

2008.1

RESEARCH AND EDUCATION AT
DELFT UNIVERSITY OF TECHNOLOGY

DELFT Outlook

Superbus
High-tech
wrapped in luxury

Famous Alfa Romeo • Guest writer A.F.Th. van der Heijden
Tectonic turmoil • Luminous bricks • Skyscrapers with shock absorbers

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DELFT Outlook

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'The Laughing Man' is a real Rembrandt. Without the painting itself ever changing in any way, its buyers at the auction in Gloucester last year made a bundle when the news broke. Real history pays more than ever, in spite of the criticism levelled at the excessive values being placed on it. TU Delft managed to prove the authenticity of some distinguishing features of a 1930s vintage racing car, which will push up its value quite a bit. Pecuniary advantage is not always the driving force. The Dutch Luminescence Dating Centre of TU Delft used an advanced technology to discover that the medieval church of St. Catharine's in Eindhoven is a century and a half younger than previously thought. Nobody's going to profit from that, although the archeologists in Eindhoven do get a kick out of it. History teaches us nothing, as the opponents of historicism will tell you. Nonetheless it would still seem we cannot do without that strange drug called history.

FRANS GODFROY,
Editor-in-chief, Delft Outlook



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CORRECTION

In the previous edition there was an error in the column by Joop Schoonman. The DIOC did not raise 1,135,000 euro, but rather 11,350,000 euro.

COLOPHON

coverphoto

PHOTO: SAM RENTMEESTER/FMAX

Volume 25, № 1

DELFT Outlook is published four times a year
by Delft University of Technology
ISSN 0926-7212

editorial staff

Frans Godfroy (editor-in-chief), Jorinde Hanse, Katja Wijnands,
Dorine van Gorp (managing editors), Saskia Bongers,
Tomas van Dijk, Maaike Muller, Sam Rentmeester (image
editor), Connie van Uffelen, Jos Wassink

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

Jos Hilkhuijsen, Catholijn Jonker, Bianca Lambrecht,
Joost Panhuysen, Angèle Steentjes.

subscriptions

Anke Stronks
(015) 278 8598
subscriptiondo@tudelft.nl

translations

Margareth Clegg, Marcus de Geus, David McMullin

design & typesetting

Cok Francken & Roland van Roijen
MultiMedia Services, TU Delft

photography

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printing

DeltaHage bv, The Hague

editorial council

prof.dr. J. Dankelman (mechanical engineering)
prof.dr. J.W. Drukker (industrial design engineering)
prof.dr.ir. J.T. Fokkema (applied earth sciences)
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IN•BRIEF

Solar boat



PHOTO: SAM RENTMEESTER/FMAX

Seven hundred grand will get you one, the world's first solar-powered speedboat. In May the first potential customers can take it for a spin. Maritime engineering students Nils Beers and David Czap unveiled their craft late last year at the Millionaire Fair. As the white sheet was lifted, a ten metre long, black carbon-fibre boat was revealed. Fourteen square metres of deck-mounted solar panels provide the power to propel the vessel at up to 55 kilometres per hour.

Beers and Czap got the idea of developing a luxury solar-powered speedboat after winning a solar-powered boat race in Friesland last year. They don't consider themselves environmentalists, but, as Beers says: "Something will have to be done. I was given a BMW 760 to drive on the days preceding the Millionaire

Fair. That's hardly a green car, but once you're used to a fantastic car like that, you won't go looking for a Toyota Prius." The company's aim therefore is to combine sustainability with luxury.

They are still waiting for their first buyer. They don't think there's much of a chance of it being a Dutchman. "Statistically speaking, there are only four private buyers for this boat in the whole of Holland." So, instead, they are looking for prospective customers in France and the Middle East.

Contact:

Nils Beers,
nils@czeers.com

Living on Mars

Aerospace technology should be used for colonising space and searching harder for extraterrestrial life, said Dr. Ir. Jacco Hoekstra, Dean of Aerospace Engineering, in his inaugural speech in January.

According to Hoekstra the pace of innovation in the aerospace industry has been much too slow these past decades. He believes major rethinking is needed to make any progress, so he has set five targets for this century.

The colonisation of space and the search for extraterrestrial life are the first to catch the eye. Hoekstra: "The main question facing scientists is of course, where do we come from? To answer that question, we need to study life in outer space."

According to the Dean of Aerospace Engineering there is no doubt whatsoever that there is life out there. He thinks his faculty could play a major role in the search for life. "Ideas germinate here, and we can investigate them. Of course we don't do so all by ourselves. This is an international world, so we must cooperate with ESA and NASA." Hoekstra also thinks that his faculty should play a role in the colonisation of space. "There is a limit to the available space on Earth, but the population keeps growing. This is an obvious reason to start looking for other places within our solar system where we would like to go." His first thoughts are of the Moon and of Mars. "We should be able to establish permanent and self-sufficient colonies in both places before the end of this century."

Windmill desalinates seawater



PHOTO: SAM RENTMEESTER/FMAX

It looks like an old-fashioned windmill of the type you see so often in the Dutch landscape, but the fifteen metre high structure along the A13 motorway near Delft is not there to keep the land dry. Instead it desalinates seawater.

The installation is a project of civil engineering student Evgenia Rabinovitch. The eventual purpose of her project 'Drinking with the wind' is to build windmills that can purify seawater in developing areas.

The researcher will be able to test her setup this spring, when the windmill, which is currently being tested in a basin of water to which salt has been added, will be installed on the island of Curaçao. The mill pumps saltwater through a thick cylinder made up of a series of porous polymer membrane layers. Once the water has penetrated through the tube's core, the water has been desalinated. This membrane filter technique is called reverse osmosis, and although it has been in use for decades, the combination with a windmill

is new. The usual way of pressurising water to pass through the membranes is to use electric pumps. In Rabinovitch's setup the pump has been left to the mercy of the wind. In very high winds the pump might push too much water through the filter, leaving behind a salt and calcium solution that is too highly concentrated. The particles in this solution could clog up the filter. The student has found a clever solution to this problem by adding a second, smaller pump to the purification plant. This pump acts as a buffer to catch excess pressure and reroutes it back into the system. According to Rabinovitch's supervisor, Dr. Ir. Bas Heijman, the windmill could ultimately be constructed at a cost of 35,000 euros. This would mean that the mill could produce 1,000 litres of pure water at a price of 1 to 1.5 euro. Which is a good thing on an island like Curaçao, where 1,000 litres of water currently costs between 5 and 7 euros.

More information:

Evgenia Rabinovitch, e.n.rabinovitch@gmail.com

www.drinkingwiththewind.nl

Skyscraper with shock absorbers

According to Professor Ir. Rob Nijse, skyscraper structures can be made much lighter. During his inaugural speech in February, the architectural engineer presented a mathematical formula that should make this possible.

Get seasick in the middle of town? You can on the 59th floor of the Citigroup Center in New York. The top of the 279 metre high building sways almost 30 centimetres in high winds. To prevent such mishaps, structural engineers like to be safe rather than sorry, and use so much material in their buildings that they hardly move even in the fiercest of gales.

Nijse thinks this approach has gone too far. "Buildings should become more dynamic. You could for example use hydraulically controlled shock absorbers in a building that help it to push against the wind and so stabilise itself," says the researcher, who got his inspiration from the resilient nodes he saw in the stems of reeds. Less revolutionary methods could also be used to good advantage, Nijse believes. "If you start your strength calculations early on in the design stage, you can reduce the structural weight by ten to twenty percent without affecting the stability." Of course it does require a new formula, one that will enable engineers to play around with the

design at an early stage. Finite-element programs were not the way to go, according to Nijse, so he came up with an algorithm in which he establishes a link between a building's height and its deflection in a state of harmonic oscillation. This is a state we have all observed as a toddler, when our tower of building blocks swayed drunkenly before it collapsed."

According to Nijse, the formula is particularly

useful for buildings over 200 metres high. Only then does the oscillation effect come into play. "They could really use it in Dubai, where the 808 metre high Burj Dubai contains as much steel as we use in a whole year in the Netherlands."

More information:

Prof. Ir. Rob Nijse

R.Nijse@tudelft.nl

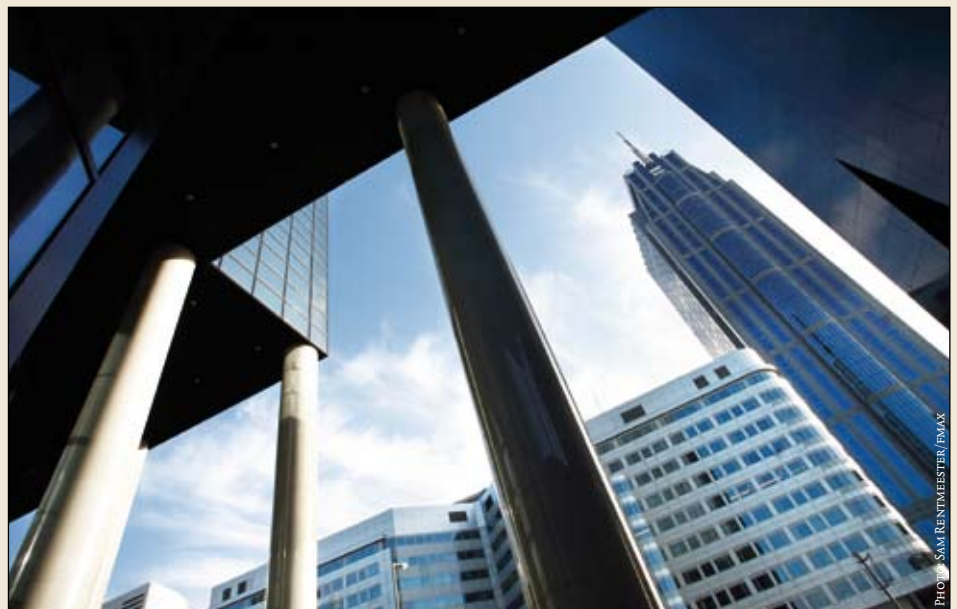


PHOTO: SAM RENTMEESTER/FMAX

Racing on alcohol

The Delft racing team came in second place at last year's Formula Student competition for university team Formula-style racing-cars. This year the team will be reaching for victory with bio-ethanol.

Of course it's a good thing that the decision to switch to biofuel brings green associations to mind. The change also fits in well with the intention to reduce CO₂ emissions from racing, a trend that was started with the use of lightweight materials to create a vehicle weighing only 140 kilogrammes. The main reason however, is that the student racing team sees a chance to squeeze more power from their engine using alcohol and so leave the Australian team – which will keep racing on petrol – behind. The changeover involves quite a bit of tinkering.

In order to get the most out of the new fuel the engine block will have to be modified. The most important modification will be to increase the compression ratio. This is done by milling the cylinder to shorten it, so that the cylinder is lowered, minimising the space above the piston at its highest point.

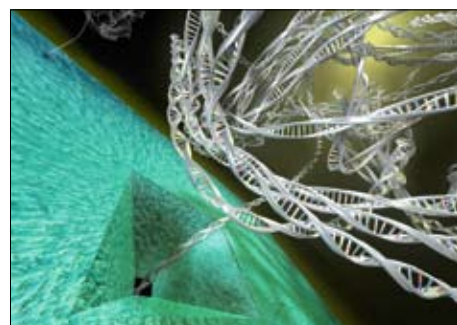
The next step is to test run the engine on the testbed. The team has ordered a special spark

plug that will be used to measure the changing pressure inside the cylinder. Other test data to be recorded include fuel consumption, engine speed, torque, and power output. The Delft team expect they will also have to adjust the ignition timing and the fuel injection system to be able to make full use of the bio-ethanol.

In addition to modifications to the engine block, other materials will have to be used, since

ethanol eats into rubber and aluminium. "An aluminium tank would simply dissolve" The first meet is scheduled for 14–18 May in the United States, to be followed later in the summer by races at Silverstone (England) and Hockenheim (Germany). We will see then if green really is better.

More information:
www.dutracing.nl



Bionanoscience

The latest shoot to sprout from the stem of Applied Sciences is the department of BioNanoScience. According to its initiators, Professor Dr. Cees Dekker and assistant-professor Dr. Nynke Dekker, bionanoscience is a key scientific field for the 21st century. The field of biology as an engineering science with useful applications remains largely undeveloped. This TU Delft initiative is the first in Europe. In the field of molecular biology, collaboration has been established with the European Molecular Biological Laboratory (EMBL), a top-ranking institute in Heidelberg, Germany. The illustration shows a drawing of a DNA molecule being pulled through a nanogate.

More information: Prof. Dr. Cees Dekker, phone (31) 15 278 6094

Molecular pinball

A chip that will sort DNA molecules and proteins. The lab chip created by Dr. Ir. Gea Oswah Fatah Parikesit promises new possibilities for genetic tests.

The Delft Centre for Microelectronics DIMES produced the laboratory chip, four cells on a square centimetre. Each cell has a radius of one millimetre, with an input channel that is about one tenth of a millimetre wide and only one micrometre (one thousandth of a millimetre) deep.

Gea Oswah Parikesit, who recently obtained his doctorate with Professor Dr. Ted Young at the Faculty of Applied Sciences, intended to use the chip to sort molecules according to length. An electrical field

across the input and output channels propels the liquid through the cell. Dissolved molecules move about like balls in a pin-ball machine, entering the cell on the right, moving through an arc and then leaving through one of the output channels to the left of the input.

