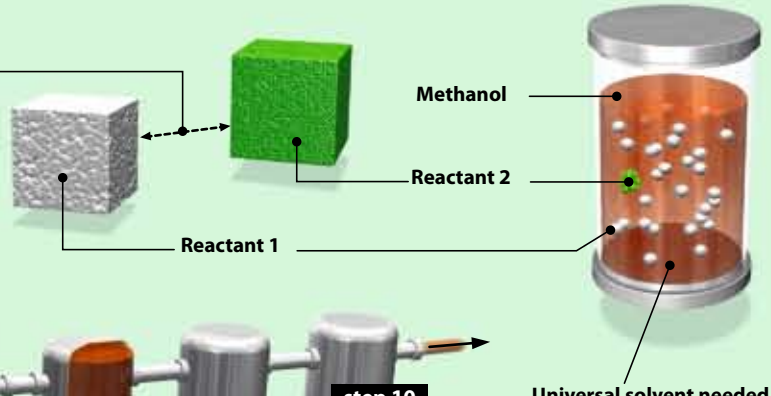
Supercritical

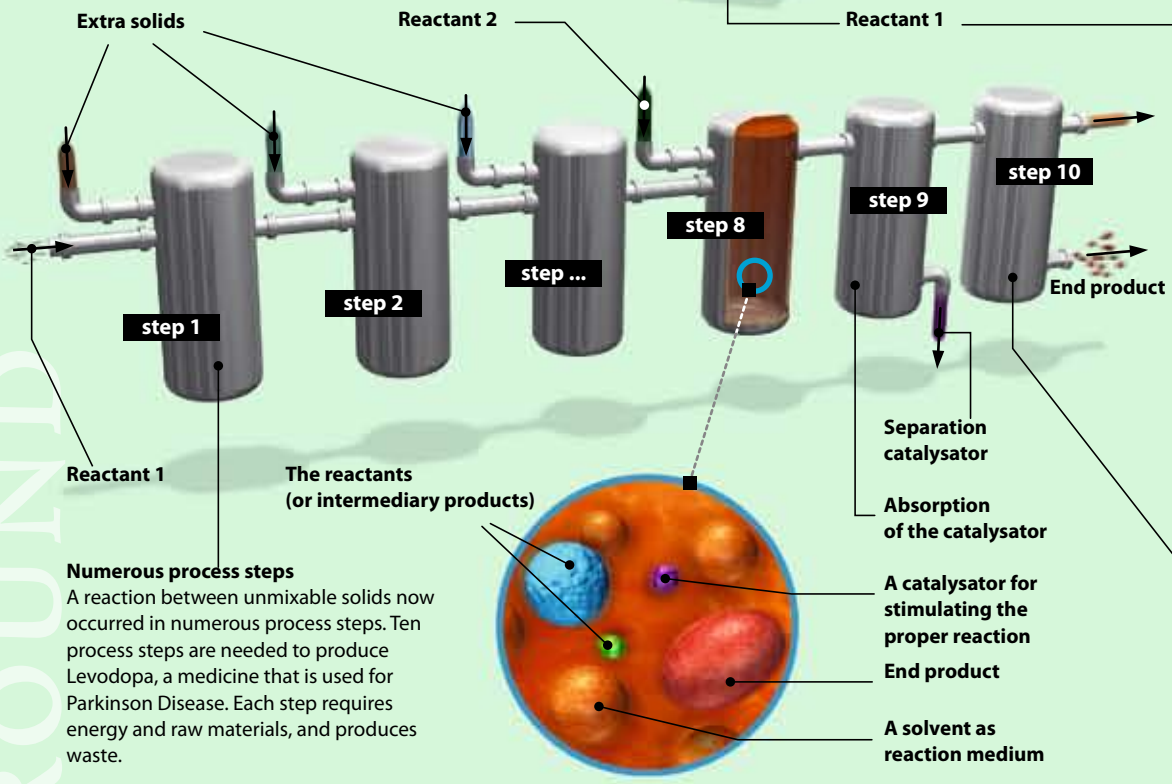
The key to the secret is carbon dioxide (CO_2), which, when added under high pressure to an ionic liquid, increases the solubility of certain chemicals. The CO_2 is in the so-called 'supercritical phase', a phase state in which there is no longer any difference between liquid and gas.
There is another advantage to using supercritical carbon dioxide. In the production process it can be used as a kind of switch between the various production stages. Once the reaction is completed, the pressure is lowered, and two phases are formed, the ionic liquid with the catalyst, and the supercritical CO_2 with the end product (see illustration, pages 14-15). Lowering the pressure even more will cause the CO_2 to evaporate, leaving only the product. The CO_2 can be repressurised, so it can be used again and again, as can the ionic liquid and the catalyst.
How big the consequences could be for the process industry became clear when in the course of her Ph.D. research Kroon investigated the effect of the new process on the production of Levodopa, a drug that is used to treat the symptoms of Parkinson's disease. The production of Levodopa currently involves ten process steps, all of which use energy and produce waste. In one of these steps, a reaction takes place between a solid and hydrogen, with methanol as the solvent. For each kilo of (intermediate) product, the process step uses 17 megajoules of energy, producing 3 kilos of waste material (methanol and catalyst). Using ionic liquids, the same step would use less than a third of the energy, and produce no waste. Worldwide on a yearly basis, this would save 20,000 gigajoules of energy, 4800 tons of methanol, and 480 kilos of catalyst, Kroon calculated.
The process has already been patented. Kroon: "Of course, the new technology looks fine in a laboratory environment, but I want it to be used in the real world of the fine chemical industry."

More information: maaike.kroon@gmail.com; Geert Jan Witkamp, g.j.witkamp@xs4all.nl.

Current method

Because the contact surface between two solids is very small, the chemical reaction between the solids occurs ineffectively. By dissolving the solids in a soluble agent, the molecules come into contact with each other, and this allows them to react well with each other.





Universal solvent needed
Solids dissolve most effectively in solvents that are similar molecularly. A polar solid dissolves best in, for example, methanol, but an apolar solid lumps together and does not mix or react. Until now, there was no existing solvent for a reaction between a polar and an apolar solid.

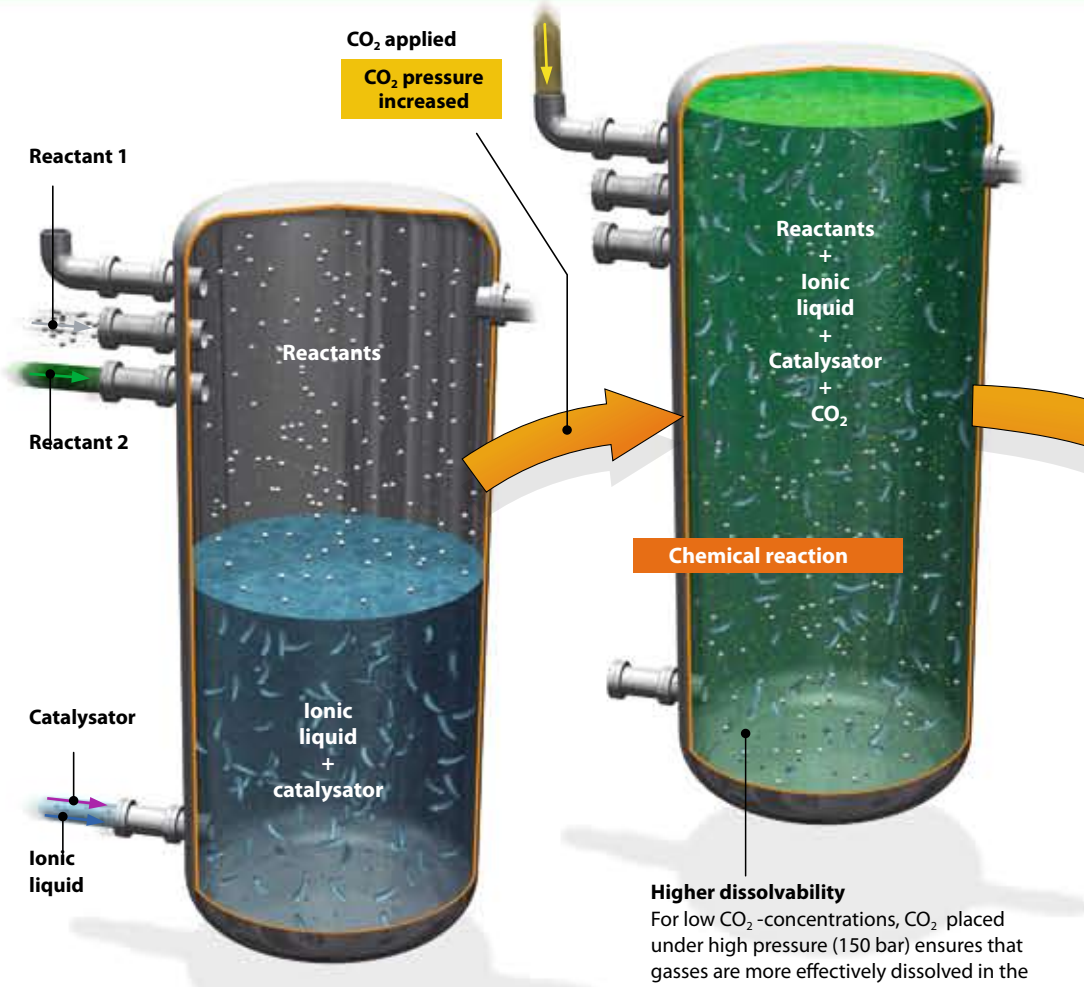
Numerous process steps
A reaction between unmixable solids now occurred in numerous process steps. Ten process steps are needed to produce Levodopa, a medicine that is used for Parkinson Disease. Each step requires energy and raw materials, and produces waste.

Evaporating solvent
To arrive at the left-over (Levodopa) product, five kWh per kg of end product is required to evaporate all the methanol. For every kilo of end product, three kg of waste is produced

New method

Discovering the homogenous phase
By increasing the CO_2 -pressure in the reactor chamber, the two non-mixable phases (supercritical CO_2 and the ionic liquid with catalysator) lead to a homogenous phase, in which all solids are dissolved. The reaction occurs during this phase. When the pressure is then decreased, the end product separates.

Why not discovered earlier?
Although the CO_2 -pressure is also increased during the two-phase process, a homogenous phase had never before been discovered. This was because of the (too) high CO_2 -concentrations (for supporting the extraction of the product from the ionic salt). Instead of a homogenous phase, two unmixable liquids (liquid CO_2 and ionic liquid) emerged when the CO_2 -pressure was increased.



Higher dissolvability
For low CO_2 -concentrations, CO_2 placed under high pressure (150 bar) ensures that gasses are more effectively dissolved in the ionic liquids.

ADVANTAGE 1 | High reaction speed

Because all solids (the reactants, the catalysator, the end product and the ionic liquid) are dissolved in one homogenous phase, the reaction speed is greatly increased.

Two-phase process

The combination of ionic liquids and supercritical CO_2 is an existing method for a two-phase-reaction procedure.

1 The reactants flow into the reactor chamber

2 The reactants dissolve in the ionic liquid

3 The catalysator is added and dissolves in the ionic liquid

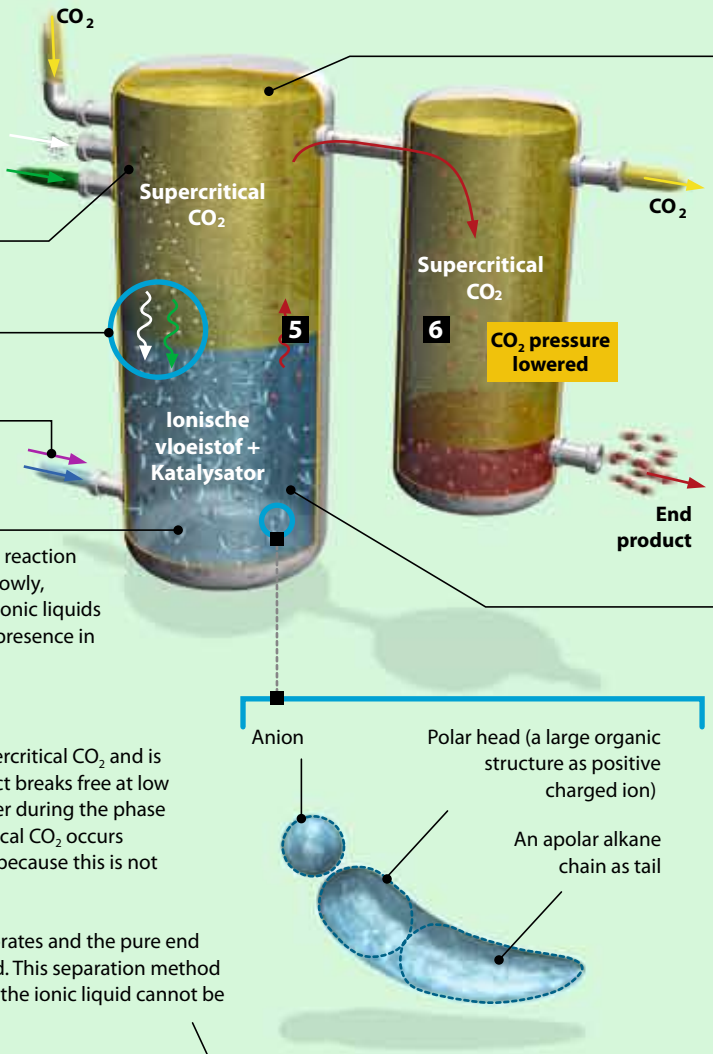
4 Ionic liquid-phase

The reaction occurs in the ionic liquid. A reaction between a gas and a solid occurs very slowly, because a gas does not dissolve well in ionic liquids and therefore has an extremely limited presence in the ionic salt.

5 Supercritical CO_2 -phase

The end product is dissolved in the supercritical CO_2 and is transported by the CO_2 . The end product breaks free at low rates of speed, because the mass-transfer during the phase transition from ionic liquid to super-critical CO_2 occurs slowly. The catalysator remains behind, because this is not dissolved in the ionic liquid.

6 By lowering the pressure, the CO_2 evaporates and the pure end product precipitates as a liquid or a solid. This separation method works well, because the catalysator and the ionic liquid cannot be dissolved in the supercritical CO2.