The doctorate student noticed that heavier molecules, just as in a mass spectrometer, ended up further from the input than lighter molecules did. This enabled him to separate two types of DNA molecules (one three times as long as the other) from each other. The lab-on-a-chip (LoC) idea is not new, and some types are even commercially available, but the small scale makes Parikesit's chip unique. The advantage of working on such a small scale is that for medical

applications only a few molecules are required to be able to make a diagnosis.

Although the molecule sorting mechanism is still a bit rough, the separation principle has been proven. The researcher himself suggests a few ways in which separation may be improved. The input channel could be narrowed, the input flow alignment could be improved, or a number of separating cells could be connected in series. To begin with, a chip already contains four cells. The first bit is always the hardest, but once the system has made to work, it can usually be improved tenfold quite easily.

More information:
Prof. Dr. Ted Young, t.young@tudelft.nl

Business Class in a racing car

It's not a car, it's not a bus, it's not a truck, and it's not even a super stretch limousine. What is being built in Delft is the much-discussed Superbus, which is to travel from door to door, reaching speeds of 250 kilometres per hour. This summer this new form of public transport is to enter service in Beijing during the Olympic Games.

JOS WASSINK



Antonia Terzi, chief vehicle designer of the Superbus

"Ladies and gentlemen, traffic on the A13 has come to a halt due to an accident. I propose that we wait another ten minutes." Professor Dr. Wubbo Ockels couldn't have wished for a better start to his presentation of a new concept in public transport. After all, his Superbus is to provide a new way out of the growing mobility problem. In fact the solution seems a long way off when you walk through the building in Delft where the Superbus is being built. The floor of the Superbus is still lying in pieces at the back of the workshop. A little further on is a nine metre long mould of the side and wing doors which is waiting to be covered with several layers of carbon fibre before being vacuum-injected with epoxy resin. The process is labour-intensive, and the material is expensive, so it comes as no surprise that the ultra hard, ultra rigid, and ultra light carbon fibre technology is used only in the most exclusive of cars, including the top of the Ferrari range.

The big mould is a hopeful sign for Ockels: "I can remember the difficulty we had in designing the side of the vehicle, nine metres long and with eight doors in it, and still making it stiff enough. We managed by using cross bracing to obtain the required rigidity. Actually producing the thing is not the main issue anymore." Ockels understands how the uninitiated may find it hard to imagine that a prototype Superbus will be rolling out of the workshop in six months time, but he is confident that it will. "The electric motors, the steering system, the batteries, the windows, they are all there, or they will be delivered soon. From then on it will just be a question of assembling the thing. You wouldn't believe the speed

we're keeping up here. From first sketch to prototype in two years, nobody else can match that." The remark that this could well be the reason why the project has met with quite a bit of resistance is countered by Ockels: "What many people don't know is that I have quite a bit of experience running projects. I once built a satellite in six months. And how about the Nuna solar racer? Just give me a small team of intelligent people with a common focus. Let me take care of the workshop and the money. Mark my words, this is going to turn out a winner."

Formula 1

A prominent member of the team is chief vehicle designer Dr. Antonia Terzi. During the course of the interview she twice rushes out of the room to see to other things. Each time she carefully closes the door behind her so as not to disturb the others. "I tend to yell a bit," she says. "I'm Italian, and it shows." High-spirited Terzi studied mechanical engineering and materials science at Modena University. "The heart of Ferrari," she adds. For her graduation assignment she did work for the Menardi racing team. This was followed by her doctoral research on aerodynamics at Exeter University, on behalf of Ferrari. She was then hired as chief of aerodynamics for the BMW-Williams F1 team. "In other words, I have worked for all the major racing teams. I had a great time, and I learned a lot. Not just about aerodynamics, but also about fast cars in general. Superbus is my next challenge. Superbus is full of high-tech stuff," says Terzi. "We took our inspiration from the state of the art, and we redefined the solution within the constraints



PHOTOS: SAM RENTMEESTER/PMAX

The contours of Superbus according to Antonio Terzi: a low, streamlined and super stretched limousine.

of Superbus. I'm especially proud of the way everything has been integrated. It was a major job. We are working together with a total of fifty different companies, not just in the Netherlands, but also abroad. All of them have to be singing to the same hymn sheet. Only thirty people work in this building. All in all, more than 75 different companies, institutions, and universities have been involved in the project."

Superbus will emulate the comfort and privacy of private transport. Terzi: "You enter the Superbus through your own door, straight into your own private space. Your whole trip is individual, since you call Superbus when you want to leave. It is just like having your own car, but it is still public transport. Superbus is not the slow type of bus we all know, it is more exciting than a Porsche. The passengers ride comfortably in large, wide seats with cream-coloured leather stretched over soft foam cushions. They will look out through blue-tinted glass, so it will always appear to be summer. They will have their own compartments with individual television sets and separate doors. Just like a private car, but more luxurious."

The space where the luxury cab is soon to be built now holds a full-scale Heath Robinson structure. Timber battens have been screwed together to form a model of the bodywork. The frame has been boarded up in places with cardboard, plywood, or plastic. A seat commands the front, facing the spacious control console, with a row of three seats behind it. For streamlining purposes, Superbus has been kept low, too low to allow standing room inside, so there is no aisle. Passengers get in and

out through one of eight doors on either side. Only the centre passenger will have to pass in front of someone else. Industrial design engineer Jochem van Deelen is on the interior design team. He explains that although the interior was designed using a computer, a full-scale mock-up is now being constructed to get a better idea of the interior space. Van Deelen closes his eyes to visualise the interior: "Sporty it will always be, because it is a racing car after all. The bare carbon fibre frame will remain visible, as will the structural elements. But within that environment you will be in a luxury seat with your own climate control. It is in fact business class in a racing car."

Alterations

With only six months to go to Beijing, the team still has a lot of work to do. Terzi: "Some of the design work has yet to be completed. The vehicle is currently being built, and then the tests will follow."

Although the design of the middle section has been finalised, front and rear sections still require some alterations. At top speeds, the current nose design would push down too hard on the road. The chassis and glazing are being manufactured; the electric motors have been ordered and partly delivered. Each of the electric motors will be coupled to one of the four rear wheels by means of a drive shaft, keeping the unsprung mass at the wheel as low as possible. The lithium polymer batteries have been ordered, and the software to process the input signals from no less than 750 sensors on board the Superbus is under construction. The onboard software will handle ➤

input ranging from safety belt detection (for each of the 24 seats) to obstacle-detection radar.

Finally, the design for the wheel suspension has also been completed, although it has been kept a lot simpler than originally planned. The first idea was to create a proactive suspension system, i.e. a system that looks ahead and pulls up a wheel the moment a jump in the road looms ahead. Eighteen months ago Professor. Dr. Ir. Ingo Hansen (design of transport and traffic systems, department of transport and planning, Faculty of Civil Engineering and Geosciences) made some critical comments on the subject. With a feeling for understatement he called the intelligent suspension system 'a major challenge'. Ockels now says: "We failed to take into account the fact that the moment you pull a wheel up, the reaction causes something else to go down, cancelling the effect."

"Yes, the active suspension is an example of simplification," Terzi says. "Another change involves the

automatic pilot. We said that a driver would drive the bus in town and on motorways, and that the Superbus would be equipped with an automatic pilot for use on the supertrack (purpose-designed concrete tracks for the Superbus, ed.). Since there are no supertracks yet, we did not pursue the automatic pilot system, but other support systems, such as radar, have been included. Any other changes? I can't think of any."

The software is something that doesn't worry Terzi – in spite of the 750 sensors involved. The sensors are connected to a Lloyds'-certified system that is also used on large yachts. The system integrates the sensors and a number of local PLCs (Programmable Logic Controllers). Terzi is prepared for surprises in some of the control systems, though. As an example she mentions the battery charging system, which prevents the batteries from being overcharged. Suppose the batteries are fully charged and charging current flows back from the brakes, what will the system do? Store the power in a capacitor,



A realistic model is built to optimise the interior, ergonomics and the driver's view.

or brake mechanically? Things like that are waiting to be tested.

Smooth

Asked about the ride the Superbus will provide, the chief designer says: "On the road it will give a ride like... a Superbus. There is nothing to compare it with. A normal bus gives a rather wobbly ride, but not Superbus. Superbus gives a smooth ride, though it can also be driven aggressively. Not that fast driving will be required in normal use – comfort was what we were looking for – but we did want good road-holding properties to enable obstacles to be avoided in an emergency without any strange side-effects."

The assembly of Superbus will take place concurrently with the production of the last components. Later in the spring the Dutch vehicle inspection authorities will grant a special license for the public highway, as well as dispensation from the standard regulations as the vehicle does not fit into any available categories. The summer will see Superbus being shipped to Beijing to arrive in time for the opening of the Olympic Games on 8 August. By then Superbus will probably not have been tested at full speed, and may be lacking some of its final functionality, if only because the speed limit in Beijing is 100 kilometres per hour. Wubbo Ockels has no problems with that: "This is the initial test platform to meet the requirements. After that we will be making further improvements to the tyres, wheels, and aerodynamics. Beijing is the place where interested parties can come and see the product." One thing is certain, Superbus will not pass unnoticed in Beijing.

The Superbus programme is supported by the following main sponsors: Delft University of Technology, Ministry of Transport, Public Works and Water Management, plastics manufacturer Sabic, and bus company Connexxion. The available funds of just over 7 million euro are expected to last until 2010. <<



A nine meter long mold serves as the basis of the Superbus' chassis. Layer by layer the carbon fibers are added to create a hard and ultra-rigid frame.

Superbus specifications	
Power train	Electric motors powered by lithium polymer battery pack with regenerative braking
Output power	300 kW, 600 kW peak power for 1 minute
Range	210 km
Acceleration	0-100 km/h in 36 s (comfort mode)
Braking distance	Less than 200 m from 250 km/h (emergency)
Cruising speed	250 km/h (155 mph)
Length	15.00 m (49.21 ft)
Width	2.50 m (8.20 ft)
Height	1.60 m (5.25 ft)
Weight	9,000 kg fully loaded
Weight distribution	34/66
Torsional stiffness	30,000 Nm/deg
Suspension	Air spring and adaptive damper system with lifting sub-frame in aluminium
Ride height range	70–400 mm
Chassis frame	Carbon fibre and epoxy composite
Bodywork	IXIS
Glazing	Polycarbonate (Lexan)
Driving mode	Manual on existing roads, automatic pilot on supertrack
Passenger features	Seat belts, airbags, TV, internet, air conditioning, heating, etc.
Equipment includes	Navigation system, obstacle detection system, communication system, fail-safe system, and system monitoring
Seating capacity	23 passengers plus driver
Launch date	August 2008, Beijing Olympics Games

Rigid sides

In broad terms the chassis consists of the floor pan, two side walls, and roof elements. Each side wall consists of a pair of upper and lower beams, connected by the pillars of the gull-wing doors. The pillar sections are arranged in a criss-cross pattern to impart rigidity to the side wall. Each side wall is fabricated as a single unit. The same mould is used to make the gull-wing doors in a separate production process. Where necessary the separate carbon-fibre elements are bonded together using adhesive.

Roof structure

Roof elements connect the two side walls to create a rigid, enclosed structure.

Floor pan

The chassis, cabin, and rear section of the Superbus use a carbon-fibre construction. The floor pan is carried by eight longitudinal beams and dozens of transverse ribs sandwiched between the two floor panels, which are 5.5 mm thick.

Gull-wing door

Lower beam

The lower beam of the side wall fits into the U-beam of the chassis.

Aluminium frame

The frames of the front and rear sections, including the wheel suspensions, are made of aluminium.

Existing technology

Although the Superbus makes use of state-of-the-art technology, many components were specially developed. The Vredestein company developed a special tyre for the Superbus. Standard truck tyres can withstand high loads, but cannot be run at high speeds. It's the other way round with racing tyres. The unique Superbus tyre combines the load-carrying capacity of a truck with the speed of a racing car.

Supertracks

On the motorway the Superbus changes from normal roads to special Supertracks that enable it to travel at its top speed of 250 km/h, as fast as a high-speed train. A network of Supertracks is an essential ingredient if the Superbus concept is to succeed.

Driver's cabin

Top speed

250 km/h

Acceleration

0-100 km/h in 36 s

Capacity

23 passengers

Sensors

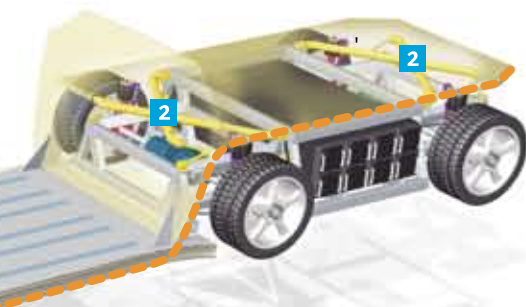
The Superbus will have 750 on-board sensors to check, among other things, that passengers are wearing their seat belts and to make sure nobody is in range of the gull-wing doors as they open and close. In addition the Superbus will be fitted with an obstacle detection system that uses a radar system **5** to detect objects up to a few hundred metres ahead of the vehicle.

1 Variable ground clearance

In town centres the Superbus has a ground clearance of 40 cm to enable it to clear speed bumps without any problem. As soon as the Superbus hits the Supertracks and its speed is increased to 250 km/h, ground clearance is reduced to 7 cm to minimise the air resistance of the Superbus. The low ride also has the advantage of lowering the centre of gravity of the Superbus, enabling it to avoid obstacles at top speed without risk of overturning. Of course the road surface needs to be free from bumps.