Supercritical CO_2

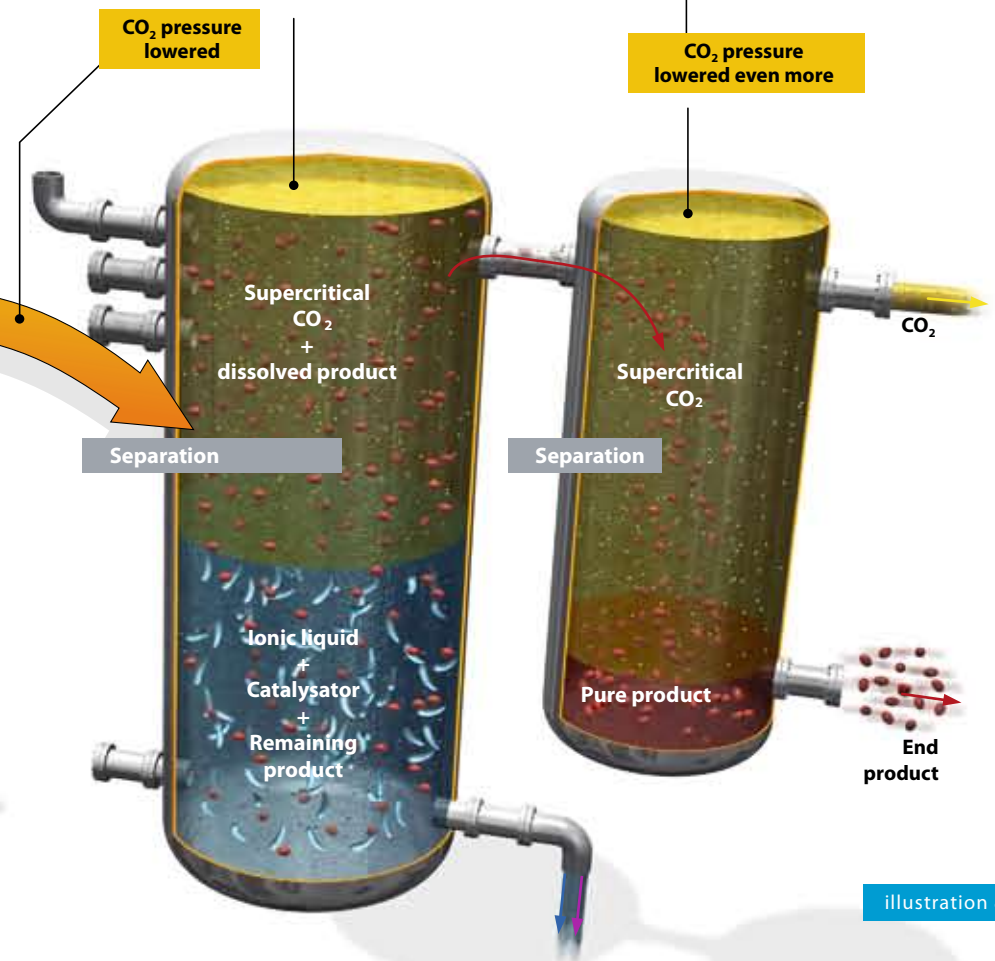
Supercritical CO_2 has properties that are between a gas and a liquid. Apolar components and organic solids dissolve well in supercritical CO_2 ; polar molecules (such as metallic catalysators) do not dissolve. Supercritical CO_2 can however dissolve in an ionic liquid, but an ionic liquid cannot dissolve in supercritical CO_2 (because an ionic liquid cannot evaporate).

Ionic liquids

Ionic liquids can mix together solids that are normally unmixable (organic and inorganic solids, polar and non-polar) and allow them to react to each other. Many catalysators are metallic (polar) and also dissolve well in ionic liquids. An important characteristic of ionic liquids is the fact that they are in a fluid state at room temperature (25° C) but cannot evaporate.

Regulating dissolvability with CO_2 -pressure

When the reaction is complete, the CO_2 -pressure is decreased and complete demixing occurs immediately.



ADVANTAGE 2 | Immediate separation/demixing

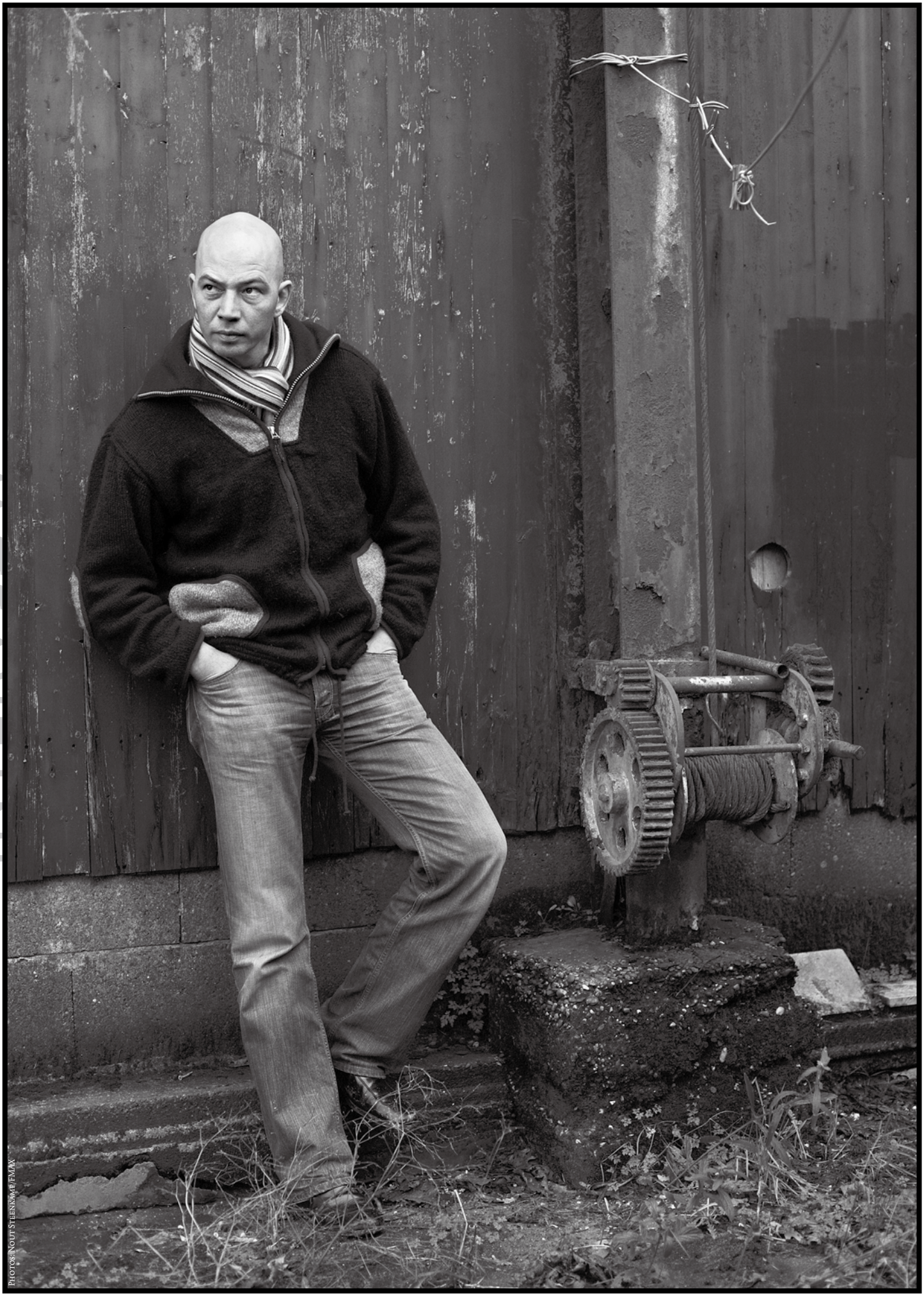
At low CO_2 -pressure, the homogenous phase immediately occurs in two-phases: the ionic liquid, with dissolved catalysator and any remaining products, and the supercritical CO_2 , with dissolved products (and any reactants). The CO_2 -pressure is an ideal parameter for switching between one phase for the reaction and two phases for the separation of the end product.

ADVANTAGE 3 | No pollution and safe

Traditional organic solvents (often flammable, poisonous and non-biodegradable) evaporate easily and enter into the air. Ionic liquid do not evaporate at room temperature and therefore do not pollute the air.

ADVANTAGE 4 | Energy-saving

The combination of reaction and separation in the same process step does not produce waste (fewer process steps are needed and no solvents evaporate) and uses much less energy. The CO2 is once again compressed and is completely reusable. The catalysator is added and dissolves in the ionic liquid. The reactants flow into the reactor chamber. The reactants dissolve in the ionic liquid.



Photos: Nout Steenkamp/FMAW

‘I don’t wait for my characters with a knife’

Tommy Wieringa is this year’s TU Delft guest writer.

“Joe Speedboot aroused my interest in technology.”

Joost Panhuysen

For the theme of your guest writership, you chose the ‘dynamic of desire’.

“Arnon Grunberg’s theme concerned the ‘technology of suffering’, but according to the Buddhist, desire comes before suffering.”

Did you consciously decide to relate to the theme of the previous guest writer?

“This was more of an afterthought. When I received the letter from TU Delft, I had just returned from spending a couple weeks on the French island Belle-île, where I had been as happy as a child, sitting there surrounded by all kinds of scotch broom flowers. Some people speak of ‘unimpassioned’ nature, but this nature was impassioned – everything was exuding passion and desire. There are scotch broom flowers growing there that have a ‘folding chair’ hidden behind the leaves. When an insect lands on such a tightly stretched pistil, the flower springs open and the insect is sprayed with a mist of pollen. It’s a sexually attractive object. The invitation from TU Delft and my fascination with scotch broom flowers coincided. This is how I arrived at the theme of desire.”

Joe Speedboot, the title character of your novel, is so fascinated by technology that he and his friends decide to build an airplane. Did you infuse this character with your own interest in technology?

“Actually, it’s the other way around. Joe Speedboot aroused my interest in technology. With Icarus-like energy, these boys wanted to defy gravity by learning to fly in their self-built plane. The best way to capture the experiences of such a person is by writing about their deeds, and to show how he physically constructs his life. Speedboot wants to make things that are loud, go fast, go high. To portray this, I had to embrace a world that demands technical details. As a writer, you cannot allow a character to build an airplane without making a few carefully chosen details plausible. To do this, I spoke to various people, including Joost Conijn, an artist who flew across the desert in his self-built airplane.”

Is the character Joe Speedboot based on Joost Conijn?

“No, absolutely not. The book was already in its final stages when I consulted him. But Speedboot and Conijn have both shown that they’re fearless. Fear is present, of course. But they can immediately convert that feeling into a thirst for action and a lust for life. Last year Conijn crashed his plane in the Czech Republic. He wasn’t hurt, but the plane was a total loss. He once invited me to fly with him in his plane around the Black Sea. I immediately said yes. But then for three nights in a row I lay awake in bed gripped by pure, unadulterated fear. In the end I didn’t do it. I’m not so easily scared, but I do want to have some semblance of control in my hands. Or in any case, to have the illusion of control.”

What contributes to the mystery surrounding Joe Speedboot is that we only see him through the eyes of Fransje, the handicapped but highly intelligent and observant boy for whom Joe is like a hero sent from the gods. And also in your previous novel, ‘All about Tristan’, the story isn’t told from perspective of the poet Viktor Tristan himself, but rather from the biographer who is trying to reconstruct Viktor’s life.

“This also came as a surprise to me. You think that Tristan and Speedboot are the main characters, but in both books the narrator is ultimately the main character. I realized this myself halfway through writing the book. Being a writer would be an awful profession if it were only about following the lines laid out in a preconceived outline. What excites me is that the story goes in directions that I haven’t foreseen. Characters who in the beginning must defend an idea, rebel against this and gain their own dynamic. Perhaps this sounds like a writer’s lame romanticism, but if characters have to defend an idea, then it becomes clichéd, and the story never comes to life. As soon as I give them space, it becomes something, a certain layering emerges – the same layering that also exists in the human soul: one moment you’re lost in mediation, and the next moment you’re in your car giving the finger to somebody because they’ve just cut you off. All this exists on the same line, and is separated from each other by just a few centimeters.”

For a novel like ‘Joe Speedboot’, how did you know that this was the best ending for the story? ▸▸

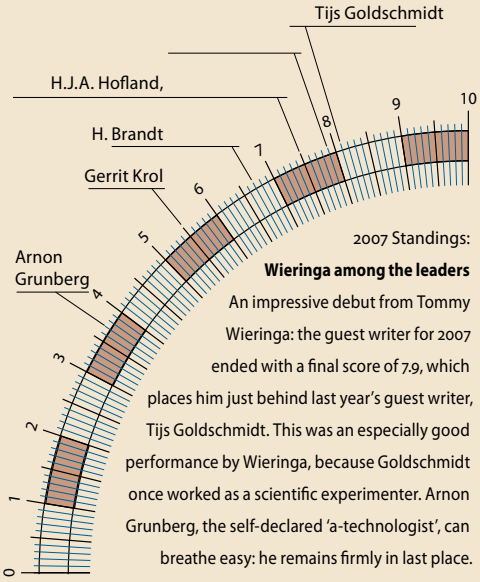
Who is Tommy Wieringa?

Perhaps someday they will build a statue of Joe Speedboot on the grounds of the Faculty of Aerospace Engineering. Speedboot is the newcomer who causes upheaval in the sleepy border town of Lomark when he and his friends build an airplane. Published in 2005, ‘Joe Speedboot’ was the breakthrough novel for Tommy Wieringa. The story revolves around the friendship between Speedboot and the son of scrap metal dealer, Fransje Hermans, who was once run over by a lawnmower. Wieringa (Goor, 1967) spent most of his youth in the Antilles Islands. In the late 1970s, he returned to the Netherlands, where he attended the free school in Zutphen. He later dropped out of Groningen University, where he was studying history, in order to make a series of long journeys. Wieringa studied journalism in Utrecht from 1994 to 1997.

After publishing two autobiographical novels, ‘Dormantique’s Manco’ (1995) and ‘Amok’ (1997), Wieringa decided, “to trust my imagination”. This resulted in a remarkable third novel, ‘All about Tristan’ (2002), in which a biographer gets entangled in the riddles that a Rimbaud-esque poet has left behind. In 2006, Wieringa also published a collection of travel stories: ‘Ik was nooit in Isfahaan’ (‘I was never in Isfahaan’).

INTERVIEW

Guest writers measured by the Technologist's Yardstick



2007 Standings: Wieringa among the leaders

An impressive debut from Tommy Wieringa: the guest writer for 2007 ended with a final score of 7.9, which places him just behind last year's guest writer, Tijs Goldschmidt. This was an especially good performance by Wieringa, because Goldschmidt once worked as a scientific experimenter. Arnon Grunberg, the self-declared 'a-technologist', can breathe easy: he remains firmly in last place.

Question	Answer	Tommy Wieringa 2007	Tijs Goldschmidt 2006	Arnon Grunberg 2005	Nelleke Noordervliet 2004	H. Brandt Cortius 2003	H.J.A. Hofland 2002	Gerrit Krol 2001
1. Do you ever change a light bulb? When was the last time you did so?	*The day before yesterday.*	2	2	2	2	2	2	2
2. Do you ever patch a bicycle tire? When was the last time you did so?	*Two years ago, but I know how it's done.*	2	2	0	2	2	1	1
3. Can you change the oil in your car? When was the last time you did so?	*On December 20th, when I was driving home from Italy.*	2	2	0	1	0	1	0
4. Can you change a car tire?	*No*	0	2	0	1	2	1	1
5. Do you ever use a power drill?	*Yes*	2	2	1	2	2	1	2
6. Can you follow the instructions and assemble Ikea furniture?	–	-	1	0	1	1	0	1
7. Can you assemble Ikea furniture without following the instructions?	*No idea, I don't shop there.*	-	0	1	0	0	0	1
8. Are you able to understand consumer electronic instruction booklets?	*Yes, especially if they are translated from Japanese into English and from Hebrew into Dutch....*	1	1	0	1	0	1	0
9. How many toolboxes do you have?	*One for screws and nails, one for hardware, and one for electronics: wire, connectors, etc.*	2	1	0	2	1	1	2
10. Do you write using a computer?	*Pen and paper. They're better for the thought process. And it's not so pleasantly deceptive.*	0	1	1	1	1	1	1
11. Do you use the Internet?	*I visit various sites every day, and sometimes I notice how compulsive this has become.*	1	1	1	1	0	1	0
12. How many hours per day do spend at your computer?	*1*	1	2	2	1	2	2	1
13. Can you fix computer problems yourself?	*Simple problems. If it's a bit idiot-proof, then I can manage, otherwise I can't. The first ring of self-help, lets say.*	2	0	0	2	2	2	0
14. Is your computer protected by a virus scanner and/or firewall?	*Yes*	1	1	1	1	0	1	0
15. Did you install them yourself and do you maintain them yourself?	*Yes*	1	0	0	0	0	1	0
16. Can you communicate with the helpdesk if you're able to reach it?	*Yes*	1	1	1	1	0	1	0
17. Have you ever had an idea for an invention, or have you ever posed a technological question?	*Maps with sound – audiography, I thought up the word myself. The idea came to me in Alexandria: so many sounds, so much low-level noise, and the longer I remained in the city, the better I got at identifying each sound, until I achieved some sort of stratification. Then I thought: it would be great if you could hear what the noise of a particular city actually consists of. Sounds are such an important part of a city. It is a reason why you want to leave a place or in fact to go there.*	1	1	0	1	1	1	1
18. Have you ever actually realized an invention and how often?	*No. But together with a friend I've always wanted to write a 'Big Antillean Odd-Jobs Book'.*	0	1	0	0	1	1	1
	Total points	19	22	10	20	18	20	15
	Final score	7,9	8,1	3,7	7,5	6,7	7,5	5,5

"'We're still here'. I was writing toward that last sentence throughout the entire book: it was like a promise that lay ahead in the future, because it was the key sentence."

Why is that sentence so important?

"It is the most solitary sentence in the novel. It's the sentence that seals the future."

'Joe Speedboot' has been described as a book that makes you smile. But it's also somber.

"Of course it is. This is what I find so nice about the book: there is a lightness about the way that fate is accepted, and the way setbacks are accepted. If you met the main character Fransje Hermans on the street, you'd think: 'O god, how terrible!'. But it's the humor and lightness that makes it bearable. And that's what makes the book suspicious in some people's eyes, because Dutch literature often isn't like this."

In many Dutch novels the fall of Joe Speedboot would've been described in great detail, in order to make it absolutely clear that heroes cannot exist.

"This is the dull nihilism that most writers suffer from. Nihilism, that's the writer who waits for his characters with a knife. Nothing can end happily. Undoubtedly, this has something to do with my personality, but I really find this gives a very incomplete picture of how things really are. It may well be true that everything ends in suffering and illness, pain and death, but Mozart did create a Requiem. And I much prefer that. As for the rest, I know all about, and it's very tedious."

Does it bother you that in twenty years, some readers might say: Isn't it strange that in Wieringa's novels he never refers to the major events of his time, like the murder of Theo van Gogh or the Iraq war?

"No. When I read Nescio, I never read about the outbreak of the First World War. I read about the daily events of the time, what life was like then, and for a novel, such information is just as interesting. I spent a lot of time deliberating whether or not I should include cell phones in 'Joe Speedboot'. There's only one reference to a cell phone in the book. Another thing that's strange: I wrote 'Joe Speedboot' at the time when the Dutch guilder was being replaced by the euro, and I noticed that the word 'euro' absolutely did not fit with this book. That concept was still too new for me, not yet familiar enough. I solved such problems by using slang, which allowed it to remain unclear as to when exactly the story took place. Slang was a savior.

Tip from the children

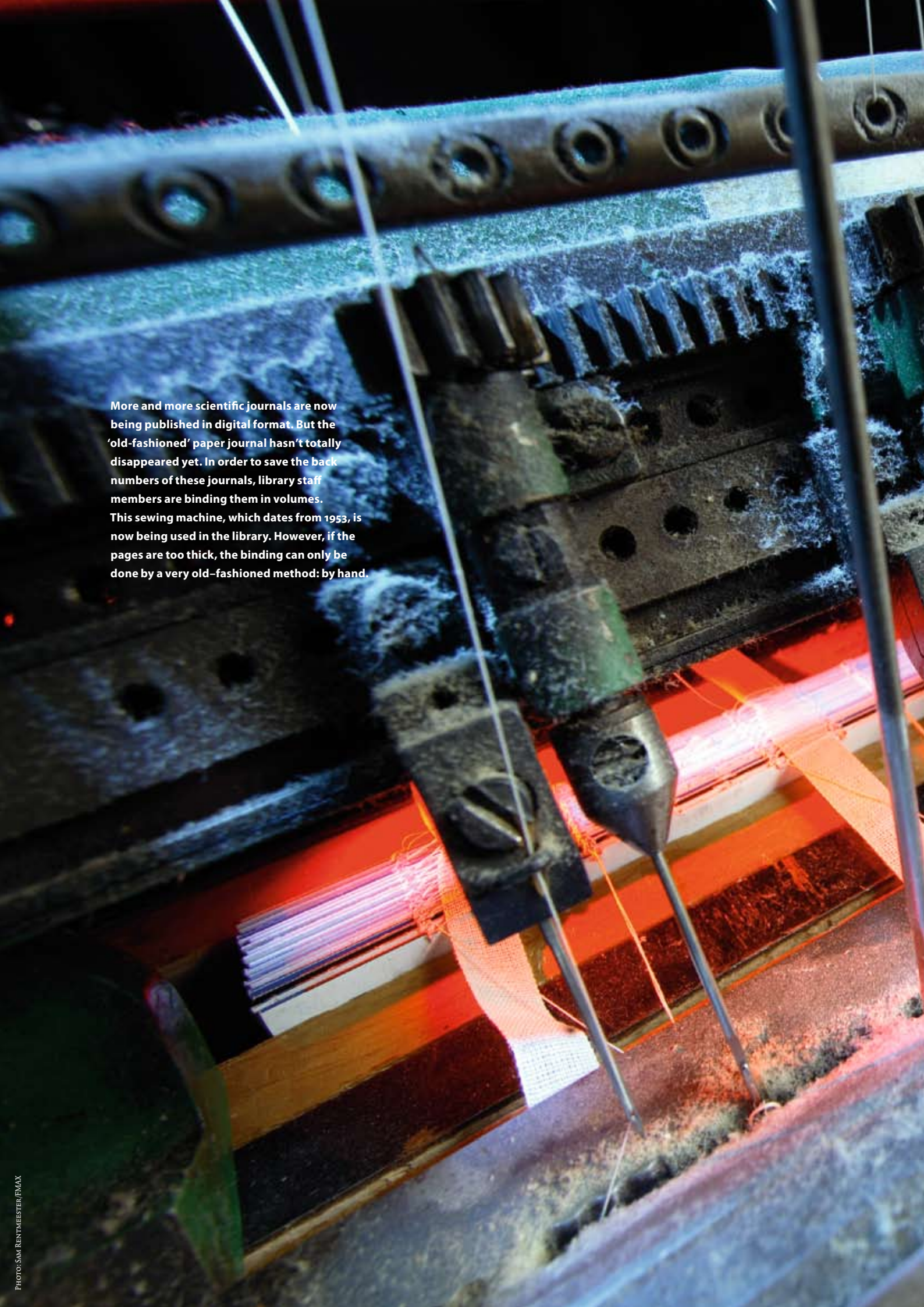
The dynamic of desire is an outstanding theme for a guest writer at TU Delft, according to TU Delft Rector Magnificus Jacob Fokkema. "Desire is an emotion, and an engineer is by definition someone with strong emotions. Otherwise, he would never be able to create an innovative and sustainable design."
Of 'Joe Speedboot', Fokkema says it's a "great book". "My children had already told me that I must read that book." The first meeting with the author was also not disappointing. "We clicked. His open, enthusiastic personality appealed to me. And he has an interesting perspective on technology."

The use of language, and also the laconic humor in 'Joe Speedboot', often made me think of Twente and Groningen.

"Of course. Once, after I had finished giving a reading in Nijverdal, a woman came up to me and said that expressions like 'HIJ IS NIET GOED TE PAS' had really made her laugh. 'Not easy to pass' – everybody who lives below the IJssel River gets it, and it means that a person isn't totally sane. Such laconic humor sets the tone of the book. I got it from Groningen, Twente, and such humor is firmly rooted in the province. That is my hinterland."

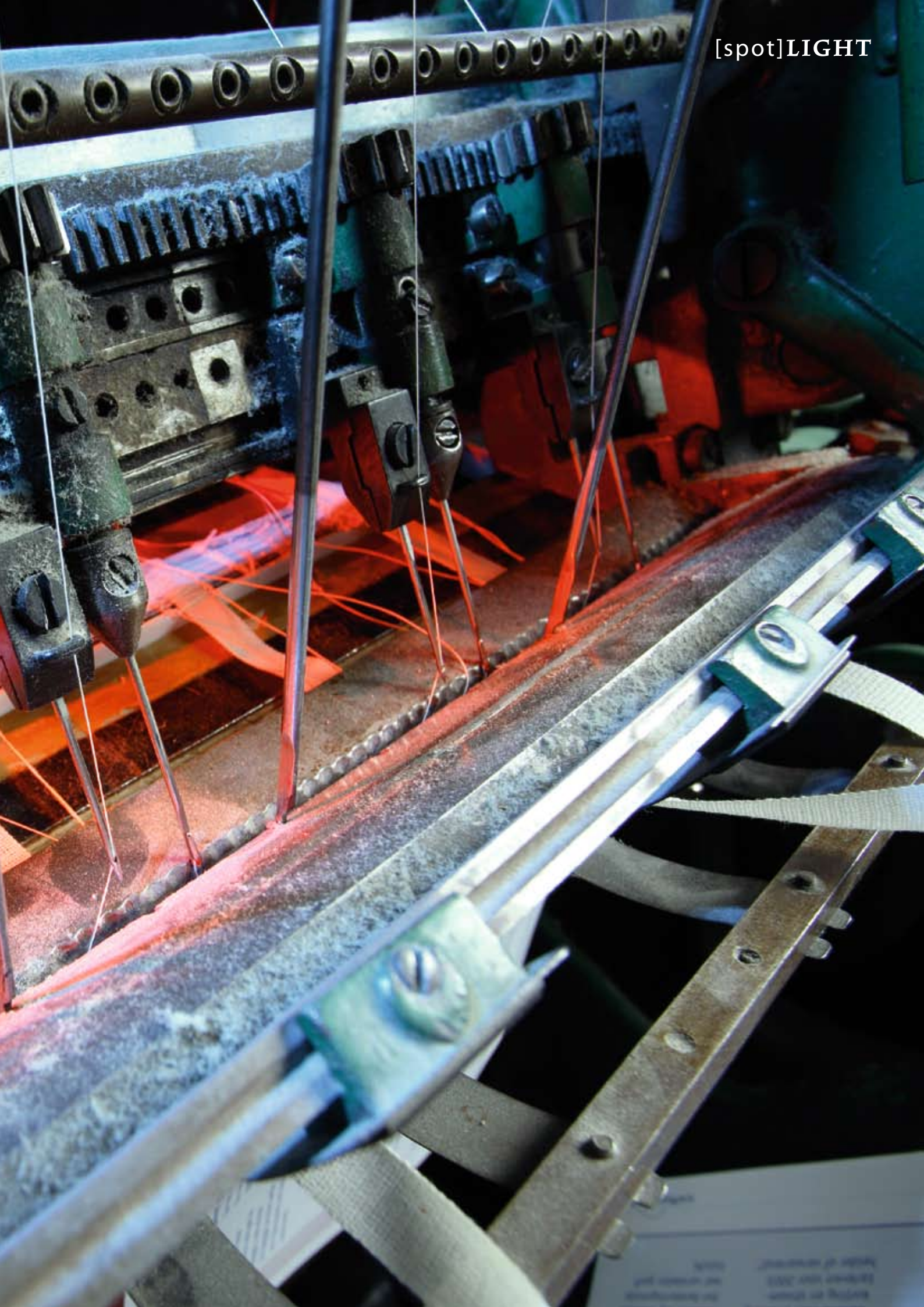
You've been praised for the rhythm of your sentences: the swing.

"This is simply a result of the fact that I read them aloud. I read aloud the entire time, to myself, to other people, I read aloud until it bleeds, and in this way I hear precisely if a group of sentences has the same rhythm, or if they're of the same length. I don't like books in which all the sentences have the same cadence. A lot of very short sentences, one after another, start to irritate me. It's too obvious. The things in a book shouldn't be so obvious."



More and more scientific journals are now being published in digital format. But the 'old-fashioned' paper journal hasn't totally disappeared yet. In order to save the back numbers of these journals, library staff members are binding them in volumes. This sewing machine, which dates from 1953, is now being used in the library. However, if the pages are too thick, the binding can only be done by a very old–fashioned method: by hand.