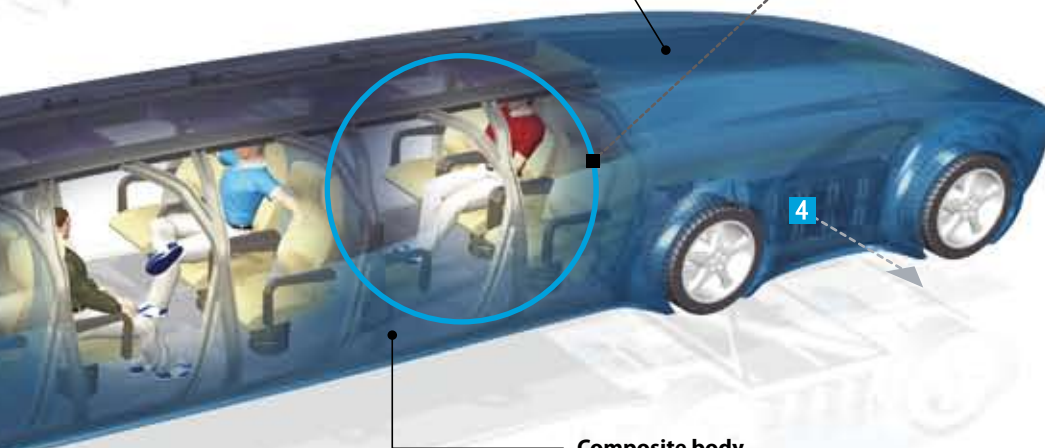
Lift system

A lift system raises and lowers the entire Superbus superstructure on the front and rear frame sections. The superstructure is connected to the frames by means of hinges **2**. Four hydraulic cylinders provide the vertical lifting power.



Cooling

The rear section contains an air-conditioning unit and engine cooling system. Fresh air enters through an intake in the roof.



Composite body

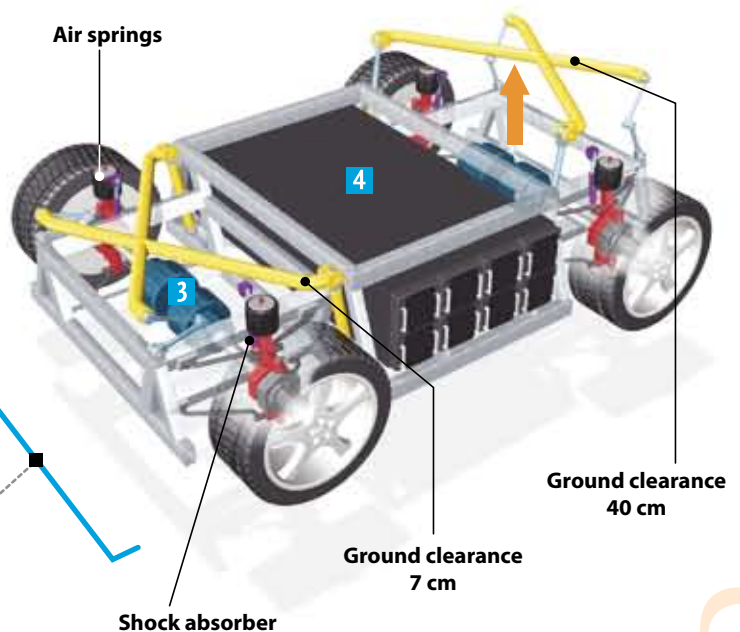
The Superbus body is made of IXIS, a composite material consisting of a foam core sandwiched between glass fibre-reinforced outer layers. This material absorbs large amounts of energy in the event of a collision, and is easy to recycle.

Travel in comfort

The Superbus has 23 luxury seats with displays and internet access. The two front seats (the racing chairs) provide a grandstand view of the driver's console – ideal for back-seat drivers. Passengers can indicate their seating preference when booking a trip. A camera in the front of the vehicle ensures that the other passengers can view the road ahead on their displays. The centre seats are positioned slightly forward to improve passenger privacy. The rearmost two compartments are separated by transparent panels.



Air springs



Electric motors and batteries

The Superbus is propelled by four electric motors **3**, each coupled directly to one of the rear wheels by means of a drive shaft. As no gearbox is required, transmission losses are avoided. A power inverter converts the energy from lithium polymer batteries **4** to make it suitable for use by the electric motors. As the bus brakes, the electric motors act as generators, providing energy that is stored in the batteries. Hatches on either side of the bus allow the batteries to be rapidly replaced. With a range of 210 km, a long journey from, for example, Rotterdam to Groningen will require one battery change.

Lightweight Superbus

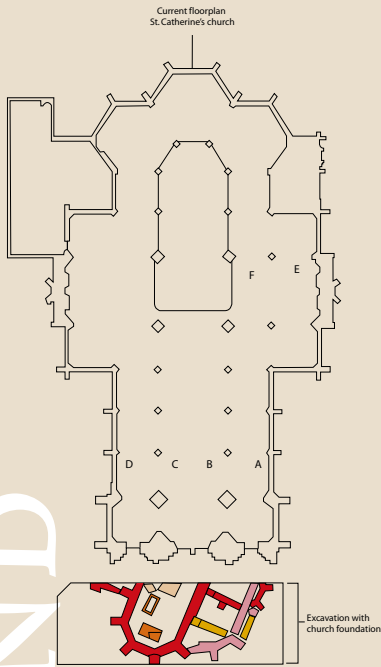
The Superbus is as long (15 m) and wide (2.5 m) as a normal bus, but it is much lower. The Superbus has been streamlined to keep its profile low (1.6 m), and its passengers don't have to walk along a centre aisle. Thanks to the carbon-fibre frame and the composite walls, the weight of the fully-loaded Superbus is less than half that of a normal bus (9 tonnes compared with 20 tonnes).



Shining a light on the past

Invisible to the naked eye, pinpricks of light from minerals reveal how long they have been hidden inside a brick. Researchers at Delft University of Technology have ways of detecting the light, but their dating method yields results that don't tally with those of archeologists.

MAAIKE MULLER



East-West was best

The foundations of the medieval church of St. Catherine's jut out from under the current church at an odd angle. However, in medieval eyes it would have been today's St. Catherine's that would have been oddly misaligned, built as it was to follow the line of the street. In those days the custom was to build a church with its sanctuary pointing east. The dead would have been buried with the same orientation, feet pointing east, ready for the Resurrection of Christ. When the time came, all they would have to do was to raise themselves and they would be 'face to face' with Jesus. All the bodies that were found here were buried this way, except for two, which were lying exactly the other way round. "Their position tells us that they were priests," municipal archeologist Joeske Nollen explains. "At the time of the Resurrection they would be expected to address the faithful. As the priests rose, they would have looked straight into the faces of their flock."

A badly lit room is the ideal workplace for Dr Jakob Wallinga and his colleagues at TU Delft's Dutch Luminescence Dating Centre. The soft orange glow in the laboratory makes the place look like a photographer's darkroom. "In fact, we do call it our darkroom. You get used to it," Wallinga assures visitors. Just as well, for if anyone were to turn on the light, every piece of research material lying exposed in the room would be rendered useless in an instant. The researchers use the material – usually sand – to determine for example when a tumulus or burial mound was built, or when a brick was fired. Minerals have a kind of memory that takes the form of a minute light signal. The moment the minerals are exposed to light they suffer from acute amnesia, as the luminescence signal disappears. Heat also resets the luminescence signal.

The moment a mineral becomes buried, or locked inside a brick, it starts to very slowly build up the signal under the influence of the natural background radiation that is all around us on our planet. The longer a grain of mineral stays in place, the more radiation it builds up, and the stronger its luminescence signal becomes. The principle was used as early as the 1960s by archeologists to date pottery. Wallinga often uses luminescence dating for sand. He used the method to find out when the sea dunes on the Dutch island of Texel were created, for example. He also used it to discover when the medieval church of St. Catharine's in Eindhoven was built.

Child

In front of St. Catherine's in the centre of Eindhoven lies a newly paved square. Municipal archeologist Joeske Nollen points out the lines in the stone paving. "Those show the contours of the medieval church." Today churchgoers can cross the square in their Sunday best shoes without any mishaps, but in 2006 Nollen and her fellow archeologists were squelching around the site in muddy wellies trying to find out what the church

had looked like in the Middle Ages. Although the little remaining archival material that had survived a succession of fires had enabled them to get some idea of the development of the church in its earliest years, it remained to be seen whether their ideas were correct. There was nothing for it but to start digging. In 2002 the municipal archeologists started with an exploratory excavation. Working entirely by hand, they exposed a plot of a few square metres layer by layer. Part of it had been inside the sanctuary of the medieval church. There, in the holiest part of the church, which also housed the high altar, they unearthed the grave of a ten-year-old child. It must have been a special child, since it had been buried with a Venetian coin carrying the effigy of Saint Marcus. "This is remarkable, as in those days Christians were rarely buried together with objects. It was considered a heathen practice," Nollen explains. Of course the archeologists wanted to find out more. The child must have been buried sometime round about the year 1300, but the immature skeleton made it impossible to determine the child's sex. A DNA test was the only solution. Although the chances of finding any usable DNA in the bone cavities were slim, the archeologists sent the child's jawbone to the university of Louvain. To their surprise DNA was found. The child turned out to have been a boy, whom they named Marcus of Eindhoven. "If we hadn't discovered the child, we would have stopped after the first dig," Nollen thinks. In her opinion that would have been a shame, as graves near churches can contain a wealth of information. "We can read a lot from the state of the skeletons. It's rather like finding a register of births, deaths, and marriages."

Peter de Knijff, professor of genetics at Leiden University, also showed a keen interest in the skeletons lying under the square in Eindhoven. If the DNA of Marcus had been preserved, perhaps more DNA from other individuals could be found, which could benefit current medical research (see text box, Genetics using old DNA).



Surprising

Thanks to the interest shown, a more widespread excavation was started in 2005. A team of almost ninety archeologists and volunteer helpers painstakingly opened up the square in front of the church. Pointing out locations on the new pavement of the square, Nollen recalls a number of surprising discoveries. “That is where a priest lies buried. We know he was a priest because, unlike the ordinary people, he wasn’t buried with his feet pointing to the east, but the other way around (see text box, East-West was best).” Not long into the dig it was discovered that the floor plan of the original church was quite different from what the archeologists had expected. Once the tests had been completed earlier this year, dating specialist Wallinga, commissioned to investigate, concluded that the church was probably built a century and a half later than was originally thought. For his test, Wallinga took lumps of the old wall to his laboratory, where the ancient bricks were pulverised. “This returned the material to the state it was in before the bricks were fired.” The researchers then looked at the luminescence signal to find out when the bricks were fired. According to Wallinga, that must have been in 1393, with a margin of 43 years. That laid to rest the theory that the church had been built in 1235, as it did the story about Marcus of Eindhoven. The boy must have been put into his grave before the walls of the church’s sanctuary went up.

So what did the archeologists have to say? Nollen is matter-of-fact about it. “Archeology is not an exact science. You work rather like a detective; as you collect more pieces of the jig-saw, you keep having to change the story,” she says. Could it be that Wallinga’s method is wrong? Well, fragments of pottery discovered under the sanctuary wall also rule out the earlier construction date of 1235. “The latest pottery we found under the sanctuary wall matches a pattern that was in fashion between 1350 and 1500. Therefore the wall must have been built after 1350,” Nollen explains. Wallinga’s estimate is within that margin.

Wallinga has every confidence in the luminescence method, but he can also see its shortcomings when applied to brick walls. For instance, samples taken from two different bricks that came out of the same wall gave different luminescence signals. Wallinga suspects that the discrepancy was caused by different environments, rather than by the bricks being fired years apart. “When we date soil layers, the sample we take usually comes from a fairly homogeneous environment containing only sand,” Wallinga says. This means that within a radius of approximately thirty centimetres around the sample the level of natural radioactivity is roughly the same. “Bricks, mortar, and the sand against the old wall all have different levels of natural radioactivity.” As a result, the amount of radiation varies for each part of the wall, and consequently, so does the strength of the luminescence

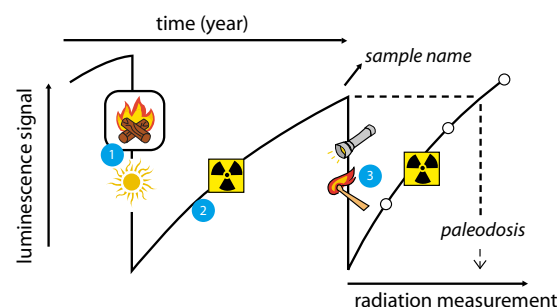


Dr. Jakob Wallinga

signal. "We took the mean value of the two dates." Another issue is that the method fixes the time at which a brick was fired, not when it was incorporated into a wall. This made it possible for Wallinga to date bricks from two different walls – which were added onto the church later and one of which was clearly constructed on top of the other – to almost identical periods. "The explanation is simple. One wall was demolished, and the bricks were reused for the new wall," Wallinga explains. The only material that might give an indication of the wall's date of construction would be the mortar between the bricks. The luminescence signal of the minerals could reveal when the mortar was mixed, which would have been the last time the grains of sand were exposed to light. "We were hoping that the method would work, but the grains apparently didn't catch enough light during the mixing process." Their luminescence signal had not yet completely disappeared, causing the mortar to appear much older than it was.