Photo: Sam Rentmeester/FMAX



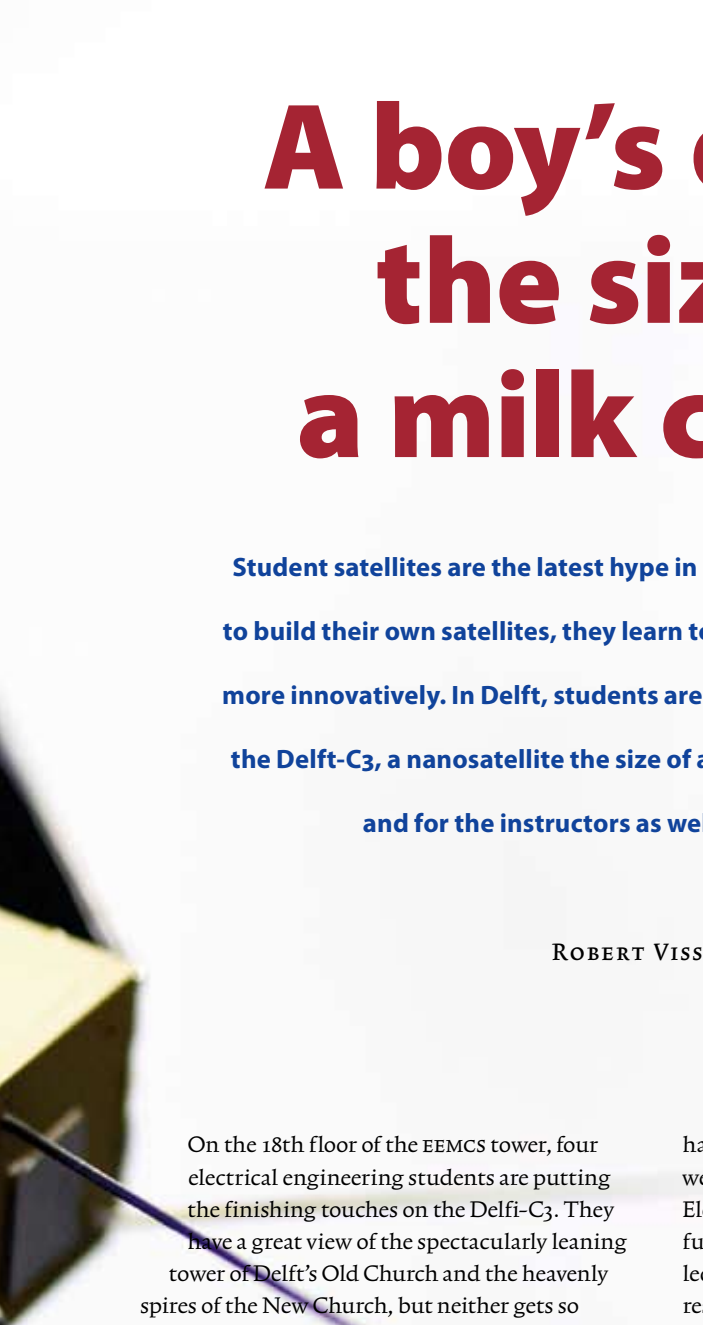
Delfi-C3 is the first amateur satellite built in the Netherlands. The project is a joint partnership between the faculties of Electrical Engineering, Mathematics and Computer Science, and Aerospace Engineering. On June 30, 2007, in India, a Polar Satellite Launch Vehicle will launch the satellite to a height of 630 kilometers, from where its orbit will carry it over the poles. A nanosatellite (satellites that weigh less than ten kilos are called nanosatellites) consists of three combined cubesats, weighing one kilo, and is approximately the size of a milk carton. Delfi-C3 will test autonomous wireless solar cells in space for TNO and new thin solar sensors for Dutch Space. EEMCS will also test a new radio, the highly efficient transmitter-receiver. The fifty universities that are currently working on cubesats exchange relevant information. "We give tips about subsystems, for example," Rob Hamann says. "You're of course continuously trying to get the better of each other. Every university wants to develop the best technology. If our *transceiver* should ultimately prove to work really well, other universities are welcome to use it in their cubesats, but they must give us the credit for having developed it."

Photo: Sam Rentmeester/FMAX

A boy's dream the size of a milk carton

Student satellites are the latest hype in education. By allowing students to build their own satellites, they learn to solve problems faster and build more innovatively. In Delft, students are now putting the final touches on the Delft-C3, a nanosatellite the size of a milk carton. "For every student, and for the instructors as well, this a boy's dream."

Robert Visscher



On the 18th floor of the EEMCS tower, four electrical engineering students are putting the finishing touches on the Delfi-C3. They have a great view of the spectacularly leaning tower of Delft's Old Church and the heavenly spires of the New Church, but neither gets so much as a glance. The students' eyes are firmly fixed on the computer screen. After two years of hard work, they're once again checking the simulation model of the high frequency amplifiers. One of the students has gloves on and inspects the nanosatellite's thin wires and tiny chips.

These students are working as fast as they can to prepare their own satellite for the approaching voyage into space. On June 30, the Delfi-C3 will be launched in India. On March 30, the satellite will be shipped to Asia.

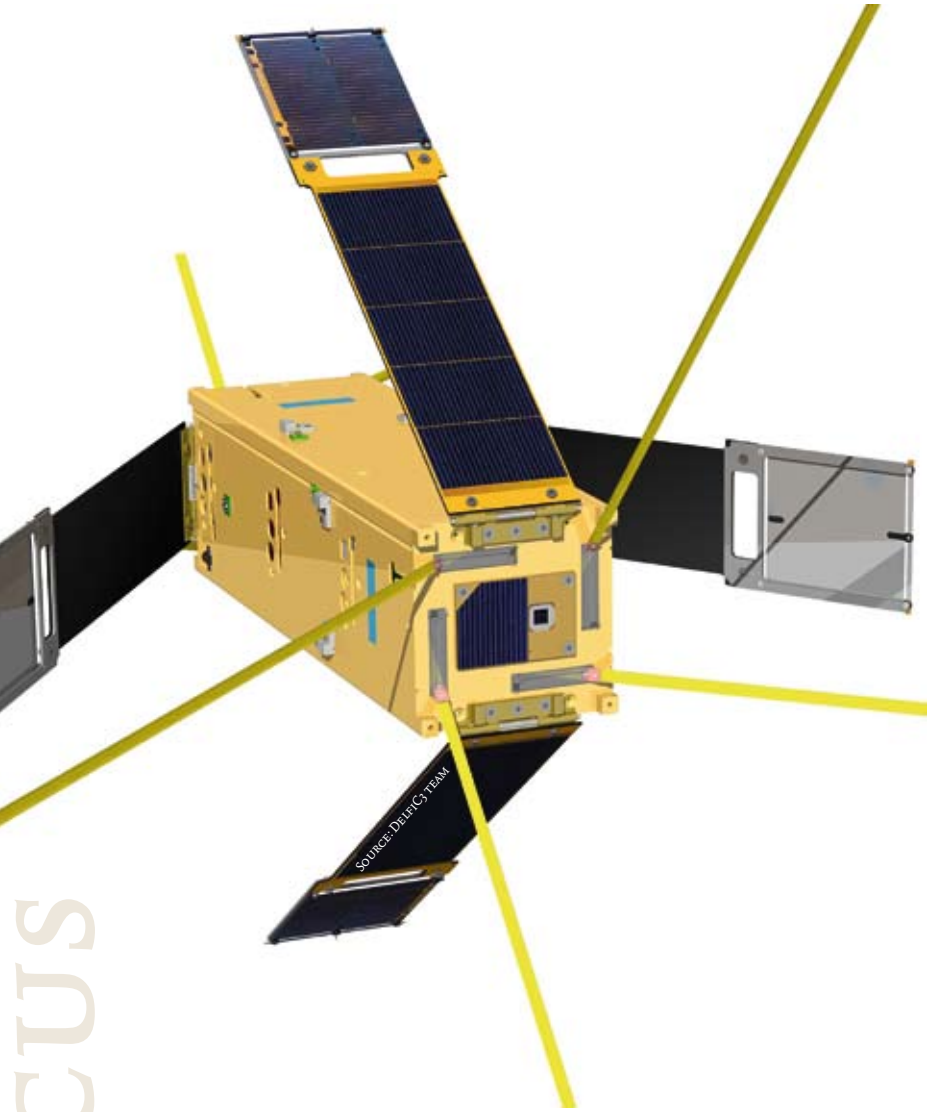
There are no books scattered across the desks in the workroom. The instructor also isn't present. If one didn't know better, one could hardly call this a university course. Yet this is the latest teaching method. "The TU has become a paper factory," says Dr. Chris Verhoeven, disgustedly. He works at the Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) and is one of the Delfi-C3 project leaders. "Most students only write papers full of theories about how you could possibly build something. But is this why you study at TU Delft? If so, then you would've been just as well off becoming a Master of Arts. As an engineer, you want to build something. Paper marks the start of the research, not the end. We give students the chance to build a satellite. This is the crowning achievement of what they themselves have devised. For every student, and for the instructors as well, this a boy's dream."

Electrical Engineering MSc student Mark Stoopman is full of praise for this new teaching method. "During the lectures you must write everything down on paper. The result remains theory. But with the Delfi-C3, I'm working on something that actually exists and which you can actually work on. So I'm learning more. It suits me much better to work with my hands. My research and hard work has really created something special."

Ingenious

Students building satellites with their own hands. For years this was considered a *mission impossible*. In the late 1990s, various American and European universities, including TU Delft, were considering the possibility of building student satellites. But when drawing up the budgetary requirements, it became clear that the costs would run so high that such a project was unfeasible. Satellites usually weigh between 20 and 30 kilograms: much too expensive to launch them. Students would also have to spend too long working on the project: five years. Many of the students would therefore graduate before the satellite was completed.

The great breakthrough came when American professor Bob Twiggs devised an affordable solution: the *cubesat*. His satellite – measuring 10x10x10 centimeters and developed at prestigious Stanford University – needn't weigh more than one kilo, provided the right microelectronics were used. Consequently, the cost to build and especially to launch a satellite fell drastically. Twiggs was moreover ▸▸



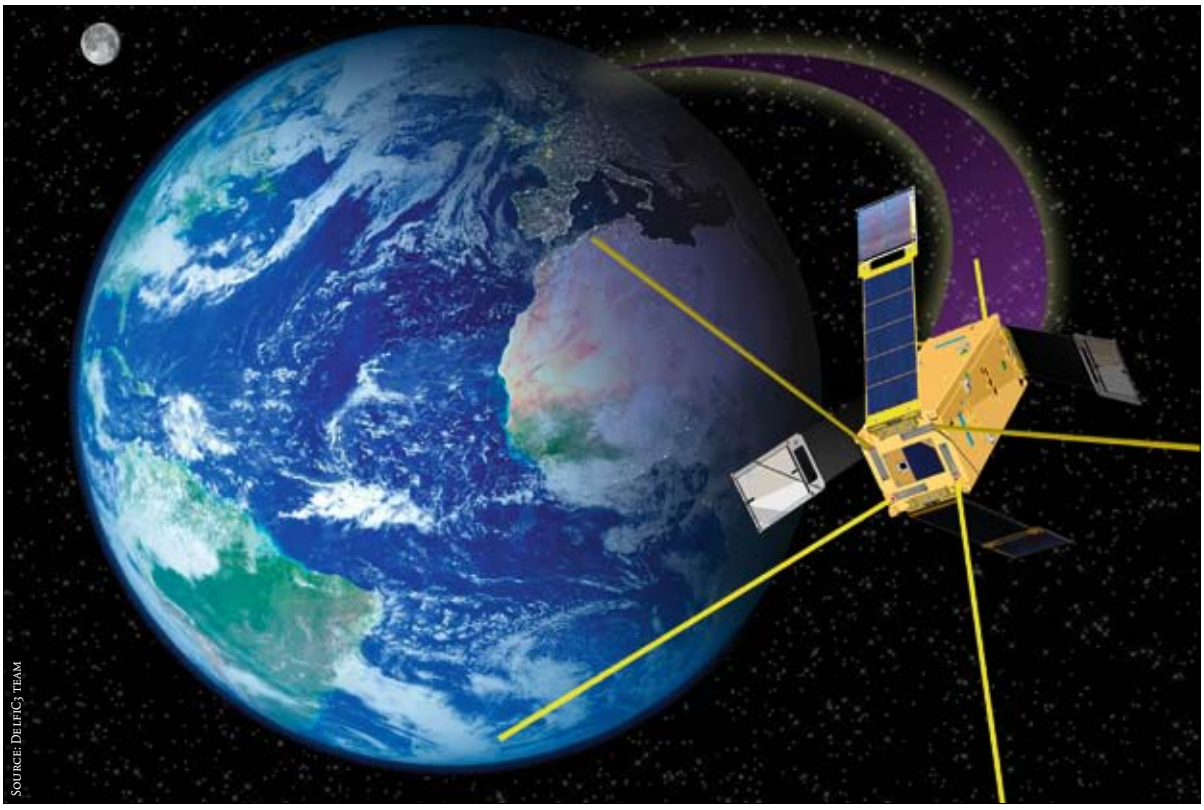
Source: DelfiC3 team

following the trend of the new millennium: make everything smaller. Students were wildly enthusiastic about his plans. “But many of my colleagues scoffed at me. They said it was impossible to make everything small enough to fit into the satellite,” Twiggs recalls. “But their opinions didn’t interest me in least – I believed in it. And what’s more, I had devised the satellite for students, not for

“Thanks to the cubesats, it’s finally time for new ideas in education and missions to space”

my colleagues. Because there was so little space available for wires, the students had to come up with solutions by devising small, innovative operating systems. The cubesat forces you to be ingenious.”

The cubesat is a resounding success. Within just two years, the satellites are designed, built and launched. And the students are involved in the entire process, from the first conceptual drawings to the launch. Twiggs: “The students



Source: DelfiC3 team

Source: Delfi-C3 team

also don't need much room to work on them. You can take the cubesat anywhere. It's but a small thing."

Insecurity

After Twiggs' students had launched cubesats in America and Japan, people in Europe also grew interested in the nanosatellites and the new teaching method. Rob Hamann, of the Faculty of Aerospace Engineering, was immediately interested. "I'd previously worked for Fokker Space and noticed that the new employees we hired from TU Delft always lacked practical experience. It was only after three years on the job that they really developed into something. This was because they hadn't conducted enough multi-disciplinary research while at university. Yet aerospace engineering is this by definition: 50% of it involves electronics. Delft students had never had to devise the entire process, from conception and design to construction and launch. During their university studies, they stopped after the design phase, because there was nothing to build. With the Delft-C3, we've filled in that gap."

"Many of my colleagues scoffed at me. They said it was impossible to make everything small enough to fit into the satellite"

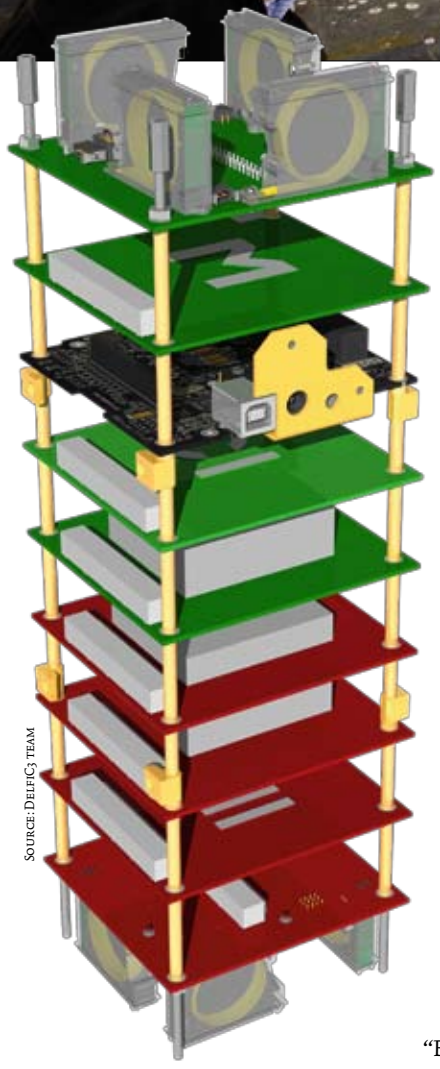
To provide the necessary microelectronic components, Hamann contacted Chris Verhoeven, of the TU's electrical engineering department. With 13,000 euro in 'seed money' provided by ICT Delft Research Center, Verhoeven bought two cubesat kits, which the students would then build into space-worthy satellites. The Delfi-C3 student satellite project was born. "From the start, our goal was to educate the students in a different way," Verhoeven says. "Students often think that we here at TU Delft know exactly how everything must work. We try to teach the students that in fact engineers must deal with lots of insecurity, but that this mustn't be allowed to stop them. You can't calculate and prove everything, because it would then take three hundreds years before you could finally start building and nobody in industry is interested in that. The Delfi-C3 project teaches students to make typical engineering assessments. They're forced to make choices now, because within two years the satellite must be launched."

Verhoeven and Hamann offer the Delfi-C3's communication system as a typical example. "You cannot use a standard oven-controlled crystal oscillator to create an accurate frequency, because this takes up far too much space. And an electro-mechanical relay for changing the electric current is too heavy. This is the first option that students think of, but you must make it clear to them that they could calculate this for a hundred years and still it would never work. So what to do then? We let them find that out for themselves, while also encouraging them to choose unorthodox solutions. They thought that a microprocessor could also be used for really simple functions, like switching the electric current on and off. And indeed it does its job well, using less than 30 microampere, which is important, because we can only use two watts. And thanks to microprocessors, you no longer need a mountain of wires, which used to be the case in satellites. You teach students not build rashly, but rather innovatively. But you needn't waste your time knocking on the doors of NASA and ESA for these types of missions: Those organizations are much too conservative and too often use old and expensive solutions."

Disaster scenario

There is no question that the cubesats better prepare students for the jobs they're likely have after graduating. But building a satellite is of course about more than just the educational value of the building process. A mission is

Photo: Sam Rentmeester/FMAX



Source: Delfi-C3 team

only successful if the satellite ultimately works. At present, fifty universities are working on their own student satellites, ranging across the world from Denmark's Aalborg University to Kentucky State University. All these universities have one overriding fear: that their nanosatellites will crash. Sadly, this disaster scenario unfolded frequently during the past year. In the summer of 2006, fourteen student satellites were lost when a joint-launch went disastrously wrong. "This really shocked me, and I immediately thought: will our operating system really function properly?" Stoopman recalls. The Delfi-C3 project is however prepared for any possible failures. The team is building two cubesats. If the first one crashes, then all their hard work wouldn't have been for nothing, because the second satellite will then be launched. "But it will certainly be extremely disappointing if something goes wrong," Stoopman adds.

Founding father Twiggs isn't concerned about the failed launches. "That's a risk of the profession. Cubesats are often launched with Russian ballistic missiles, but for the Delfi-C3, an Indian launcher will be used, because they're less expensive. But with this comes extra risks. Actually, none of the student satellites I've worked on have ever failed."

"Aerospace might transfer some of its old bravado to the students."

Other student satellites have also failed, however. The Sseti Express, a micro-satellite developed for ESA by two-hundred students from various universities, lost contact with the earth after launch.

Launching the Delfi-C3 will cost 120,000 euro. A crash would therefore be financially disastrous as well. "A student satellite costs 60,000 euro per year, which isn't exceptional and also includes the microchips made by researchers. But a number of consecutive crashes is indeed very bad for the project," Verhoeven says. "You'd then have to ask yourself why they're still being made and the flow of funds would be stopped. I think it's fair to say that the other cubesats suffered from some growing pains. A few years ago at the electrical engineering department we set students the task of making their own microchip. Just

about every chip made by the first group of students malfunctioned, but a year later they were more successful and now all the chips function properly."

Bravado

To underline such confidence, Verhoeven and Hamann revealed that there would be two successor student satellites. Regardless of whether the Delfi-C3 crashes or doesn't crash, TU Delft student satellites will be launched until 2011. Verhoeven and Hamann have ambitious plans. This year the Delft Aerospace Centre will also be founded. This will serve as the linchpin for building and launching future nanosatellites in the Netherlands. The EEMCS, Aerospace Engineering, Mechanical, Maritime and Materials Engineering and Applied Sciences faculties will be involved. "We don't yet have our own building and will start off small. We must prove ourselves. But we're very ambitious," Verhoeven says. "The TU must distinguish itself in aerospace engineering. There's no other university that has two such prestigious institutes with so much expertise as Aerospace and DIMES for microelectronics. We already have a good list of payloads, companies that want to test their experimental designs in space. SRON for instance is interested in testing the electronics of an x-ray detector. A cubesat can carry such components. SRON will then be certain that the components work properly, before allowing the entire machine to be part of a larger mission, which costs a lot more money."

ESA is also undeterred by the failed missions. "We're working on the successor, the ESEO, which will be launched in late 2008," says Neil Melville, Sseti project leader. And ESA even has bigger plans for student satellites. "We're currently researching if it's feasible to build a student satellite that will go to moon." Despite the high-profile crashes, student satellites haven't seemed to lose any of their popularity. "I'm proud that the concept has been so well received," Twiggs says. "This way, aerospace might transfer some of its old bravado to the students. Following the landing on the moon, the aerospace industry fell asleep. The safety levels for missions had to be so high that there was hardly any innovation and only tested solutions were chosen. Thanks to the cubesats, it's finally time for new ideas in education and missions to space."

Photo: Sam Rentmeester/fMAX

Almost ready for space.

www.delfic3.nl

cubesat.calpoly.edu

www.esa.int/specials/sseti_express

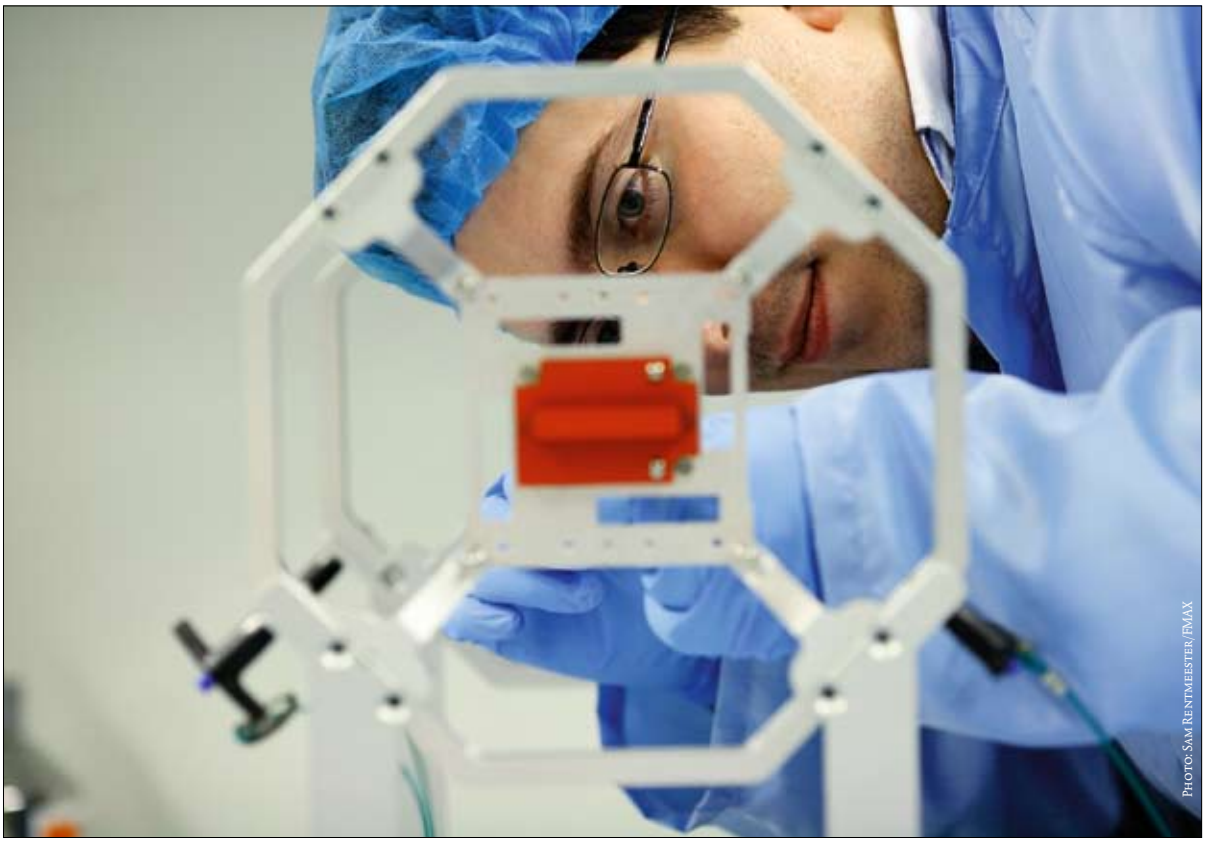


Photo: Sam Rentmeester/fMAX

Fast reactors

Trying to make nuclear power stations sustainable

There is a new generation of nuclear power stations on the drawing board. They must be sustainable as well as safe and cost-effective. Can these ambitions be realised? "The sustainable power stations are less safe, and the safe ones are less sustainable."

Maaike Muller

We all seem to agree that the world is going to need more and, most of all, clean energy. What will be the role of nuclear power in this?
Two hundred energy experts of the so-called Energy Transition Task-force and the European Union recently pointed out that nuclear power was a CO_2-free energy source. Opponents would rather see investments in nuclear energy go to sustainable solar and wind power. And, points out PvdA member of parliament Diederik Samsom: "Nuclear energy is not sustainable."
Nonetheless, the phrase 'sustainable nuclear power' has been coined. It can be found on the cover of the Ph.D. thesis produced by Dr. Wilfred van Rooijen and in the foundation day speech of nuclear energy professor, Prof. Dr. Tim van der Hagen, for example. Is there really such a thing as sustainable nuclear power or is it a misleading concept?

Fourth generation

"Nuclear energy is not sustainable. At least, not yet," says Dr. Jan Leen Kloosterman of the Delft Reactor Institute. Putting 'sustainable' before 'energy' means that the source of the energy is inexhaustible, or in any case renewable. Nuclear reactors are not sustainable because they use up their fuel, which is uranium. Using the current generation of reactors, which can split only uranium-235, we will run out of fuel in a few hundred years, Kloosterman estimates. If we were able to also use the other 99.3 percent of the uranium, which is uranium-238, there would be enough to last us another ten thousand years Kloosterman thinks. "Now that I would call sustainable."

Nuclear Power with little or no long-life waste would be a major step forward

So-called fast-breeder reactors can 'breed' fissile material from uranium-238. The German reactor at Kalkar was one, and three of the six reactors the international organisation Generation IV International Forum selected in 2002 as promising reactors for the fourth generation, also are fast-breeder reactors.
If nuclear power really is to score high on the sustainability ladder, a more efficient use of raw material simply isn't enough. Burdening future generations with radioactive waste harmful to man and the environment alike, does not go well with sustainability. When a uranium nucleus is split, energy is released, but is also produces debris. This radioactive nuclear waste will eventually clear itself, but it does take three hundred years to do so. That is not too long, according to Kloosterman. "You could build a bunker to store the stuff in."
Even so, the nuclear waste also contains materials that remain radioactive for much linger, such as plutonium and americium. The plutonium is processed to be used again, but the remaining chemicals are long-life waste that must be safely stored for a hundred thousand years. The Dutch nuclear waste pile is now being kept, safely vitrified, in barrels at Flushing. One hundred years or so from now they will be transported into underground salt deposits. Is there nothing that can go wrong in those hundred thousand years? "Of course there is," Kloosterman. says, "because you can never guarantee that those barrels will remain intact during all that time. However, if they were to start leaking, it would still take several hundreds of thousands of years before the radioactive material, extremely diluted, would reach the biosphere through groundwater flows. After al that time, there would be no negative effect left."

Holy grail

Of course, even better than safely storing nuclear waste would be not to produce any waste at all. There is no avoiding the waste that remains a health hazard for three hundred years, but new fast-breeder reactors can reuse the long-life waste. Last December, Dr. Wilfred van Rooijen gained his Ph.D.

for designing of a fast gas-cooled reactor that can generate more than eighty times the usual amount of energy from natural uranium while producing little or no long-living waste. Like a master chef he came up with a recipe containing uranium and plutonium. Once the energy has been generated and fission waste disposed of, a residual product is left which after adding a little natural uranium is ready for a new energy generation cycle.
Van Rooijen has not yet tried to find out whether his starting recipe can be made chemically. "Reasonably speaking, you can assume that it can be done."
Nuclear power with little or long-life waste would be a major step forward. Van Rooijen: "A closed fission cycle like that is one of the Holy Grails of reactor physics."
PvdA member of parliament and TUD alumnus Diederik Samsom is not in favour of using nuclear fission for energy production. "However, we still face the task of reducing the health hazard posed by the hundreds of thousands of tons of highly radioactive waste stockpiled all over the world."
Could a reactor be used to dispose of the existing waste? Kloosterman: "You could extract the waste, but it would be so expensive it would not be worthwhile."

Safe

In his computer, van Rooijen has what can be called a sustainable reactor that generates lots of energy and produces hardly any waste at all. Still, the researcher expects his reactor to exist in theory only. For one thing, he doesn't know what his reactor would be made of. Van Rooijen designed a reactor that uses helium as coolant. This makes it possible to raise the temperature to a level where a generator can directly generate electricity. The usual process is to first produce steam which is then used to generate electricity. Van Rooijen expects the reactor to have a very high efficiency of 48 percent , but he does not yet know of a material that is strong enough and able to withstand the extreme heat. Safety is also a point to worry about. In thermal reactors, if the coolant fails, a moderator such as graphite is inserted to slow down the neutrons, closing down the reaction. In a fast reactor there no such moderator, as a result of which the temperature can rise to extreme levels. "The reactor is safe, but safety could be better, and for the fourth generation of nuclear reactors we are aiming for the best," says Van Rooijen.
About the nuclear reactors selected for the fourth generation Kloosterman says: "The sustainable power stations are less safe, and the safe ones less sustainable." The very high temperature reactor, ready to hit the market in a decade or so according to Kloosterman, scores high on safety, for example. The reactor also uses fissile material more efficiently than the previous generations did, but it does produce long-living waste.
All over the world research efforts are directed towards developing sustainable and safe nuclear power stations, But according to van Rooijen there are other ways of combining safety with sustainability. For example, less sustainable nuclear reactors could be used to generate energy, and other nuclear reactors could then be used to dispose of the nuclear waste. Of course, this would make nuclear power more expensive.
"Nuclear power currently is very cheap, relatively speaking. My estimate is that , mostly because of the more expensive power stations, it will become fifty to a hundred percent more expensive," says Kloosterman. "Some estimates are more optimistic, but I consider those to be too optimistic. Whether nuclear power will still be cost-effective will depend on other factors, such as the price of energy from other sources."
Given a few more decades on the drawing board, most fourth-generation reactors of the fourth generation will be technically ripe for construction, Kloosterman considers. The cost and the outcome of the public debate on nuclear power will determine whether it will actually happen. According to Kloosterman nuclear power can in any event play a major role in the future, even if solar and wind power were to supply the greater part of our energy, if only to cope with peak demand when the sun is not shining and the wind is not blowing. Kloosterman: "We will always require a minimum generating capacity, and nuclear power is ideal for that."