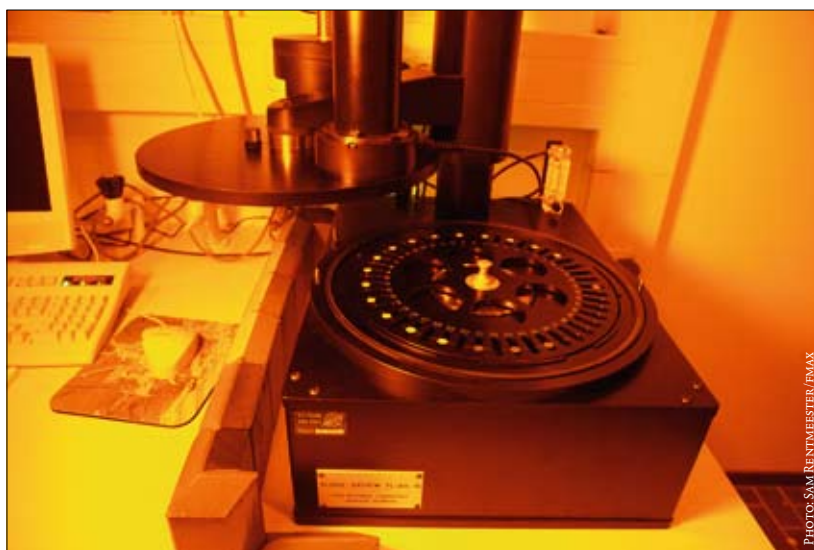
However, Wallinga expects to be able to date mortar at some time in the future. "We would have to be able to measure the luminescence signal of separate grains, rather than test a couple of hundred at a time as we now do. We have tried it before, but the signal from a single grain is so small that the measuring error becomes relatively large. We are still unable to interpret the results." A doctoral student, Alastair Cunningham, has been given the job of finding a way to make single-grain testing possible. "We store all our samples, so as soon as we are able to tell the archeologists more." Until then, all the archeologists in Eindhoven can do is wait for the next piece of the jigsaw. ◀◀

Principle of luminescence dating



Granules that light up

In luminescence dating, minerals emit a small signal of light, revealing how long they have remained buried. The moment they see light or heat up, their counter is reset. As soon as they become buried or embedded in a brick, the counter starts to run as a result of the effects of natural background radioactivity. The luminescence signal tells us something about the amount of radiation the grain of mineral matter has been exposed to. As the amount of radiation increases, so does the signal. If you know how radioactive a mineral grain's surroundings were and how much radioactivity is required to produce a certain signal level, you can calculate how long the grain has remained buried in those surroundings.



The measuring instrument for luminescence dating is set up in a dimly lit room.

Genetics using old DNA

White suits, rubber gloves, and mouth shields. Researchers took every possible precaution before taking DNA samples from the living as well as the dead during the excavations on the site of the medieval church of St. Catherine's. In so far as they were still to be found the researchers extracted four molars from each of the ancient skeletons to be used for genetic material. The archeologists also had to provide samples of their own DNA, since theirs could have contaminated the older DNA.

So why go to all this trouble? Peter de Knijff, professor of population and evolution genetics, has a hunch that the old genes can help modern medical science. The DNA could provide insight into the way the genetic 'risk set' of the inhabitants of Eindhoven has changed over the past millennium. "People used to die from simple infections, but these days most of us die from complex diseases such as cardiovascular disorders," De Knijff says. "Insight into our genetic past might help us make better decisions in medical practice."

Deconstructing a famous Alfa Romeo

So is this the famous racing car Mussolini liked to show off, the one driven by Achille Varzi and used by Clemar Bucci to impress Evita Perón? Is just has to be, if materials research conducted by TU Delft is anything to go by. It's just that the chassis number doesn't match. "That Bucci guy has been telling a lot of lies."

TOMAS VAN DIJK

Beaming with joy, Jetze Visser, together with Harry and Jerry Bootsma, listens to the conclusions of a small team of materials experts. The scientists can confirm what the three classic car buffs had been suspecting all along. The racing car bought by Visser with some negotiating help from father and son Bootsma very probably is the famous Alfa 12C/316.

This is the car that would finally carry the Italians to Grand Prix victory over the Germans in the late 1930s, or so they thought. It is also the car that famous racing driver Achille Varzi, and later his colleague Clemar Bucci, would later drive in Argentina at the end of the 1940s. The story goes that Bucci even started a secret affair with Evita Perón in order to be allowed to drive the car, which had been confiscated by the Perón regime. He drove the car sporting her name on the bonnet (see text box).

The Alfa Romeo in question has been occupying the minds of vintage Alfa racing car buffs for quite some time. In the 1990s Bucci sold his car to an Englishman, who later sold the car to an Austrian. Some years ago the Bootsmas were tipped off that Bucci still had the car in his garage. "That car exhibited every trace of the alterations to the chassis which the car had undergone according to the historical records," Jerry Bootsma says. "Even the engine must be the real thing. At one point during its racing career the left hand cylinder bank and head were damaged. The repairs that followed can still be clearly seen."

The Dutchmen suspect that in the 1980s Bucci secretly put together a second car from spare parts, and used the newly assembled vehicle to swindle the English buyer, who then decided to make the best of things and had the car taken to the United States, where it was restored to such an extent that its authenticity is now difficult to establish. For example, the wishbones were nickel-plated, which makes it impossible to see whether they are the age they should be. Also, contrary to normal practice, no photographic record was kept of the restoration process.

"However, experts have always confirmed that the car which the Englishman bought off Bucci was the original one," Jerry Bootsma says. "Of course, there is no reason why they shouldn't. If someone buys Bucci's Alfa Romeo, you'd expect it to be the Alfa Romeo driven by Bucci. I suspect nobody even bothered to ask

whether it was the original car. There's every chance that Bucci didn't even have to tell a lie. On the other hand, when we asked Bucci about the truth of the matter, he was a bit evasive. 'Find out for yourself' is what his comments amounted to." So Bucci's a scoundrel? "Well, yes," Bootsma laughs. Bucci remained unavailable for comment.

So what about the frame numbers of the two cars, which are also on the identification plates? No luck there, according to Patrick Italiano, professor of sociology at the University of Liege, and another Alfa Romeo aficionado. Italiano has written about the history of the 1938 vintage 12C-37, 312, and 316 Alfa Romeo

**'Bucci is said to have started
a secret relationship with
Evita Perón in order to be able
to drive the car'**

cars in 'Het Klaverblaadje', the periodical of the Dutch Alfa Romeo owners club. "The numbers on both cars are fake," the researcher says. "The discs carrying those numbers were made in the 1980s and 90s in Argentina. And I know who made them. Our Mister Bucci has been telling a pack of lies."

Fingerprint

Some months ago Visser and the Bootsmas rolled their 1937 vintage twelve-cylinder Alfa Romeo into the workshop at the department of materials sciences, hoping that the scientists would be able to provide them with more explicit proof. Student Janneke Nienhuis and her supervisors, Dr. Ir. Jilt Sietsma and Dr. Joris Dik, collected paint samples from the front and rear of the body, bits of aluminium from the chassis, and flakes from the welds. The purpose was to get a fingerprint of the component materials of the car. ➤



MUNDO *deportivo*

AÑO DEL LIBERTADOR GENERAL SAN MARTÍN



CLEMAR BUCCI

NUMERO 40 ★ BUENOS AIRES, 19 DE ENERO DE 1950

60
CENTAVOS
EN TODO
EL PAIS

SOURCE UNKNOWN

During the 1950s, so the story goes, Bucci raced a car sporting the bodywork of a 12C-37 and a chassis consisting of the front section of a chassis from a 1937 or 1938 twelve-cylinder Alfa Romeo married to a chassis from a 1938 sixteen-cylinder Alfa Romeo. He later shortened the car and later again restored it to its former state. The scars of the alterations are there for all to see. The question is, when was the surgery performed?

“Between 1920 and 1940,” Sietsma says. “Or rather, the beams of the two chassis were welded together at some time during that period. We know that because the weld samples contain traces of aluminium, silicon, manganese, and iron, elements that are typical of the welding rods used for autogenous welding at the time. The period also shows in the roughness and width of the welds.”

The coats of paint on the bodywork also seem to indicate that the Dutch buyers took home the original car. Under the red paint Nienhuis found, among other colours, a blue and yellow coat, Bucci’s Argentine racing colours.

The results of the tests have a direct impact on the racing world. Belgian sociologist Patrick Italiano says he is pleasantly surprised that the metallurgical tests show that the bodywork probably dates from before the war. He chooses his words with care. “If that is a fact, and I have no reason to doubt the quality of the tests performed in Delft, it goes against the accepted interpretation about the authenticity of the two cars.” Until now Italiano had always taken the position that the Austrian car contained a greater share of original parts. He based his view partly on tests carried out by two Argentineans who published a

book in 2005, ‘Alfa Romeo Argentina’, in which they discuss the two Alfa Romeo cars in detail. “I am hoping to meet the authors in Paris this weekend to discuss the new information.”

Italiano will also contact the Englishman of the story, Simon Moore. In their small world, Moore is considered to be the man

‘This goes right against the accepted interpretation about the authenticity of the two cars’

who knows everything there is to know about Alfa Romeo cars. In exchange for his knowledge Italiano hopes to get information from Moore about what happened for example to the gearboxes of the cars, which the Belgian says aren’t the original ones. Moore appears to have sworn the gearbox manufacturers to secrecy. “That’s because Moore intends to publish a book on the Alfa cars himself,” Italiano explains.

Big money

Right up to the moment the test report came in from Delft, the new owner remained reticent towards the media. “Quite understandable,” Jerry Bootsma explained when the team had



PHOTO: SAM RENTMEESTER/FMAX

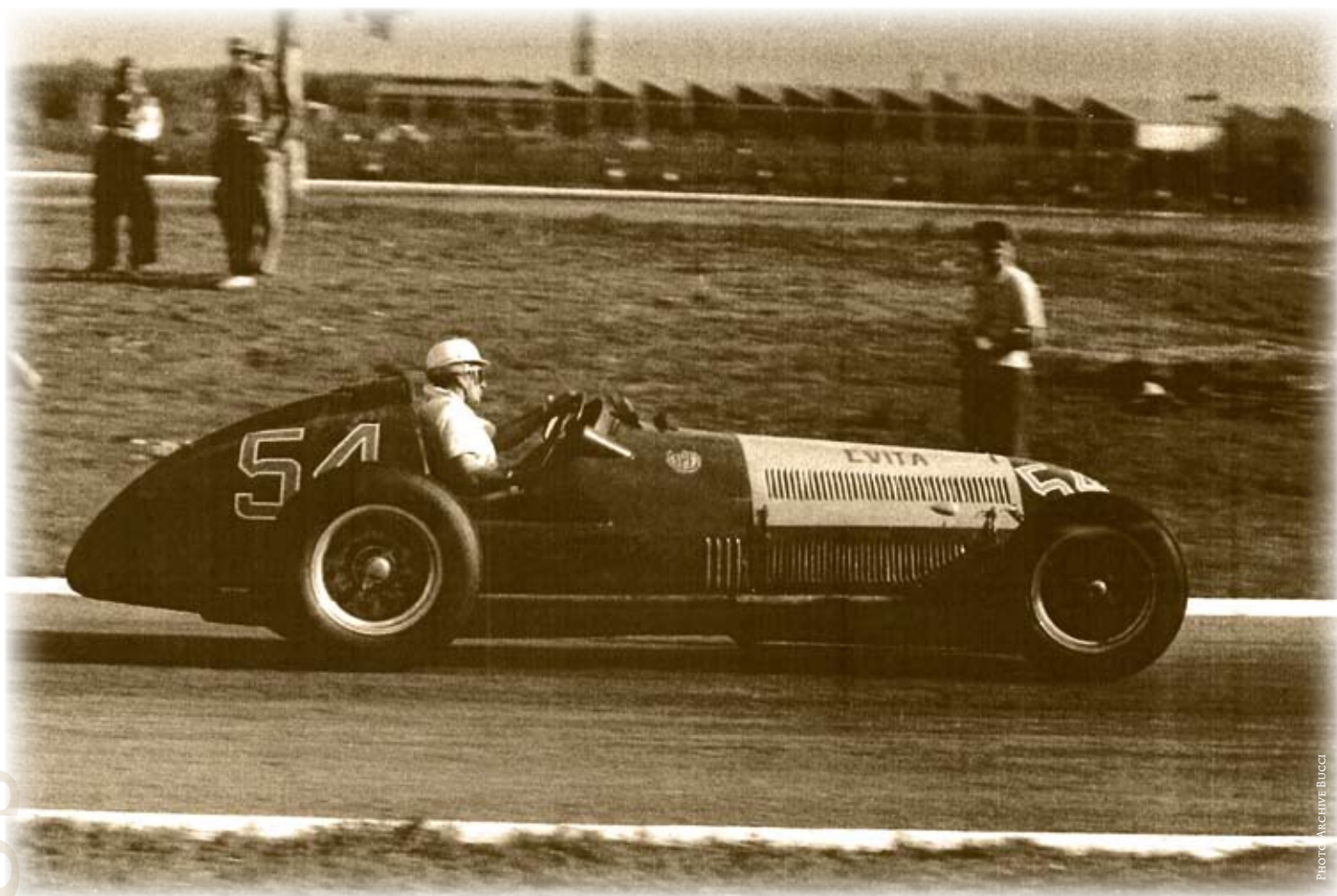


PHOTO ARCHIVE BUCCI

Racing history

Even without the suspicion of fraud hanging over Bucci's dealings, the story behind the Alfa Romeo 12C-37 contains enough ingredients for a Hollywood movie. The car was the weapon launched by the Italians in 1937 to challenge on the racing track the supremacy of their German fascist competitors, who were driving the mighty Mercedes. Alfa Romeo designer Vittorio Jano created four cars that were slightly longer and lower than had been usual until then. He also fitted them with twelve-cylinder engines instead of the commonly used eight-cylinder variety. The powerful cars adorned many posters of the 1930s, with Il Duce's banner proudly waving in the background.



PHOTO ARCHIVE BUCCI

During the Coppa Acerbo, the 12C's litmus test, the car's road-holding properties proved to be less than ideal. Patrick Italiano, professor of sociology at the University of Liege, and an Alfa Romeo aficionado, wrote about the event in 2001 in 'Het Klaverblaadje', the Dutch Alfa Romeo owners club magazine: "Expectations of the new 12C-37 ran high because Italian nationalist feelings, fed by fascist propaganda, had received a devastating blow from German dominance of racing during the previous three seasons. The press simply refused to believe the outcome, and the response was almost comical. 'Surely this hadn't been the real test, since everybody knew that the cars hadn't been ready. The first real demonstration would take place during the next Grand Prix, the Italian Grand Prix in September, which the Alfa Romeo cars would of course win.'" Unfortunately, at the 1937 Grand Prix at Livorno, the Germans again trounced the Italians. The fiasco led to the dismissal of Jano.

In 1938 the Grand Prix rules were changed, and engine capacity was restricted to three litres. In that year Alfa Romeo built a number of chassis similar to the 1937 chassis, and fitted them with sixteen-cylinder engines. They may also have modified some of the 12C-37 chassis. During a race in Tripoli that year two of the 12C-37 cars crashed. One of them was a write-off, and the driver was killed. No one knows what exactly was left of the Alfa Romeo complement just prior to the war. "Alfa Romeo was the king of recycling," Italiano says.



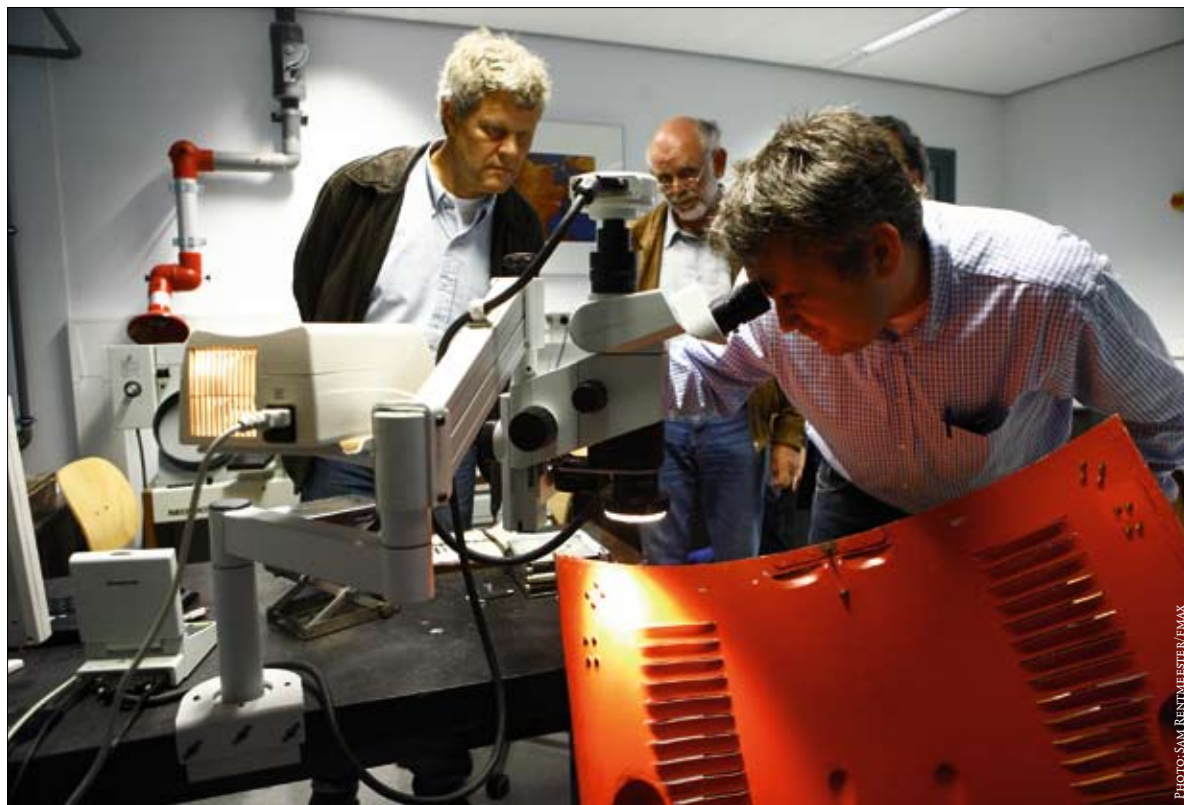
PHOTO SAM RENTMEESTER/EMAX

"They used to recycle components all the time. We now know exactly which combinations they made." After the war Alfa Romeo updated one of the cars for Italian racing driver Achille Varzi. Until his fatal crash racing an Alfetta in 1948, Varzi used the car to race in Argentina. The story goes that the car then came into the possession of the Perón regime, and that Argentine racing driver Clemar Bucci managed to lay his hands on it by starting a secret affair with Evita Perón. The driver changed the car's livery to blue and yellow, the Argentine racing colours, and printed the name Evita on its bonnet in bold capitals. He drove the car in the Argentine Grand Prix on four occasions.

In the 1990s Bucci sold what was purported to be the legendary car to an Englishman, but several years later he turned out to have another car in his garage. The 12C/316 mystery was born.

only just begun testing. “We’re talking big money here. Jetze Visser has put his pension on the line.” The parties involved refuse to say how much the car cost. Hundreds of thousands? “No, more than that,” says Huub Rothengatter, friend and advisor to Visser, and another ex-racing driver. “If the tests had shown that the car was not the real thing, it would have been a disaster.” So Visser can breathe freely once again. The animated

discussion about the results continues during a short break at the coffee machine. “We haven’t demonstrated that the car is real. We can’t,” says Sietsma, in an attempt to curb Jetze Visser’s excitement somewhat. “We have shown, with a high degree of certainty, that components of the chassis members were welded together between 1920 and 1940, which points strongly to the car being authentic.” ◀◀



A light microscope gives materials scientists a first impression of the paint layers on the hood.

The tests

Perfectly aligned layers of colour, like liquorice all-sorts, appear when student Janneke Nienhuis places a flake taken from the car’s body under the microscope and increases the magnification to 200. Under the lead chromate red that currently adorns the car are a coat of grey, shades of blue, and Alfa red. “The blue coat appears to indicate that the owner has managed to obtain the original car,” Nienhuis says. “Bucci had painted the car in the Argentine racing colours. The bonnet was yellow at the time, which is also borne out.”

Retracing the colours that covered the car throughout its history is just one of the ways of establishing the materials fingerprint. Using an X-ray scan, Nienhuis also tries to find out whether the name Evita still graces the bonnet. An electron microscope was the instrument of choice when it came down to dating the paint pigments, the bodywork’s aluminium, and the steel and welds of the chassis.

Researchers at the Delft Reactor Institute are helping Nienhuis in her quest for Evita. Detecting the name would have been the ultimate find of her materials testing. To test whether an X-ray scan could reveal the true identity of the car, Nienhuis had previously prepared 1.5 millimetre thick pieces

of aluminium sheet by painting them with various types of white paint in use during the 1940s and 50s, lead white, titanium white, zinc white, and chromium white. The x-ray absorption differed between the aluminium and the coats of paint, making the various layers stand out in contrast. Nevertheless, Evita failed to put in an appearance. “They probably used very thin decals that are invisible between the layers of paint,” Nienhuis says, “or the letters were sanded off, or perhaps they simply aren’t there.” Electron microscope tests have also yielded some interesting information. Based on the amount of energy radiated by the atoms after being pelted with electrons, Nienhuis was able to deduce the elements contained in the paint. She discovered that the blue contained copper, which could indicate a blue pigment called copper phthalocyanine, which was used extensively during the period following the Second World War.


So far Nienhuis has been less successful in dating the steel and aluminium components. “Steel and aluminium come in hundreds of different varieties,” her supervisor Jilt Sietsma explains. “The precise composition of the metals depends on the production process. The production process is characterised by the varying quantities of manga-

nese, silicon, and copper contained in the alloy. We have managed to form an idea of the composition. Now we have to search the archives to find out when these metals were made.” Help for the historical part of the research comes from metal manufacturer Corus.

The Delft team draws its main conclusions from the tests carried out on the material taken from the welds. From the roughness and width of the welds in the chassis Sietsma and his fellow expert on welds, Professor Ian Richardson, immediately deduced that the car had probably been welded together sometime in the 1930s or 40s, no later.

“The electron microscope also showed the presence of aluminium, silicon, manganese, and iron,” Sietsma says, “which are elements that are typical of the welding rods that were used in autogenous welding during that period.”

Sietsma doesn’t commit himself though. “Of course, it could be the work of an expert forger, but that is highly unlikely. We even found bits of rust between the welds. Forgers always lack the necessary expertise on materials. You get the same with painters forging pictures. They always use the wrong pigments.”



Tantalisingly slowly, the baffle moves forward. Then suddenly, **SPLASH!** A tidal wave of several thousands of litres surges over an aluminium cube packed with sensors. At the Laboratory for Fluid Mechanics (Faculty of Civil Engineering and Geosciences) repeated micro tsunamis are used to find out how houses and offices can be better protected against tidal waves. "It's the only way of getting an idea of the effect of a tidal wave," says Dr. Ir. Wim Uijttewaal, head of the laboratory. "There is little information to be found in existing literature." (JW)

More information: www.floodsite.net





PHOTO: SAM RENTMEESTER/EMAX

‘I shall always keep experimenting’

Guest writer A.F.Th. van der Heijden discusses style and modern myths.

“If an event appeals to my imagination, I’m done for.”

JOOST PANHUYSEN

You once said you would have preferred to have been just another scientist. Were you serious?

“I was then. It was just one of those things you say when you can’t see the point of it all. Harry Mulisch once said that he had no memories of the times he spent writing. I know what he means. Going to the pub after a day’s writing and having a good discussion with a friend, that’s something you will remember for years afterwards. But sitting down to write, on a chair at a desk, pen moving across a sheet of paper, there is no way you’re going to remember that, try as you like.”

Not even the high points?

“No, you have already left the writing process behind you at that point. I can remember when

I finished ‘Judgement by Shards’ on 1 February 2007. The last corrections had been applied, and I was sitting in an espresso bar, where I had been putting the finishing touches to my accompanying notes. That’s when I thought, it’s finally finished, I’m going to take this piece to my publishers, and then I can do as I like. A moment like that becomes a memory, not the writing itself. And if you write a lot, you also have lots of times that you won’t remember anything about. It’s like a heavy drinker looking back on his life to find whole chunks of it missing. Oh well, it’s all part of the game.”

Do you have special moments during the writing process?

“Absolutely. Anything ranging from major satisfaction to a mental itch between the shoulder blades that cannot be reached. Even so I consider it a comfortable occupation most of the time. I have discovered that I’m at my best when I’m sitting at my desk working on a text. There is that well-known line of verse by Cees Nooteboom, I had a thousand lives and I took only one. I am fortunate in knowing that I took the right one.”

Out of the thousands of possible lives, would an academic career have been one of the more attractive ones?

“Well...”

You once dreamed of being a professor.

“I was very young at the time. I thought being a simple professor wouldn’t be enough. I wanted to make a big impression by becoming a professor of at least four disciplines. It’s the kind of thing you like to dream up when you’re sixteen.”

You later studied philosophy. Has the interest remained?

“Yes. Ten years ago I was about to write a philosophical work as part of the ‘Homo Duplex’ cycle of novels. That’s when I was struck once more by doubt. Should it be an explicitly

philosophical work, or should the philosophy be invisibly worked into the series? I might still do it. I can perhaps imagine writing a philosophical version of the old ‘Movo Tapes’.”

You once said that to you writing is a must, to create a ‘counter reality’.

“That still holds true, but you’re caught in a paradox. It was said of Oscar Wilde that he had arranged his life to be his best work of art. To a certain extent one can compose one’s own life. It’s what dipsomaniac Ernst Quispel does in ‘Advocaat van de Hanen’ (‘Lawyer to the Punks’), during the happy weeks when he is having a vodka period.

People who turn their lives into an art form are reshaping the chaos of their own existence into aesthetics. They are the focus, actors in their own lives. I have always considered that an attractive idea, but I describe it. I create a counter-reality for our everyday world with all its slings and arrows. Creating such an extensive counter-world takes all my time. It is inconceivable that in addition to that I could have a day-to-day world of my own in which I could live life to the full. I sacrifice my actual time to create my imagined time.”