More information: Dr. Jan Leen Kloosterman, j.l.kloosterman@tudelft.nl; Dr. Wilfred van Rooijen, w.f.g.vanrooijen@tudelft.nl.


(Photo: Sam Rentmeester/fMAX)

The current type of reactor, like this one at Borssele, will use up our uranium supply within a few hundred years, Dr. Jan Leen Kloosterman of the Delft Reactor Institute estimates. New fast-breeder reactors will use uranium much more efficiently, making supplies last for another ten thousand years.

Photos: Hans Stakelbeek/FMAX

Prof.dr.ir. Han Meyer

'Transport and traffic problems demand a reorganization of the infrastructure'

Driven

Professor Han Meyer (1951, Rotterdam) graduated from TU Delft in 1979. He then joined the stream of recent graduates to the Municipality of Rotterdam's Department of Spatial Planning & Urban Renewal. In the 1980s, he was involved in developing Rotterdam's 'Kop van Zuid' project. In 1990, he found his way to TU Delft, where he was appointed associate professor of urban design. During the 1990s, Meyer worked on his doctoral dissertation, entitled 'The city and the harbor', which he completed in 1996. In 2001, he was appointed professor of urban development and design at the Faculty of Architecture. Meyer's professorial chair encompasses the development of methods for restructuring and designing urban spaces, which includes leaving space for future social developments.

Tomas van Dijk

How would each of you characterize the other?

Meyer: "Fransje is an initiative-taker and has a great talent for organization. She seemingly sets up all types of projects effortlessly. I met her in 2001, when she was organizing a project about water for Rotterdam Cultural Capital. She immediately impressed me, and this led to my asking her if she'd be interested in pursuing a PhD degree under my supervision."

Hooimeijer: I got to know Han as a 'partner in crime' in Rotterdam, and it's partly for this reason that we don't have a hierarchal relationship. He gives me freedom, he's very knowledgeable about the subject matter, and he's extremely driven. When I began my doctoral research, I didn't know all that much about urban development. But slowly I too am becoming a specialist, although Han still leads the way.

What have you learned from each other?

Meyer: "Fransje shows me how to open doors, of sponsors for instance. Fransje has a very open personality, yet at the same time, as a researcher, she digs very deep. She has for instance read 130 years of *De Ingenieur* (*The Engineer*) magazine. I would've leafed through them, and have the tendency to look for something that is more immediately relevant. But Fransje arranged things in such a way that her father helped her to read all the magazines. In this way, she can put the essential dots on the 'i'. She maintains an overview without becoming overwhelmed."

Hooimeijer: "He teached me about urban development. Han reads a lot, which takes him to many places. He knows an incredible amount about the history of harbor cities."

What is distinctive about him/her?

Meyer: "Fransje isn't from TU Delft, but instead her background is in the social sciences. So for her, researching in archives is a normal way to gather information. This absolutely isn't the case for those with a scientific background.

Hooimeijer: "Everyone has their own thing. I think for Han this is the importance of history."

What characterizes a good teacher-student relationship?

Meyer: "That both parties feel that they can learn from each other. I really hit my stride when a student discovers something that I didn't know and we can then discuss it together. I have this feeling with Fransje."

Hooimeijer: "The most important is that you respect each other's point of view and think along the same lines as the other. Students must search for challenges, so that their research interests their teachers. And you're allowed to be audacious.

Drs. Fransje Hooimeijer

'There must be a social debate about a new etiquette'

Initiative-taker

After graduating from the academy of art, Mrs. Fransje Hooimeijer (1971, Capelle aan den IJssel) studied art and cultural sciences at Erasmus University in Rotterdam. She then became an independent researcher in the field of urban development and landscape architecture. In 2003, she began her PhD research, focusing on the new Dutch polder city. In 2005, she and co-authors Han Meyer and Arjan Nienhuis published the 'Atlas of Dutch water cities', a book about water structures in urban areas. Hooimeijer hopes to receive her PhD degree in 2008. In addition to her PhD research, she is currently working on a book about post-war landscape architecture.

Who impresses you?
Meyer: "People who have the discipline to regularly come up with new presentations and products. People who besides having a busy day job can write a book in the evening."
Hooimeijer: "People who are good singers. If I appeared on the 'X-factor', they'd have been ruthless and sent me home. I'm often impressed by people who can concentrate intensely on gaining information and then present it in new ways."

Who don't you envy?
Meyer: "Professors who get stuck in an organizational structure. This is threatening. I'm the head of department, and for such jobs, it's vital that one maintains a proper balance between management on the one side, and developing the content of your specialist field on the other. Some professors aren't able to do this. It's my opinion that TU Delft is still searching for a model in which both aspects are equally balanced."
Hooimeijer: "The Queen, because she isn't really able to lead a free and enjoyable life."

What places do you avoid?
Meyer: "There aren't any places in the city that I avoid. My specialization is primary urban development. I'm interested in developing the entire city. But I'm also happy to leave the city. Urban and rural areas are equally nice.
Hooimeijer: "The city center. I don't like shopping. All those people...all that buying, buying, buying."

What is your favorite TV program?
Meyer: "I'm not much of TV-watcher, although I enjoy watching premier league football. I also enjoy "*Zomergasten*' ('Summer Guests') if there's an interesting guest on the show. But actually I prefer listening to the radio. I listen to Radio 1 on Sunday mornings, for instance, or to Radio 4."
Hooimeijer: "'24' is really exciting. And unrealistic. The series has a nice dynamic, though. Also, '*De wereld draait door*' ('The world keeps spinning') is funny and often has nice guests."

What book has recently made an impression on you?
Meyer: "'*Een Nieuwe Wereld*' (A New World) by Auke van de Woud, professor of architecture history. The book is about the modernization of the Netherlands in the second half of the 19th century. At that time, the construction of harbors and canalization had opened up the Netherlands to the world after a period of lethargy. The book is a mirror for the present. Then, as now, the ongoing discussion was about the division of tasks between the state and private sector."
Hooimeijer: "'*The Making of Urban Japan*'. In Japan, people aren't familiar with the urban development phenomenon and nothing is done regarding quality awareness. Yet there's a pleasant atmosphere in the ▸▸

Photo: Sam Rentmeester/fmax

Married/Living together:
Meyer: Lives together with partner, one daughter
Hooimeijer: Married, three cats

Hobbies:
Meyer: Collecting old city maps, reading, tennis
Hooimeijer: Sailing, swimming, reading, playing the flute, eating, drinking

Favorite newspaper:
Meyer: NRC Handelsblad
Hooimeijer: Volkskrant and NRC Handelsblad

Favorite magazine:
Meyer: Groene Amsterdammer
Hooimeijer: Kunst en Wetenschap (Art & Science)

Discovery that you wish you had made:
Meyer: An anti-Aids drug
Hooimeijer: Penicillin

streets. This is because up until 130 years ago people were really concerned with their neighborhoods. And you still feel this today: there are plants in the street and no litter on the ground."

What circumstances would compel you to resign?
Meyer: "If the professors' professional responsibilities for determining the content of their specialist fields should be seriously encroached upon."
Hooimeijer: "I'm a PhD candidate, so I'll be out of a job in about eighteen months time. I'll then decide what to do next."

Which website do you visit most frequently?
Meyer: "The TU Delft site, for email addresses. I use Google for professional purposes; it's a very helpful tool for accessing treasure troves of contacts.
Hooimeijer: "I have a digital subscription to the *Volkskrant* newspaper, so that I don't have so much paper in my house. I also often visit my own website to see who has been there. It attracts international visitors.

Which social debate should now be greatly expanded?
Meyer: "The debate about the spatial planning of the Netherlands. In recent years this debate has too often been shoved to the margins and the national government doesn't regard it as a top priority. Yet, at the same time, very radical changes are taking place. The contraction and restructuring of the agricultural sector is leading to major changes in function of rural areas; climate change and problems relating to water demand a clear and well-coordinated policy; transport and traffic problems demand that the infrastructure for roads and public transport be reorganized. A fundamental spatial policy is now needed in which these related problems are solved. Such a fundamental policy is however now further away from being enacted than ever before.
Hooimeijer: "About a new etiquette. In Japan, the society is more advanced than ours. Because there are so many people living there, it's considered rude to make telephone calls in public spaces or to litter in the streets. Or about the individual responsibility of people. Everyone thinks for example that the government must solve the water problem; however, if you move to low-lying areas near rivers, it's also your own responsibility to ensure your home is protected against floods. In the past, people had tiled floors downstairs and the WC was upstairs. But now, some people don't even realize that they live in a flood region.

Which of your parents are you most alike?
Meyer: "My physical appearance is that of my father. And just like him, I have a hard time throwing things away. Consequently, my bookshelves are overflowing and my basement full of junk, because you never know when you're going to need something.
Hooimeijer: "Like my father. I'm a control freak, just like him. And therefore I can get through 130 years of *De Ingenieur* magazine. He helped me with this. We were looking for articles about making preparations for building, but he happened to come across an interesting article about batteries, which he then proceeded to study for three days until he understood everything about it." ◂◂

An overview of the most important awards, appointments and other remarkable personal particulars at TU Delft

Less demolition, more renovation. This was the critical message **Professor André Thomsen** delivered during his valedictory lecture as a professor of housing renovation and housing management. Thomsen often felt that his was a lone voice in the wilderness. "It pains me to see that in the past half century we have ruined the skylines of the Netherlands by building tall buildings everywhere without any respect." Thomsen has begun losing hope in his colleagues; instead, he's counting on a new mentality among the upcoming generation. He regrets that he is forced to leave TU Delft, having reached the retirement age of 65-years-old. In the coming years, however, he will remain active at TU Delft's OTB Research Institute for Housing, Urban and Mobility Studies, where he will continue to insist that respect be shown for existing housing.

Two Antoni van Leeuwenhoek professors were appointed in November: the mathematician **Professor Jan van Neerven** (1964) and the physicist Professor **Herre van der Zant** (1963). Antoni van Leeuwenhoek professorships are awarded to excellent young researchers. Van Neerven is engaged in solving and analyzing stochastic partial differential equations. These equations describe processes in which random disruptions play an important role. Van der Zant is active in the field of nanoscience: his research group recently made and 'tuned' the world's smallest vibrating nanowire.

Graduating cum laude in just two years. **Maaike Kroon** (25) achieved this remarkable feat on 11 December 2006. She developed a method for using super-critical carbon dioxide and liquid salts ('ionic liquids') to produce material for the precision engineering industry. Her method uses only a quarter of the energy normally used for this and produces hardly any waste. (Page 14: The ideal solution)

TU Delft's Platform for Sustainable Development has a new chairman: Professor **Dr. Rietje van Dam-Mieras**. The TU Executive Board announced his appointment on 9 January. Van Dam was a member of the Board of Supervisory Directors for Akzo and Unilever, was the rector of the Open University and member of the Scientific Council for Government Policy (WRR). Van Dam conducts research of the bio-molecular processes occurring in blood vessels. The Platform for Sustainable Development was founded ten years ago with the aim of instituting the 'actual integration of sustainability in TU Delft's education and research'. This has resulted in the basic module sustainable development, the graduation notation sustainability and a bi-annual international conference.

Honorary doctorates were awarded to **Professor Chimay Anumba** (1966) and **Professor Michael Grätzel** (1944) during the university's 165th Dies Natalis celebrations on 12 January. The Nigeria-born Anumba is a professor of construction engineering and informatics at Loughborough University (UK). He was awarded an honorary doctorate for his groundbreaking research in the field of ICT in architecture and construction. Anumba: "Many of the things occurring in the building industry now would never have been possible without ICT. Project team members from opposite corners of the globe can now work together effectively. Technology, as intelligent agents, now helps designers and engineers take decisions: it breaks down complex problems into digestible fragments." For Michael Grätzel, a professor at the École Polytechnique in Lausanne, Switzerland, his TU Delft honorary doctorate was his third, after those from Uppsala and Turin. He believes his reputation primarily rests on the Grätzel-cell, a solar cell inspired by the process of photosynthesis, in which plants extract nutrients from sunlight. The result is a solar cell that uses titanium oxide, a white substance also used in toothpaste and latex house paint. This cell does indeed produces less power than silicon solar cells, but it's much cheaper and easier to manufacture.

The future science museum in Sana'a, the capital of Yemen, must be able to be seen from miles away. The imposing, domed building was designed by TU Delft professor of building technology **Fons Verheijen**. His design was chosen ahead of competing submissions. The upper section of the building is modeled on Paris' Arc de Triomphe and is situated on a rotunda.

The 'Father of Wifi', **Vic Hayes**, was the honored guest at a Wifi-seminar held at the Delftstede conference center. The occasion was the awarding of the 2007 Charles Proteus Steinmetz Award, a prize awarded by the IEEE, the American association for electrical engineers. The spiritual father of the highly successful wireless network also visited the Faculty of Technology, Policy and Management, where a small Wifi-network is currently in use. But Hayes himself doesn't have a wireless Internet connection: "I helped a previous neighbor of mine with his Internet connection, and in return for this, he let me use his transmitter when I was working in the garden. Nowadays I sometime use the Internet of my other neighbors." At home, Hayes' Internet connection is via an old-fashioned ethernet cable.

Wonderful adventures in a millionaire's dream

The main building of TU Delft

An abandoned monument to wastefulness. An accidental storage dump. A hiding-place for uranium and resistance fighters. A bunker for an indifferent executive board. And now, TU Delft's main building will become a luxury apartment complex for premium living. From an empty shell to a national monument: the history of 'Red Chemistry', a building that has had the most wonderful adventures.

Afke van der Toolen

Original Gemeentearchief Delft

National monument since 2002

"The university building 'Red Chemistry', which later became the main building of TU Delft, on Julianalaan 132-134, was designed by architect Van Drecht from 1918-1923 and is of a great cultural and architectural-historic value:

- because of the function that it fulfills; namely, as a university faculty building for Chemistry and as the main building of the university, and because of the place it occupies in the history of Delft University of Technology;
- because of its architectural style and the place it occupies in Van Drecht's oeuvre, and because of its characteristic shape, the use of materials and detailing, and because of its flawlessness.

It has monumental value because of its visually defining location on the De Vries van Heystplantsoen, its central location on the TU campus and the spatial function and visual relationship it has with the surrounding TU buildings.

The building has singular value as one of the country's largest pre-war university buildings."

Source: National Service for Archaeology, Cultural Landscape and Built Heritage (RACM).

It all seemed so simple around 1915, when the Chemical Technology department was searching for new accommodation. In the old chemistry building on the Westvest, the test tubes rattled in their holders with every footstep, and the building was not only a fire trap but also much too small for the growing numbers of students. So what would be more desirable than a brand new building in the nearby polder? The administrators of the then TH-Polytechnic had already been dreaming of building their own campus on that site.

The government minister responsible for education spluttered his dissent. Couldn't these people just as easily move into an existing building? Nevertheless, the necessary polder land was purchased in 1917. Architect G. van Drecht, of the Dutch Government Building Department, then proceeded to sit down at his drawing table and design a mastodon of a building: Nine wings, a surface area of 30,000 square meters, built in a traditional style with influences of the 'Amsterdam School' of architecture.

The First World War provided the first stumbling block, however. It was impossible to import piles and Queen Wilhelmina did not feel obliged to donate any of the trees on her t'Loo estate. But fortunately trees from Brabant came to the rescue: the building work commenced.

"The music of the hammer, saw and trowel, which in the years following the first pile being driven in had sounded so lovely, was raised to heights of a pianissimo around 1921, before descending into dead silence in 1923", was how an article in the TH-Polytechnic's *Mededelingen* newsletter described the first years of construction. This was because following the signing of the Treaty of Versailles, the building project stalled. The war had also affected the economies of neutral countries and the Dutch government embarked on a severe austerity program. The building works were stopped. A fence was erected around the bare shell of red bricks and the building was left to its fate. The local youths quickly turned it into a playground – The long hallways! The tower with its winding staircase! – and soon thereafter the *Delftsche Courant* newspaper dubbed it a 'broken millionaire's dream' and a 'monument to wastefulness'. It would however been equally just to have labeled it a 'monument to austerity'. And this how it remained: a grand gesture that for decades would remain an empty shell.

Yellowcake

Red Chemistry. The building got its name from its characteristic red bricks, and for the science department that was originally meant to move into it. In the sad, intervening decades of the building remaining unfinished, you could still see the traces of its intended use for chemistry. There was the tower, more than 40 meters high, which was meant to serve as a reserve water tank for any fiery experiments gone wrong, and which immediately lent this broad, cumbersome building an upward-thrusting appearance. There were the remarkable decorative bulges in the outer walls, which served to camouflage the acid storage tanks. There was the height of the stories – some six meters high. This was not only to reflect status, as the newspapers supposed, but also to satisfy the design requirements for laboratories. Nevertheless, as bitter fate would have it, the Chemistry Technology department would never move into the building. The 1930s dawned, and in the depths of the Depression, there really were no funds available now. This prestigious but aborted structure descended into some kind of storage dump for passersby. The Dutch Governmental Fiber Department dumped 5,000 kilos of flax straw there. The Justice Department stored its excess furniture there. And the student union rehearsed for an anniversary celebration inside. There was certainly room enough for all this. But it was the two hundred wooden crates of 'yellowcake', or U_3O_8, or uranium oxide, stored in the basement in the Summer of '39, that actually had the most to do with chemistry. Would Red Chemistry ever see better days? Nazi

While elsewhere efforts were being made to develop an atomic bomb, the Delft yellow-cake remained unused in the basement

Germany seemed to be more interested in the building than the government of the Netherlands, judging by the fact that the famous LZ129 'Hindenburg' zeppelin flew over it. On a test flight that just so happened to fly over a few Dutch military airstrips and an army barracks, the zeppelin also flew over the red building on the edge of the green polder. Perhaps this was in the mistaken belief that there was a bomb factory inside. Whatever the case may have been, the zeppelin, equipped with spy cameras, certainly wasn't searching for flax straw. Yet the Germans apparently had no idea about the yellowcake stored inside.

This raw atomic fuel had been imported from the Belgian Congo by Universty of Leiden physicist W.J. de Haas, with the approval of Dutch Premier Colijn. Atomic fission had recently been discovered and De Haas wanted to study the process - also for possible military use. But the outbreak of the Second World War prevented this. While elsewhere great efforts were being made to develop an atomic bomb, the Delft yellowcake remained unused in Red Chemistry's basement.

The German occupying forces used Red Chemistry as a storehouse for artillery shells; meanwhile, funnily enough, there was a potential atom bomb under their feet the whole time. But there were also other things the Germans didn't know about. People were hiding in one of the building's closed wings, and while the exact details of this are unknown, one thing is certain: Red Chemistry, which for so long had been the laughingstock of Delft, could ▸▸

Red Chemistry: a monument of wastefulness

"...Indeed, the tax payer would certainly be surprised if he knew the truth about this abandoned monument to wastefulness...An agreement of 6 million guilders was reached for the construction of the building – the final amount has not been made public, but it is easily from 8 to 10 million guilders. The chimneystack cost more than a royal villa, the tower is built of the most expensive, handcrafted stone that exists, and there are expensive carvings at the top of the building, which can be seen with a spy-glass. [...] The exterior is sumptuous and enormous in size. The interior remains unfinished. The building work was halted halfway and the prohibitively expensive completed work has been wind- and water-proofed - yet one can still see in this half-built structure that everything was built regardless of expense. There are for example attics in this building that bear no relation to any previous comprehension of what an attic is. There are halls without rafters or tiles, halls with cement floors and splendidly smooth walls, seemingly endless halls, larger than exist in any city in our country. There are staircases in this building of ingenious design, which descend into magnificent, stately hallways. In the awe-inspiring lecture halls, amphitheater-like seating has been built in the most expensive way imaginable. If the building work will be continued in the same manner as it has been built until now, then the final costs shall not be much less than 20 million guilders."

From: Delftsche Courant, 23 June 1926.

finally associate itself with something positive: it had provided assistance to the Dutch resistance.

Yellow Chemistry

This marked the start of better times to come. Soon after Liberation Day, the rebuilding efforts also began for this barren, cavernous building on the Julianalaan. The Chemistry Technology department, for which the building was originally intended, did not move in however. That department had been given a more modest home nearby, but this time built with yellow bricks: 'Yellow Chemistry'. Meanwhile, Red Chemistry temporarily reverted to its traditional function as a repository, before finally acquiring a scientific purpose. Aircraft Engineering and Applied Physics – with TNO as a welcome outsider – were temporarily housed under the roof. In 1955, real life finally began. The building acquired a new purpose, and one that it could rely on. Red Chemistry became the Main Building. The right wing served as the offices of the TH-Polytechnic's Executive Board, while the left wing was designated for general sciences. Those who now walked through the building could observe the traces of the reconstruction works required for this. The attic was converted to office space, with suspended ceilings and a series of windows above the roof's ridge-beam. The six-meter high stories below had intermediate floors built in-between. When one looks closely at the building's exterior, it's possible to see where the intermediary floors are located: at the points where the high windows are interrupted by blank surfaces. Until this very day, the people whose offices are on these intermediate floors must go downstairs to lower or raise their window awnings.
Red Chemistry served as the main building of TU Delft for more than fifty years. Over the years the building lost some of its association with its red brick building material: rather, it came to stand for the executive board housed inside. 'The main building has decided such and such....' In the turbulent, socialist-red years of the 1970s, students began to regard the decisions taken inside with less and less respect. Red Chemistry – *what's in a name* – experienced this itself.

Nazi Germany seemed to be more interested in the building than the government of the Netherlands

On December 12, 1972, a couple hundred students – with sleeping bags under their arms and toothbrushes in their pockets – assembled in the courtyard of Delft's 'Maagdenhuis' for what would become the first building occupation. The students were led by the heavy chain carrying figure of 'Chain Willem' van Bodegom, whose job it was to ensure all the necessary doors and connecting doors were locked shut. The occupation was well organized and orderly, even if at first the then Rector Magnificus Van Nauta Lemke couldn't believe he actually had to leave the building and the chairman of the Executive Board Vermeyden expressed some dismay about the fate of the secretaries inside. Subsequent reports that some of these women were 'taken' on the desks by these wild, longhaired occupiers, proved to be false. For four days the TH-Polytechnic's Executive Board wing was in the hands of the occupiers. But they had it easy: the soft, thick carpets of the Executive Board offices were perfect for sleeping. For the establishment figures, however, this action was totally perplexing. "We are the father and mother of TH-Polytechnic!", Mrs. Van Nauta Lemke had cried. This first occupation was a resounding success. The occupiers' demands were met and many of the presiding Executive Board members resigned.

There are attics in this building that bear no relation to any previous

Lecture hall seats

There is of course much more to tell about the years that Red Chemistry served as the main building. About the seats in the lecture halls: 'The lecture is already over before you find a comfortable sitting position.' Or about Ragga, the singing cleaner, who in the evenings performed at Amsterdam's Paradiso nightclub, and in the mornings mopped the building's floors. Or about the squatters' misguided attempt – not so long ago – to squat part of the building: "We want to alert the university's Executive Board to the fact that there is a severe housing shortage."
But there isn't sufficient space here to tell all the tales, and the reality is that the life has already flowed out of Red Chemistry. Entire floors are now empty, just as they once were in the distant past. Movers now walk

comprehension of what an attic is.

to and fro pushing carts full of old computers and file-cabinets. Two huge, ever-fuller dumpsters now block the side entrance.
Up above in the water tower - which because of its dilapidated state is no longer accessible – the patchwork-like roofs of the TU's other buildings unfurl before the eyes of those who look southward. Once again, a new era is born, which in fact is a repeat of an idea first hatched nearly a century before: a neatly arranged, compact TU campus. It should have existed in those days, built around Red Chemistry, but the building was stranded by the capricious course of history. Now, a bit further down the line, a new endeavor beckons. And thus yet another wonderful new adventure begins for Red Chemistry: life as 'Villa Academia', a luxury apartment complex that, according to the sales brochure, will offer 'many residential benefits to a broad target group, treating them to the joys of premium residency for years to come'. This will be another entirely new phase of life for Red Chemistry. But then again, it has already experienced so much.

With thanks to: Joep Aalders, facility manager Main Building; and Auke Wouda, TU alumnus/former VSSD board member.

Sources:
O. Macel, Architecture-archive Delft University of Technology, 1994
Rutger Janssen, 'Rode Scheikunde' (Red Chemistry), Architecture presentation, 2002
H. Baudet, 'De lange weg naar de Technische Universiteit Delft' ('The long road to Delft University of Technology'), 1992
Delftsche Courant, 23 June 1926 and 13-16 December 1972
Joost van Kasteren, 'De spionagevlucht van de Hindenburg' ('The espionage flights of the Hindenburg'), in: Delft Integraal, 2002.

[BERKHOUT]

COLUMN

A Chinese ICT company plans to introduce a new cell phone onto the market that performs better than the phones currently available to us on the Western market. The message: emerging economies are no longer competing solely based on price. The young people in those countries are becoming increasingly better educated. Their universities are full of passionate students, driven by the ambition to be among the very best. And what is our response here?

In the past, commercial economic activities were based on the traditional manufacturing of goods by means of two production factors: capital and labor. Industrialization and globalization have substantially increased competition. Companies are now forced to produce better products at lower costs.
This has given rise to the knowledge economy, in which precise instruments and smart manufacturing equipment have enormously expanded the possibilities available to companies. Formal knowledge has become, in addition to capital and labor, the third production factor. Higher priority is given to training personnel. In the past decade, integrated knowledge and high value craftsmanship has made strong growth in productivity possible.
We are now witnessing a new development, which is possibly the most essential one for the future of the Western world. The truly great changes are now occurring in the innovation-economy – in addition to capital, labor and knowledge – creativity is now the fourth production factor. Placing the emphasis on creativity makes a difference. In short, we can say that in a knowledge economy, logic and reason play a dominant role, while in the innovation-economy everything depends on creativity and imagination. Innovation is not only about being more efficient (using knowledge-rich solutions), but rather is primarily about greater effectiveness (using creative solutions)
We can best describe the activities undertaken in an innovation-economy as 'creative enterprises bolstered by knowledge'. It is not only an issue of creativity or entrepreneurship or knowledge: it's the combination of these that counts.
For universities that aspire to be among the best, it is vitally important to capitalize on the above-mentioned developments. The best universities will increasingly function as an integral part of a worldwide open innovation system. The best universities do not only supply the scientific knowledge that reveals how things work; they also devise the creative concepts needed to solve the major social problems.
The best universities are therefore above all innovative universities. They have creative researchers in their midst who are able to remain independent of existing solution methods and are capable of blazing new trails. These are not researchers who allow themselves to be used to merely polish existing solutions. And they are not researchers who are simply willing to report what their employers find agreeable. The ultimate value of a researcher is after all determined by his independence.
Innovative universities possess an organizational structure that gives creative people the space they need to embark on new endeavors. Managers who institute a profusion of (conduct) regulations and (evaluation) procedures create a working environment in which it is exceedingly difficult to blaze new trails. We must therefore never give in to external pressures from contractors that result in compulsory activities. Punching a time-clock has no place in a university. Only the results must matter. One of the most important qualities of a university management team is the extent to which it protects its researchers from bureaucratic red tape.
The violent, relentless competition from emerging economies demands another approach. This approach isn't merely to improve the implementation of existing things. With that approach we will surely lose the battle. The answer is found in greater ambition, creative instructors and less-regulated organizations. Studying and working at a university must be an exciting trip of discovery, full of surprises. This produces the best results. This will only transpire if we break down faculty walls, raise morale and reward creativity. Why aren't we doing this?

Professor Guus Berkhout works at the Faculty of Technology, Policy and Management.