Does it feel like a high price to pay?

“When you stop to think about it, yes. But I have never considered it not worth the price.”

‘The Movo Tapes’, ‘volume zero’ of your ‘Homo Duplex’ cycle of novels, which was published in 2003, differs a lot from your previous works. As early as 1998 you noted in your diary that you wanted to change your style. You wanted it to become more extreme, with ‘dialogues like swords clashing’. Were you dissatisfied with the style of your first cycle of novels, ‘The Toothless Time’?

“I am not the kind of writer who could ever be satisfied with a style he has achieved. I don’t work gradually towards the ideal style. I will always keep experimenting. In a diary note – which wasn’t intended to be published in the first ➤

A.F.Th. van der Heijden

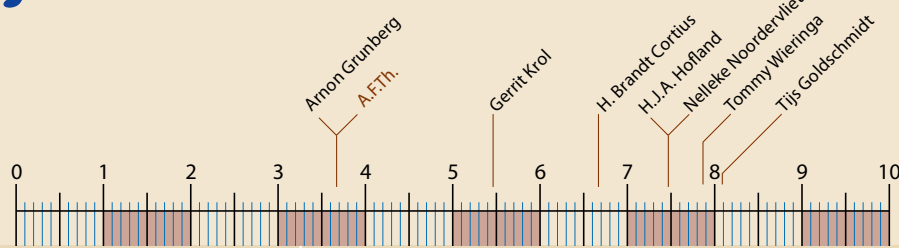
Adri van der Heijden (Geldrop, 1951) had been approached before by Dutch universities to consider becoming a guest writer, but he preferred to go on steadily building his cathedrals, the novel cycles ‘The Toothless Time’ and ‘Homo Duplex’. He has since changed his mind. “I still have some major ideas for novels waiting to be completed, but I decided it was time to come out to play again.” The new guest writer will dedicate his master class to the influence of the cinema on narrative techniques. Van der Heijden says he himself benefited from that influence. Last year the writer won the AKO Literature Award for his ‘Judgement of Shards’, a novel about an imaginary meeting in prison between two characters strongly reminiscent of Roman Polanski and Charles Manson. Van der Heijden’s best known works include ‘The Movo Tapes’ (2003), which forms the introduction to ‘Homo Duplex’, and ‘Lawyer to the Punks’ (1990), the fourth and latest part of ‘The Toothless Time’.

Guest writers measured by the Technologist's yardstick

Standings 2008:

A.F.Th. last place

A-technologist Arnon Grunberg must now share last place with A.F.Th., who couldn't score more than ten points. But still, anything can happen. The winner of the Technologist's yardstick competition will be announced in 2010.

									
		A.F.Th.	Tommy Wieringa	Tijs Goldschmidt	Arnon Grunberg	Nelleke Noordervliet	H. Brandt Cortius	H.J.A. Hofland	Gerrit Krol
Vraag	Antwoord	2008	2007	2006	2005	2004	2003	2002	2001
1. Do you ever change a light bulb? When was the last time?	<i>Not if I can help it. The idea of having to do technical jobs, however minor, makes me nervous. My hands start to shake when I think of all the time I will lose.</i>	1	2	2	2	2	2	2	2
2. Do you ever mend a bicycle puncture?	<i>Never</i>	0	2	2	0	2	2	1	1
3. Can you do an oil change? When was the last time?	<i>The only liquid I change comes in a bottle with a label saying gin. Changes go by the glassful.</i>	0	2	2	0	1	0	1	0
4. Can you change a car tyre?	<i>No</i>	0	0	2	0	1	2	1	1
5. Do you ever use a power drill?	<i>The last time I held a power drill was on a Sunday afternoon in September 1986. That was the day I received a telegram to congratulate me on winning a major literary award. I haven't touched a power drill since.</i>	1	2	2	1	2	2	1	2
6. Can you assemble Ikea furniture using the instructions?	<i>Yes, but I don't.</i>	1	-	1	0	1	1	0	1
7. Can you assemble Ikea furniture without the instructions?	<i>Yes, by touch.</i>	1	-	0	1	0	0	0	1
8. Can you understand consumer electronics manuals?	<i>Yes, but they get me so worked up I leave it to others.</i>	1	1	1	0	1	0	1	0
9. How many toolboxes have you got?	<i>I have one old toolbox with tools in it, but I hardly ever delve into it. Even so I haven't always been clumsy. I remember how I was given a carpentry set when I was about ten years old. I made a puppet theatre with hinged sides. Everybody complimented me on it, because I had put it so ingeniously together.</i>	1	2	1	0	2	1	1	2
10. Do you use a computer for writing?	<i>I am about to become completed computerised. There's simply no avoiding it. I have always used pen and paper and an IBM electronic typewriter.</i>	0	0	1	1	1	1	1	1
11. Do you use the internet?	<i>By proxy. I sometimes ask my editor at Querido, my publisher, or my wife to look something up on the internet. Once I get my array of computer equipment I will be doing that myself.</i>	0	1	1	1	1	0	1	0
12. How many hours a day you you spend at the computer?	<i>None</i>	0	1	2	2	1	2	2	1
13. Can you solve computer problems by yourself?	<i>No</i>	0	2	0	0	2	2	2	0
14. Is your home computer secured with scanning software and/or a firewall?	<i>Yes</i>	1	1	1	1	1	0	1	0
15. Do you install and maintain them yourself?	<i>No</i>	0	1	0	0	0	0	1	0
16. Can you communicate with the help desk if it's available?	<i>By proxy</i>	1	1	1	1	1	0	1	0
17. Have you ever had an idea for an invention, or did you ever formulate a technical concept?	<i>The notion of 'living broadly' is a recurring theme in The Toothless Time. You could call that a philosophical invention. How can you turn a seemingly indivisible moment into eternity? By tackling it broadly, making as much as possible happen simultaneously in the brain.</i>	1	1	1	0	1	1	1	1
18. Have you ever invented something /or put something similar down on paper?	<i>When that happened for the first time during my philosophy studies in Nijmegen, then I was indeed busy writing that down on paper...</i>	1	-	-	-	-	-	-	-
19. Have you ever developed such an invention and how often?	<i>Ultimately I have determined that it was nothing more than a nice philosophical concept. Life keeps unmercifully unrolling before us narrowly. But by trying to live a broad life, you can indeed a rich life in spirit.</i>	0	0	1	0	0	1	1	1
Behaald aantal punten		10	19	22	10	20	18	20	15
Rapportcijfer		3,7	7,9	8,1	3,7	7,5	6,7	7,5	5,5

place – one can say in an act of heroism that things need to be different, more extreme, laying into the reader, but that doesn't mean you can immediately start to put it into practice."

Even so, with hindsight it would appear to be a turning point.

"I wrote that diary note in the period when I was conceiving 'Homo Duplex'. I already knew that the first part would be a multi-faceted book and that I would use the god Apollo as the narrator, and that part of the book would consist of monologues by a young idealist driving a fast car. So I started looking for the right tone. I think that in places 'The Movo Tapes' is the result of my intention to become more extreme. On the other hand one also needs to be prepared to take a different course from time to time, as I did in 'Judgement by Shards'. That book demands a different tone, in part because it revolves around historical fact."

Have you always experimented with different styles?

"Yes, and using different writers too. That's how I started out. In 1977 and 1978 I had time to think about where I was heading. I had a sense that my first publication was on its way, and I was experimenting with two different styles. There was a baroque style infused with a Mediterranean light, and on the other hand I was wondering what the style of a Dutch Louis-Ferdinand Céline would look like. The same moaning and groaning, but in a Dutch way.

I intended to exploit the two styles under two different names. For the baroque style I came up with the writer Patrizio Canaponi, and Albert Egberts, who would preferably have been published by a different publisher, was to be the Dutch Céline. Not too literally of course, or everybody would have been accusing me of stealing Céline, but these were the two writer identities I intended to disappear into.

Unfortunately my mister Egberts was the more ambitious of the two. He wanted a bigger book, whereas Canaponi came to a point where he had finished his five-part story cycle. I then went and developed the style of Egberts, only to discover that it came very natural to me. That's when I



thought I might as well use my own name, for after all it was my own style. There was no point in having this author alter ego in the way."

Did that style incorporate the contrast between the Céline side and the baroque side?

"I think that what you might at a stretch call the style of 'The Toothless Time' is a synthesis of Canaponi and Egberts. The result is something perceived as my style. I then reacted against that by developing a new style, which one might call the style of 'Homo Duplex'."

'The Movo Tapes' also contains bits of Céline.

"Certainly. I have literally sat down to rework chapters from Céline's 'Journey to the End of the Night' from the point of view of 'Homo Duplex', simply as a warming-up exercise for the real job. The experiment really was too ridiculous. But then composers of music also like to write

variations on other composers' themes. Why shouldn't writers do the same, if it is a viable learning method? I haven't used those parts in the final version of the book, but I do think that the experiment helped introduce something Céline-like into the tone. It's a style you will also find in De Vondeling ('The Foundling')."

Is De Vondeling going to be the next volume of Homo Duplex?

"Yes. I have a few more things to add to 'The Toothless Time' before I shall declare that cycle finally completed. There will also be a fifth part: 'Verliefd Tegen (In Love Against)'. In 1994 Albert Egberts, the main character of 'The Toothless Time', returns to his birthplace Geldrop to investigate a crime of passion that involved the brother of his dead friend Tjum. After that there is to be a concluding part of 'The Toothless Time', the story of Louis Sévêke, the activist ➤

Philosophy

One reason why years ago TU Delft Rector Jacob Fokkema developed a keen interest in philosophy was his reading a novel by W.F. Hermans, 'Wittgenstein in de mode, Kazemier niet' (Wittgenstein in fashion, Kazimier not, 1967). So there is a kind of poetic logic in the fact that the rector is now receiving a guest writer who likes to weave philosophical themes into his novels. Fokkema: "Van der Heijden can tell our students

something about a question he will often ask himself: what is the best way to tell a certain story? He himself wants to learn something too, just like the best professors do."

from Nijmegen who was murdered in 2005. It was an act of revenge by Edmond Dantès, as the murderer called himself on the Internet. It is to be an epilogue, not a full-size novel."

Would you like to meet the suspect, Marcel T?

"That depends. I shall first be talking with a number of people in Nijmegen. Friends of Sévèke, people from the squatters scene. Even Sévèke's partner wants to see me. It looks as if everybody is longing to tell their side of the story. We'll have to wait and see if it's any use to me."

Won't it put pressure on you to stick more closely to the facts than you intend to as a novelist?

"I don't feel that pressure. On the other hand I can imagine someone saying that they will talk to me, but only if my book doesn't drift too far from the facts. The important thing to me is to turn the whole story into something universal. Why does one real-life event appeal so much to my imagination when others don't? All I know is that if a real-life event really appeals to my imagination, I'm done for; I simply have to go on."

Why is that?

"I think I instinctively see or hear the modern myth in a story. When squatter Hans Kok was killed I immediately knew I had to do something with that. Not just from a sense of social duty, but also as an exercise in imagination. Imagination works with myths. Perhaps that is where my talent lies in some respects. The fact that I feel able to forge a historical event into a modern myth. I had the same after the death of Carlo Picornie, although at the time I had no idea it was going to be turned into a modern equivalent of Oedipus, with a son stabbing a man to death in a hooligan battle without knowing that the man is his father."

Did you ever get any response to Homo Duplex from the hooligan scene?

"Not so far, but I dread to think what may

happen if the story in future volumes starts to resemble that of Carlo Picornie any closer. The fictitious battle at the Hellegatsplein motorway intersection brings the hooligan battle at Beverwijk to mind, and I know that friends and relatives of Picornie don't welcome any new publicity around his death. Only recently they stopped a film being made about the battle. Anyway, the battle at Beverwijk took place eleven years ago. Perhaps the rough edges of mourning will have worn down a bit by now. Also, a novel doesn't have quite the impact a film has. Squatters didn't get excited about 'Lawyer for the roosters' until it was turned into a film."

Do you have a favourite among your own books?

"To be honest, so far it's 'The Movo Tapes'. It's the book I can open at any point and like what I see, in spite of the fact that it came in for quite a bit of flak. I remember Pieter Steinz writing in NRC Handelsblad that it isn't really a novel, but rather a concoction of haphazard story lines, no more at best than a prologue to a cycle that few people will bother to read. But then the first part of a new cycle shouldn't be welcomed with open arms. It should have an air of menace about it."

It is a different approach, starting 'Homo Duplex' with what many believe to be the least accessible part of the cycle. It could lose you a lot of readers.

"Yes, but those readers will be back. I keep hearing from people that after reading 'Mim' they picked up 'The Movo Tapes' again, which they didn't understand much of the first time around."

'Mim' was your compact study for the final part of 'Homo Duplex', which is yet to be published. Even so it contains quite a few poignant scenes.

"Well, 'Mim' was published to mark the occasion of the eightieth birthday of Harry Mulisch, and I thought I would give him the best I had to offer. I did include some straight references to his work in the book, but more than anything else I wanted to show him what I was worth, what I was capable of."

What did he think of the book?

"What did he think of it? He would never read a thing like that. Never. Mind you, I knew that all the time."

'The Toothless Time' was received well in Germany, and 'The Movo Tapes' are also getting a good press. What is it like to read your own novel in German? Does it become a different book?