LHORA·EST

Propositions

Engineers are scientific architects. They advise on the application of science, just as architects advise on the construction of buildings.
Erik de Jong
Electrical Engineer

The pledge 'just between us' is a pledge to share information with everyone who has the title 'highly trustworthy'.
Amr Ali Eldin
Electrical Engineer

The life of a workaholic unfolds according to a frenzied schedule that even schedules in moments of relaxation with family and friends.
Sandro Haddad
Electrical Engineer

Helping your PhD supervisor carry his washingmachine and dryer up to the attic can prove beneficial during your doctoral thesis defense.
Paolo Tiso
Civil Engineer

The time difference you experience when traveling from east to west should actually be called a jet lead, rather than a jet lag.
Karel Hinnen
Physics Engineer

In the past people were susceptible to the climate, while today the climate is susceptible to people.
Maaike Kroon
Chemical Engineer

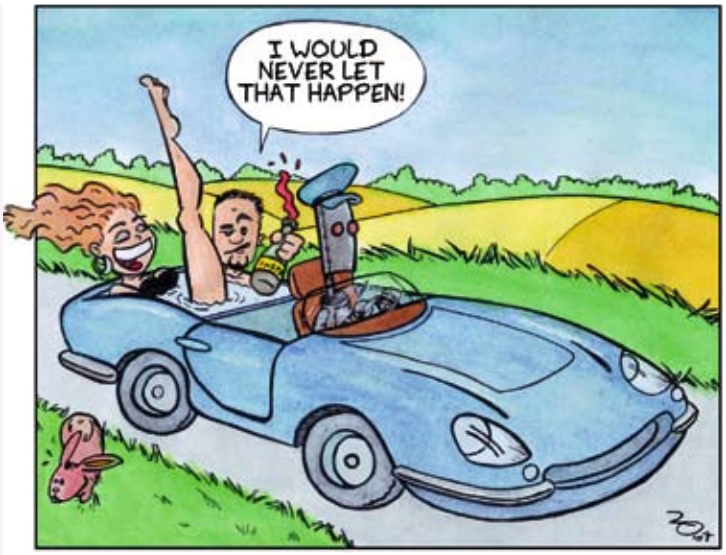


Illustration: Rutger Ockhorst

Automation of the driving task shouldn't reduce the fun of driving.
Francesco Viti, Civil Engineer

[Sound]bites

"Over the years, I've complied a large archive of pictures of steel-pipe chairs. They are often moldy, yellowish pictures from old factory catalogues. I had planned to organize them before I died, because whoever should find such a disorganized archive probably wouldn't be able to make much of it. [...] I decided to arrange them according to shape. Such as botanical, yes, or 19th century art history: study them well and classify according to exterior characteristics."
Architecture historian Dr. Otakar Macel in NRC HANDELSBLAD

"Political parties must break from the notion that when putting together a cabinet per se, they must strive for political balance. [...] The search for 'project ministers' must become a much more business-like affair. People must be invited based on their expertise, not on the grounds of their political affiliations. But I'm afraid that the old political parties could never bring themselves to do this."
Professor of innovation, Prof. Dr. Guus Berkhout in TROUW

We're accustomed to day and night, summer and winter, to the tides. So why can't we grow accustomed to a climate that is changing? A climate is actually nothing more than the average weather?
Geologist Prof. Dr. Salomon Kroonenberg in DE VOLKSKRANT

"We can maintain the coastline for a long time by using sand supplements. [...] As long as you add sand at the same rate that the sea levels rise, there's not so much to worry about."
Hydraulic engineer Prof. Dr. Huib de Vriend in TECHNISCH WEEKBLAD

"Getting coffee for your colleagues increases their chances of developing health problems and lowers their productivity."

In Defense

"*It is better if the central coffee machines are in the offices or other places where people spend a lot of time sitting at their computers. People who don't move very much have a greater chance of developing back and neck problems. It is therefore better not to politely get coffee for the whole department. Moreover, those people who sit alone behind their computers miss out on a lot of information. There is actually lots of conversation around the coffee machine, and 75% of it is about work. In this way, coffee drinkers exchange information very efficiently and consequently their productivity increases. During my doctoral research, I never got coffee for my colleagues. Instead, I invited them to walk with me to the coffee machine.*"

Lottie Kuijt-Evers
PhD in Movement Science (Industrial Design)

An alumnus of TU Delft writes a column and then passes the pen on to another alumnus of his or her choosing.

The development of the analytical mind lies at the heart of any TU Delft education. From the start of your studies you learn to calculate, for instance, the desired thickness of the UFO-Aula's support pillars or to design bridges that are capable of withstanding the forces of nature. By the way, it is a known fact that no TU Delft graduate has been involved in the design of Rotterdam's Zwanen Bridge...

As a computer scientist, however, I felt rather excluded from this world. It wasn't until my third year that I was allowed to apply my theoretical knowledge of differential equations to practical problems. Once, while studying with my then girlfriend (now my wife), I realised that these difficult calculations were in fact more than just puzzles and could actually be applied to fluid dynamics, for example. My TU Delft education has since proven to be very well-suited to my work as a management specialist at the United Nations, where a certain degree of analytical thinking and rationality is essential. My job involves overseeing reorganisations and other reforms within the United Nations Development Programme. I work with business units at UN headquarters in New York City and with various country offices located all over the world. You'll understand that in such a complex, bureaucratic environment, rationality isn't always the determining factor in the decision-making process. Other concerns often play a role. If priority is given to political persuasion, then analytical considerations are, by definition, resigned to at best a secondary role.

In recent years however it's become clear that a change has occurred: perceptions of the outside world are ever more important, and the outside world is clearly better informed about the internal workings of the organisation. Consequently, there is an increased attention to solve problems through a fact-based and rational approach. You can see that analytical skills are now more highly prized.

Having gained a wealth of experience over the years working in change management within an organisation like the UN, I've obviously learned to combine my TU Delft bluntness with a touch of diplomacy. It remains a challenge to convince for example a national counterpart by merely using the facts that are available or trying to support another counterpart in fighting corruption in the national system, yet do so without actually stating that that system is in fact corrupt. Having made many trips to the most diverse countries in the world, it became clear to me that, owing to cultural differences and different ways of working, great value is, without exception, placed on arriving at solutions in a logical manner. As Michael Persson wrote in his column: "A graduate is nothing yet, and can still become everything", and as I have experienced there are even opportunities for a TU Delft graduate in the diplomatic world. This must surely be a positive development.

George van Montfort

Ir. George van Montfort (32) studied computer science at TU Delft from 1992 to 1997, and currently lives and works in New York. Van Montfort will now pass the pen on to Arjan Poels, a TU alumnus (aerospace engineering) who is currently the general manager of a sawmill and chipboard factory in Tanzania.

Broaching Ship

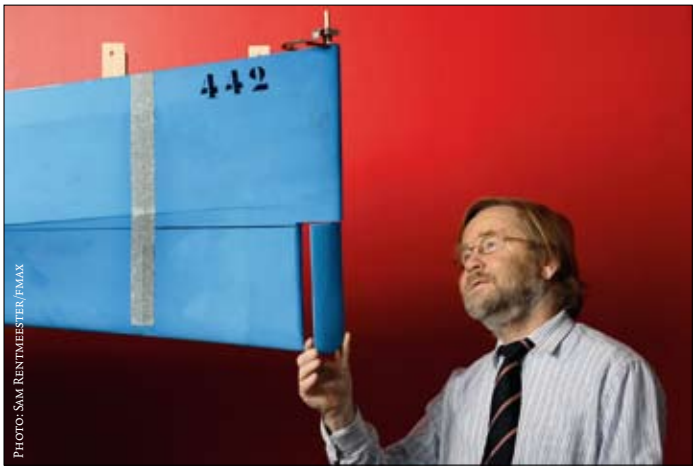


Photo: Sam Rentmeester/fmax

Fast and storm-worthy: maritime engineer Dr. Lex Keuning has developed a patrol boat with an extra rudder on the bow.

Tomas van Dijk

Year after year, Keuning watched them perish. New concepts for patrol boats rarely survived tests conducted in turbulent waters. "Huge waves that come diagonally from the rear, form a bottleneck," the researcher says. He has recently tested a number of ship models of patrol boats at the Maritime Research Institute Netherlands (Marin).

Such waves cause the ships to broach. The waves lift the rear of the boat up and plunges the nose sideways into the water, causing the ship to heel and throwing it off course. This is especially a problem for ships measuring approximately one hundred meters, which must sail fast and weather storms. "If this effect occurs at high rates of speed, the ship can capsize," Keuning explains. The ship broaches over its front. And counter steering does not help. "This causes the ship to heel even more," Keuning says, speaking from experience, as he is also a passionate sailor.

Eighteen months ago, while conducting tests on a number of fast ships, Keuning got what he calls his "brainwave". Placing a second rudder on the bow of the ship could help prevent the broaching. "You could then steer away and at the same time pull the ship upwards again."

Some ships, including certain types of ferryboats, already have a rudder on the bow. This allows them greater maneuverability in tight spaces. Their rudders however are not designed to prevent broaching.

Keuning has since requested a patent for his bow-rudder and is working together with Damen Shipyards to build a new generation of patrol boats, with a commission from the Dutch Coast Guard. He expects the first ship to be ready in 2008. The ship will measure thirty-five meters long, will be capable of reaching speeds of 30 knots (55 kilometers per hour) and should be at least fifty percent less prone to broaching.

The vessel will look like another ship that Keuning had previously designed: the axe bow. The bow of this ship, which recently set sail, is shaped like an axe, which cuts the waves and means the ship rarely rises and falls.

Because the axe bow has a straight bow that extends deep under the water, it is relatively simple to add a bow-rudder. But most ships have a slanting, upright bow, which means they rise up out of the water somewhat when traveling at high speeds. "From a construction standpoint, it's a nightmare to add a bow-rudder to such classic ship hulls," Keuning says. "It would be a fragile construction." The United States Coast Guard has also expressed interest in the Delft design.

More information: Dr. Lex Keuning, J.A.Keuning@tudelft.nl; Damen Shipyards, www.damen.nl.

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.

TU Delft
P.O. Box 139
NL-2600 AC Delft
The Netherlands
telephone +31-15 278 9111
telefax +31-15 278 6522

Disciplines

Aerospace Engineering
Kluyverweg 1
NL-2629 HS Delft
Telephone +31 15 278 2058

Applied Earth Sciences
Mijnbouwst raat 120
NL-2628 RX Delft
Telephone +31 15 278 1423

Applied Physics
Lorentzweg 1
NL-2628 CJ Delft
Telephone +31 15 278 7774

Architecture
Berlageweg 1
NL-2628 CR Delft
Telephone +31 15 278 4184

Chemical Technology & Bioprocess Technology
Julianalaan 136
NL-2628 BL Delft
Telephone +31 15 278 2667

Civil Engineering
Stevinweg 1
NL-2628 CN Delft
Telephone +31 15 278 5440

Electrical Engineering
Mekelweg 4
NL-2628 CD Delft
Telephone +31 15 278 4568

Geodetic Engineering
Kluyverweg 1
NL-2629 HS Delft
Telephone +31 15 278 3289

Industrial Design Engineering
Landbergstraat 15
nl–2628 CE Delft
Telephone +31 15 278 4750

Life Science & Technology
Julianalaan 67
2628 BC Delft
Telephone +31 15 278 8271

Marine Technology
Mekelweg 2
NL-2628 CD Delft
Telephone +31 15 278 6666

Materials Science
Mekelweg 2
NL-2628 CD Delft
Telephone +31 15 278 6666

Mechanical Engineering
Mekelweg 2
NL-2628 CD Delft
Telephone +31 15 278 6666

Computer Science
Mekelweg 4
NL-2628 CD Delft
Telephone +31 15 278 4568

Applied Mathematics
Mekelweg 4
NL-2628 CD Delft
Telephone +31 15 278 4568

Technology, Policy & Management
Jaffalaan 5
NL-2628 BX Delft
Telephone +31 15 278 7100

Multidisciplinary Centres

Adhesion Institute
Kluyverweg 1
NL-2629 HS Delft
Telephone +31 15 278 5353

Biotechnological Sciences
Delft Leiden (bsdl)
Julianalaan 67
NL-2628 BC Delft
Telephone +31 15 278 5140/2342

Centre for International Co-operation and Appropriate Technology (CICAT)
Mekelweg 2
NL-2628 CD Delft
Telephone +31 15 278 3612

Centre for Transportation Engineering
Stevinweg 1
NL-2628 CN Delft
Telephone +31 15 278 6634

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Mekelweg 2
NL-2628 CD Delft
Telephone +31 15 278 7884

Koiter Institute Delft (Institute for Engineering Mechanics)
Kluyverweg 1
NL-2629 HS Delft
Telephone +31 15 278 5460

Netherlands Institute for Metals Research (NIMR)
Mekelweg 2
NL-2628 CD Delft
Telephone +31 15 278 2535
Fax +31 15 278 2591

Wind Energy Research Group
Kluyverweg 1
NL-2629 HS Delft
Telephone +31 15 278 5170

Reactor Institute Delft
Mekelweg 15
NL-2629 JB Delft
Telephone +31 15 278 5052

OTB Research Institute for Housing, Urban and Mobility Studies
Jaffalaan 9
NL-2628 BX Delft
Telephone +31 15 278 3005

Open Building Working group (OBOM)
Berlageweg 1
NL-2628 CR Delft
Telephone +31 15 278 5400

Delft Institute for Microelectronics and Submicrontechnology (DIMES)
Feldmannweg 17
NL-2628 CT Delft
Telephone +31 15 278 3868

Interduct Delft University Clean Technology Institute
Rotterdamseweg 145
NL-2628 AL Delft
Telephone +31 15 278 7233

J.M. Burgerscentrum Centre for Fluid Mechanics
Mekelweg 2
NL-2628 CD Delft
Telephone +31 15 278 3216

Netherlands Schools for Advanced Studies in Construction
Stevinweg 1
NL-2628 CN Delft
Telephone +31 15 278 3332

Advanced School for Computing & Imaging
Mekelweg 4
NL-2628 CD Delft
Telephone +31 15 278 8032

Trail Research School
Kluyverweg 4
p.o. box 5017
NL-2629 HT Delft
Telephone +31 15 278 6046

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

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Information Office
p.o. box 5
NL-2600 AA Delft
Telephone +31 15 278 5404
http://www.tudelft.nl

Information on facilities for foreign students:
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Jaffalaan 9a
NL-2628 BX Delft
Telephone +31 15 278 4670

Liaison between business and research:
Liaison Office
Mekelweg 2
NL-2628 BX Delft
Telephone +31 15 278 1500

Information on research fellowships:
Mrs. M.Y.M. Spiekerman-Middelplaats
Stevinweg 1
NL-2628 CN Delft
Telephone +31 15 278 3773

General information on university education in the Netherlands:
Min. of Education, Science & Culture
Central Information Dpt.
p.o. box 16375
NL-2500 BJ Den Haag
Telephone +31 70 412 3456

(Post Graduate) Courses

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(vocational courses)
Mekelweg 2
p.o. box 612
NL–2600 AP Delft
Telephone +31 15 278 8019
Fax +31 15 278 1009
www.delft-toptech.nl

Institute for Biotechnology Studies Delft Leiden (bsdl)
Julianalaan 67
NL-2628 BC Delft
Telephone +31 15 278 2355

For information on courses in the Dutch language:
Language Laboratory
Jaffalaan 5
NL-2628 BZ Delft
Telephone +31 15 278 4124