"No. Helga van Beuningen translates my work into German with such a natural flair I still recognise it as my own work. And it's far from easy to find German equivalents for some of my double entendres. She often threatens to end it all because there's no way she can manage, but in the end she never gives up. And in most cases she comes up with a better idea than my own. I ask you, where do you find another translator like that?"

Sometimes you intentionally make a passage less attractive. Why?

"A text should always contain barbs to make it stick to the reader's skin. To make it burn slightly like a stinging nettle, to stop it appearing too civilised and smooth, like a well-manicured lawn."

Sinking ocean plate stays out of sight

Deep below the Carpathian Mountains in Romania the earth quakes and shakes. The reason for this tectonic violence is a mystery that is difficult to unravel even with the latest measuring techniques and seismic and tomographical research.

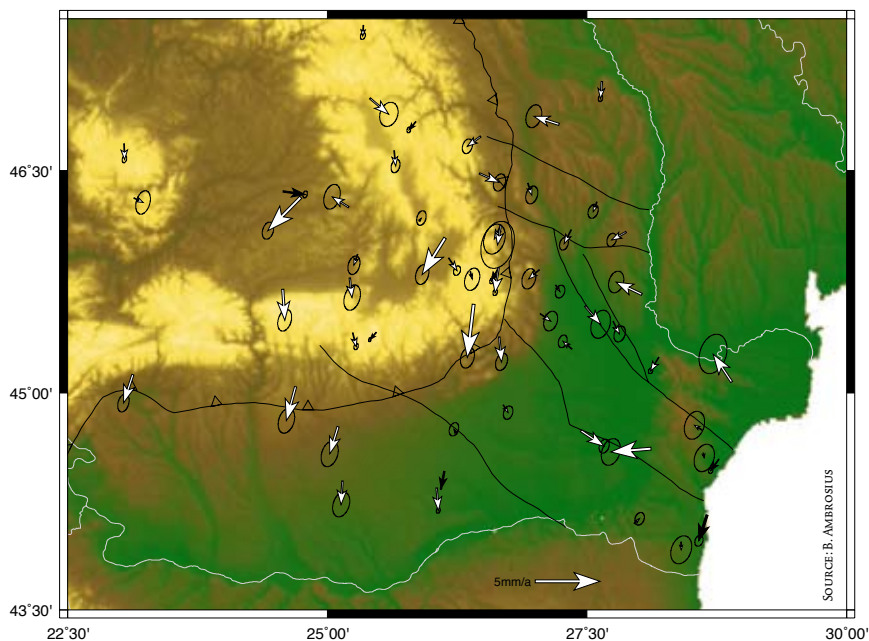
TOMAS VAN DIJK



With a look on his face that hints at despair Professor Boudewijn Ambrosius studies a map of the Carpathian Mountains. Forty or so white arrows indicate the deformations that affect the area. In some places the arrows indicate shifts of five millimetres, but most are much less, say one or two millimetres per year. They look as if they are rotating around the end of the mountain range like a very slow whirlpool. The area, about two hundred kilometres north of Bucharest, is notorious for its earthquakes. "This stress map is still incomplete," the professor says. "Some things have changed since our last measuring campaign. Our measuring rig was damaged during the construction of a windmill in that location, so we don't have sufficient data to draw conclusions."

What the professor of DEOS (Department of Earth Observation and Space Systems), a department of the aerospace engineering faculty, is indicating is the result of a major measuring programme using GPS equipment to map the stresses building up in the Carpathians in Romania. He hopes to use the results to find out more about the plate tectonics deep below the mountain range.

Six years ago the remote sensing expert set up a network of dozens of GPS receivers to detect vertical and horizontal shifts. Each summer he would travel to Romania to collect the data, assisted by students of Bucharest University. The network covers an area of 350 square kilometres and extends down to the Black Sea. ➤



White arrows on a map of the Carpathians indicate how strongly and in which directions various areas are moving each year.

Ambrosius hopes eventually to be able to make predictions about the risk of major earthquakes in the future. “The research contains a clear-cut socio-economic component,” he says, “although predicting earthquakes will probably always remains a thousand times more difficult as forecasting the weather.” One small area in the Romanian province of Vrancea in particular is ravaged by earthquakes on a fairly regular basis. And these aren’t minor quakes either. In 1977 an earthquake measuring 7.4 on the Richter scale resulted in the death of over 1,500 people. On average the area is affected by earthquakes of this magnitude or worse once every fifty years. “The epicentre area is sparsely populated,” Ambrosius explains, “but beyond Vrancea lies an extended area covered by a layer of sediment from the mountains that is many kilometres thick. The whole lot shakes like a jelly pudding, making earthquakes felt as far away as Bucharest.”

Mystery

The research is also particularly interesting from a fundamental science point of view. For decades scientists have been racking their brains about what exactly is going on in the region. Several million years ago this was the place where the bottom of the Sea of Thetys, the ocean that once lay between the paleocontinents of Gondwana and Laurasia, disappeared under the European continental plate. The Carpathians were created as a result of the violent tectonics involved. Although the Thetys plate is no longer moving westwards, peace and quiet have still not returned to the area.

Why these earthquakes are still occurring is a mystery as is why they are concentrated in an area of only a few hundred square kilometres. Perhaps even more remarkable is the fact that the epicentres of most of the earthquakes are located at such enormous depths of between seventy and two hundred kilometres.

Ambrosius: “Such deep earthquakes are exceptional for a continental area. Continental earthquakes usually occur within the upper thirty kilometres, i.e. within the earth’s crust, and sometimes at the transition between the crust and the lithosphere. Deeper earthquakes normally occur at the edges of continental plates, for example along the coasts of Chile or

Japan, where oceanic plates are sliding under the continental plates.”

GPS measurements are not the only data to offer insight into the processes involved. Ambrosius conducts his tectonic research together with geologists from the Vrije VU University Amsterdam and geophysicists from the University of Utrecht. The VU University Amsterdam scientists conducted seismic tests of strata down to a depth of approximately fifty kilometres, and their colleagues from Utrecht collected tomographical data and did model research. The research project as a whole is conducted under the auspices of ISES (Netherlands Research Centre for Integrated Solid Earth Science), one of the six national Research Centres.

One theory that might help explain the mysteriously deep earthquakes is that somewhere under Vrancea a piece of plate of several hundred kilometres length is sinking vertically. At a depth of around fifty kilometres the plate would tear loose under its own weight. This would cause the earth above it to spring back. This is one of the theories proposed by Professor Dr. Wim Spakman and Professor Dr. Rinus Wortel of the University of Utrecht, which they base on seismic tomography data.

Seismic tomography involves constructing three-dimensional images of the earth’s interior based on information gleaned from earthquake tremors. The differences in the arrival times of shock waves enable the scientists to deduce which types of rock the waves encountered in their path, and where these types of rock are located within the earth’s interior.

In addition to the slab detachment theory, Spakman explains there is also the delamination theory, that is the possibility that the plate is shedding flakes so that sections on the underside become unstuck and sink into the depths, while the upper parts can still spring back.

“It’s only now that we have an almost complete set of data for the Carpathians,” Spakman explains. “We are on the verge of processing the data using a geophysical model method. We have two different models based on different stress fields. Analysing the data is bound to make this an exciting year.”

Hard to measure

For the time being however, the area remains an enigma. The researchers expect to find that the region around Vrancea is rising, but there is no evidence of that yet. “With hindsight we can say that the Carpathians form one of the hardest areas to collect data in,” Ambrosius says. “Indonesia moves several centimetres each year, and so does Greece, but in Romania we’re talking only a few millimetres a year. That’s close to becoming impossible to measure.” Spakman adds: “Actually it’s remarkable that the lack of movement at the surface obscures the fact that here we have one of the most seismically active zones in Europe.”

The GPS receivers installed by Ambrosius should normally be capable of measuring vertical movement with an accuracy of four to eight millimetre per year, and for horizontal movements the equipment is even more sensitive, being capable of detecting shifts of one or two millimetres. However, this requires the experiments to be carried out in ideal conditions.

“We need stable datum points,” Ambrosius explains. “We can’t do any measuring in a bog. Suitable locations are few and far between. We thought we had found a first-class datum point on a hotel sitting against the side of a mountain. It was an open location, allowing the receiver to communicate freely with the satellites. We had set up a permanent field station that performed measurements throughout the year. In the end our

location turned out to move three to four times as fast as other locations around it, and on top of that it was moving in exactly the opposite direction. This was probably the result of a local landslide. We're not interested in those."

There are five more permanent field stations. One of them is located at a meteorological station, and another is housed at a seismic station. To collect the remaining data, the researchers had to spend their summers trekking through the Romanian wilderness to install GPS equipment at spots marked by metal tubes. At each of these points students from Bucharest University erected tents and spent three days in pairs collecting the data.

Unfortunately they did not use exactly the same equipment at each of the points as the year before. The position of the minute dielectric elements that make up the aerials of the measuring device can vary between individual instruments. This does not make interpreting the data any easier. "Fortunately we do know which types of aerial were used where," Ambrosius says, "and that is the good news. We are now in the process of recalibrating the receivers on the roof of NMI, the Dutch national measuring standards institute here in Delft, to enable us to interpret the data better."

The satellite expert would love to be able to install more permanent field stations. "Alas, that's not so easy," he says, "since we're dealing with a wooded area that is difficult to negotiate, and there are lots of wild animals, including bears. Permanent field stations require large solar panels to provide enough power to the receivers. In the wilderness there is every chance that the panels wouldn't survive."

Seismic image

The fact that Vrancea is probably rising, or that it has been doing so for the past couple of million years, is demonstrated a little more clearly by the results of seismic research conducted by Dr. Randell Stephenson of VU University Amsterdam, together with Romanian researcher Ionela Panea, who recently completed her doctoral research under the supervision of the rector of TU Delft, Professor Dr. Ir. Jacob Fokkema. Stephenson and Panea completed a seismic image by setting off a series of dynamite charges of 28 kilogrammes each in boreholes at a depth of 20 metres along a line 130 kilometres long. By measuring the resulting vibrations, they were able to draw up an image showing a sediment-filled depression in the earth's crust just to the east of the earthquake area. The researchers can reconstruct the geological dynamics of the area on the basis of the various layers of sediment. "From the data you could deduce that Vrancea had risen, but it is not very clear," Stephenson admits.

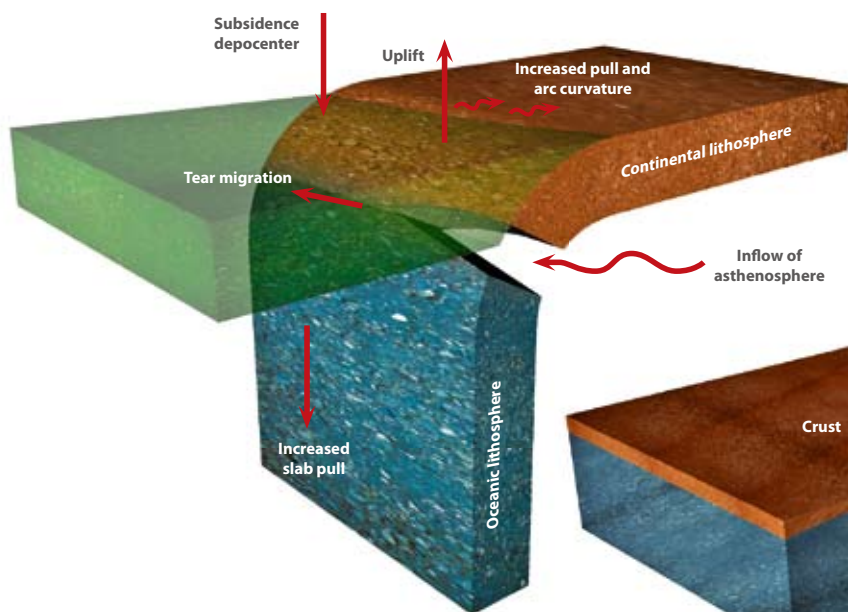
But the researcher has more exciting news to offer. "There are magma flows up to a depth of five kilometres," he says, "or at least, that is what one of my doctoral students thinks he can deduce from his magnetic research of the area. He is still working on it. Such magma flows could indicate that an oceanic plate is indeed breaking away. The resulting space would then be filling with magma."

Ambrosius will soon be submitting a new research proposal to ISES. "We would like to increase the scope of our research area to enable us to see how the stress field around the Carpathians fits into the larger European situation," he explains. "Sooner or later another major earthquake will strike Romania, and then our measurements will provide us with the perfect basis for mapping the major shifts that will then occur. Satellite measuring involves waiting for mother nature to do her work."

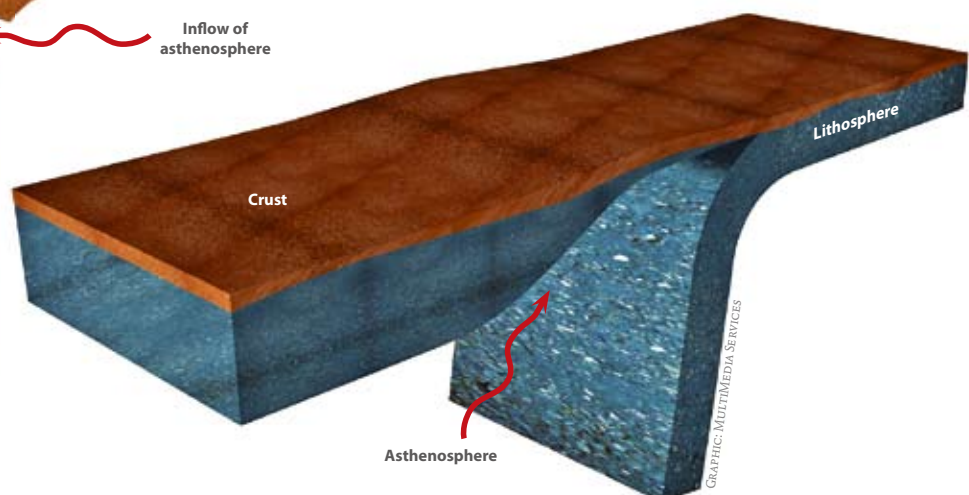


Prof. Ir. Boudewijn Ambrosius

Slab detachment:



Slab delamination:



Professor Dr. Ernst ten Heuvelhof

"Students should be given leeway."

APPEALING



Professor Dr. Ernst ten Heuvelhof (1954) studied town and country planning at the Vrije University, and law at the University of Amsterdam. He worked for the Chamber of Commerce until 1980, followed by eleven years at an urban planning consultancy firm, and a part time position with the business management section of the Erasmus University in Rotterdam. In 1982 he completed his doctoral thesis on shopping centre planning. In 1991 he became management and technology professor at Delft University of Technology. In addition he spends one day a week in Rotterdam as professor of business management at the Erasmus University. He is one of the science managers of the BSIK Next Generation Infrastructures research programme. He received the Leermesterprijs in 2006. He is a member of the Environmental Impact Reporting Committee, and chairs the Board of Commissioners of the Tauw Group.

CONNIE VAN UFFELEN

How would you describe one another?

TEN HEUVELHOF: "Martijn is very intelligent, very organised, and very nice. I call him intelligent because he has written a good thesis on strategic behaviour in the Dutch energy industry covering a very tricky theme: the villainous behaviour of players. Strategic behaviour hangs between illegal behaviour and fiercely commercial behaviour. His description hits the nail on the head. He is organised. I have seldom seen anyone plot such a straight course to their goal. That's why he finished his thesis in record time. Martijn is a past master at ordering his thoughts, and he is very efficient. He is also a very nice, pleasant and friendly young man to boot."

KUIT: "Ernst is a good researcher with a solid grasp of his field, and he is great at making connections between science and practice. He has an eye for new developments. That gift has made us trend setters more than once. Take the project on strategic behaviour, for instance, which is now in the limelight. And of course, Ernst is a very nice guy. Friendly. Great sense of humour."

In the **Mastermind** series a professor and a (former) student each answer the same questions to create a double portrait.

What sets the other person apart?

TEN HEUVELHOF: "Martijn stands out from the crowd because he is organised and business-like. You can see this in his current job and in the way he planned his work when he was doing his doctoral research. He is now executive director of the BSIK Next Generation Infrastructures research programme, and managing director of the TU Delft Centre for Entrepreneurship. He also handles the section's finances. He has a great head for business. Just look at the way he dresses, replies to his e-mails, and plans his holidays; all very organised."

KUIT: "Ernst knows how to make the step from science to practice. He has an extensive network. Things he develops often get applied. Two years ago he won the Leermesterprijs, an annual award given to a Delft professor with a record for teaching and research excellence. He has been teacher of the year at the faculty and elsewhere. Students really appreciate him. He is one of the teachers who has great appeal for students."

What did you learn from one another?

TEN HEUVELHOF: "How to organise myself. I'm not a natural organiser like he is. I wouldn't call myself chaotic exactly, but I could do with a dose of his organising skills."

KUIT: "He taught me something that I now use on a daily basis and that is the importance of getting others involved in the job really quickly. Don't just teach them what to do, but take them along and show them what you do. People should be given their own responsibility as soon as possible."

What's the essence of a good teacher-student relationship?

TEN HEUVELHOF: "Breathing space. You need to be sharp in selecting students, and then you should give

Dr. Ir. Martijn Kuit

"Involve people in what you're doing rather than just teach."

ORGANISED



them the leeway they need. Martijn needed no coaching from me at all. We have done many things together, written many articles."

KUIT: "The mark of a good teacher-student relationship is not so much the relationship between the two as the way students get actively involved in the work. Rather than active teaching, it's all about getting people involved in what you're doing. Ernst provides great examples, doesn't stick to theory, always puts matters in practical terms. Anecdotal, in many cases."

Was your relationship more like that of a father and son, or like a married couple?

TEN HEUVELHOF: "Colleagues! Absolutely not a father-son relationship. He was on my level, not below me."

KUIT: "When I was working on my thesis, we had a father-son relationship. It was Ernst who gave advice and provided pointers. When I first came to university, he was certainly someone who made an impression. Today our relationship has changed. We are both on the management of a research programme, and as such we are on an equal footing. We have also co-authored a book about the rise and fall of the sports channel, Sport 7."

Can you recall an incidence of good or bad luck that stuck in your mind?

TEN HEUVELHOF: "Right from the beginning I had great expectations for Martijn, and he has not disappointed me. Martijn has produced many publications and a very good thesis, carried out many non-government funded projects, and done lots of minor jobs. I can't say it was a pleasant surprise, because it was always in the cards. Disappointment would be an overstatement, but I would have liked to see him continue in research. If I'd had my way, he would have followed an academic career

Dr. Ir. Martijn Kuit (1975) studied management and technology at Delft University of Technology, and in 2002 completed his doctoral thesis on the liberalisation of the electricity and gas industry under the supervision of Ten Heuvelhof. He then became a lecturer at the policy analysis section where he became involved in a major international research programme in the telecom, energy, and transport industries: Next Generation Infrastructures. He became the managing director of the research foundation and recently also became managing director of the TU Delft Centre for Entrepreneurship.

to become a professor. I would have liked that, but he's found his niche."

KUIT: "Our greatest stroke of luck was the twenty million euro we got for the Next Generation Infrastructures research programme, which started in 2004 and will continue to 2012. What didn't work for me was the actual academic work within the university. Publishing, and especially the pace of things. It all went far too slowly for my liking. I just want to get on, which is why I did not take the lecturer/assistant-professor/professor route. Ernst would have liked to see me continue as a researcher, but I like operating where fields of interest intersect."

Do you socialise?

TEN HEUVELHOF: "Only when our children were born. And when we moved house."

KUIT: "No, although I did visit when his daughter was born. And he came to my place when my two sons were born."

Name one another's best habit.

TEN HEUVELHOF: "The way he replies to his e-mail. You always get an immediate answer."

KUIT: "The way he always sticks to his appointments. I like the way he often provides feedback earlier than



Kuit has devised a game about liberalisation in the energy sector.

arranged. If he has a deadline next Friday week, he'll have a text ready for you by Monday."

And the worst?

TEN HEUVELHOF: "I'm afraid he's a man without any bad habits."

KUIT: "You can tell by his body language what's up. If things are not to his liking during a meeting, he will start leafing through documents or looking around him."

What is the other person's significance in professional terms?

TEN HEUVELHOF: "Martijn has put a face on strategic behaviour, and he has included games in his thesis. For instance, he has created a game about liberalisation and privatisation in the energy industry, and used the game to see what kind of strategic behaviour it produces. He then went on to design inverse arrangements, such as laws and subsidisation, to counteract this type of behaviour and see how that works."

KUIT: "Ernst has certainly contributed greatly in the field of research on complex management issues involving technology. He is without a doubt the Dutch expert on the liberalisation of the public infrastructure."

What is your favourite television programme?

TEN HEUVELHOF: "I prefer watching movies like 'A Beautiful mind' and 'La vita è bella'."

KUIT: "Top Gear. I'm a car buff."

Which television programme would you scrap?

TEN HEUVELHOF: "They can all stay as far as I'm concerned, since I don't watch them."

KRUIT: "All the soap operas, they're awful."

When would you resign?

TEN HEUVELHOF: "The moment I loose the freedom to choose my research."

KUIT: "The matter has never come up, but I would if I felt I'd been taken for a ride."

Whom do you admire?

TEN HEUVELHOF: "People who go against the flow. That man who stood before the tank in Tiananmen Square. And the soldier driving the tank who stopped."

KUIT: "I don't suppose I can nominate Ernst? I don't admire people very easily."

What is today's greatest challenge to management and technology?

TEN HEUVELHOF: "We study the dynamics of complex systems that remain in balance for years on end and then suddenly and rapidly change, such as climate, energy, and water systems. What we need to do now is to control and manage these systems."

KUIT: "We need to find better solutions in practical terms without losing sight of the academic basis."

Which question are you glad you weren't asked?

TEN HEUVELHOF: "The one about my worst habits."

KUIT: "The question whether we ever spend time on anything else than research. We like discussing soccer and cycle racing. I support Feyenoord, and Ernst supports Ajax. I've been having a rather more difficult time than he lately."

Marital status

Ten Heuvelhof: Married, two daughters

Kuit: ~Married, two sons

Hobbies

Ten Heuvelhof: 'Going not very fast' on a racing bike

Kuit: Sailing and reading

Favourite newspaper and magazine

Ten Heuvelhof: NRC, het Financieel Dagblad

Kuit: NRC, het Financieel Dagblad, AD Utrechts Nieuwsblad, Top Gear

Invention you'd like to be yours

Ten Heuvelhof: Serious gaming

Kuit: The Senz Umbrella



Professor Dr. Franziska Bollerey, professor of architecture and urban construction history at the Faculty of Architecture, has been appointed member of the scientific advisory board of the famous Bauhaus in Dessau by the minister of the German federal state of Saxony-Anhalt. The seven members of the board are there to ensure the institute, which is funded by the German state, does what it's supposed to do. They assess and advise with regard to publications, international conferences, exhibitions and projects, and the upkeep of the listed building. The current project is the 90th anniversary of the Bauhaus, which will be celebrated next year with a major exhibition in Berlin.



In January **Professor Dr. Ir. Patrick Dewilde** (1943) retired from his Networks and System department at the Faculty of Electrical Engineering, Mathematics, and Computer Science. Dewilde held a TU Delft professorship for over thirty years. In 1993 became the head of DIMES, and he led the research institute until 2001. In 2003 Dewilde became scientific director of the ICT Delft Research Centre, and in 2005 he was again the scientific director of DIMES. Dewilde qualified as an engineer in 1966 in Louvain, graduated in mathematics in 1968, and four years later gained his PhD at Stanford University for research that would provide a major contribution towards the speech encoding for GSM telephony, among other applications.



2008 promises to be a great year for quantum physicist professor **Dr. Ir. Lieven Vandersypen** (1972). Early this year the researcher at the Faculty of Applied Sciences was appointed Antoni van Leeuwenhoek professor, a special chair specifically established to promote excelling young scientists to a professorship at a relatively early age. Some weeks earlier the researcher of the Dutch Organisation for Scientific Research (NWO) received a Vici grant of 1.25 million euros. And to top it all he was also awarded a Starting Grant of 1.3 million euros by the European Research Board. Vandersypen will be catching electrons on a chip and performing entangled electron spin calculations.



Late last year NWO awarded Vici grants to two other Delft scientists. **Professor Dr. Catholijn Jonker** (1967) will be using her grant to establish a group at the Faculty of Electrical Engineering, Mathematics, and Computer Science to develop technology for supporting decision-making processes. At the Faculty of Applied Sciences **Dr. Serge Lemay** (1970) will be leading a new research group that will be looking at reactions at the single molecule level.



In January Holland's first Internet provider, XS4ALL, established a three-year chair at the Faculty of Technology, Policy, and Management. American **professor Milton Mueller**, from the iSchool of the University of Syracuse, will spend a month of every three months in Delft to fulfil his appointment. Mueller's primary task at TU Delft will be teaching and research in the field of safety and privacy.



In February TU Delft gained three professors. Physicist **Dr. Paul Planken** (1964), earth observation expert **Dr. Ir. Ramon Hanssen** (1968), and industrial designer **Dr. David Keyson** (1962) each received an Antoni van Leeuwenhoek professorship. Planken received the chair, named after the seventeenth-century inventor of the microscope, who was born in Delft, to continue his research on terahertz vision. The terahertz viewer works with far infrared light. Hanssen will be continuing his research on earth observation from space, and Keyson will be looking at the interaction between so-called intelligent products and their users.



According to the Board of Governors, professor of Quantum Transport **Dr. Ir. Leo Kouwenhoven** (1963) is a figurehead within TU Delft, which is why in February he was appointed University professor. Together with Hans Mooij and Cees Dekker he completes the trio of University professors currently appointed by TU Delft. Only professors of exceptional merit within the University can qualify for this function. Kouwenhoven (44) is a professor of Quantum Transport at the Kavli Institute for Nanosciences. He is a world leader in the field of electronic properties of nanostructures. In 2007 he won the NWO Spinoza Prize, the Dutch version of the Nobel Prize. Kouwenhoven is a highly productive scientist, whose publications include 17 articles in Science and Nature.



On 1 March **Professor Dr. Theo Toonen** (1952) was appointed Dean of the Faculty of Technology, Policy, and Management. He succeeds Professor Dr. Ir. Hugo Priemus, who has returned to his old post at the OTB research institute. Before coming to TU Delft Toonen was Dean of the Faculty of Social Sciences at Leiden University. He has been professor of public administration at that university since 1990. Toonen has held several scientific and administrative positions at Dutch and foreign universities.



'Groundbreaking' is what the European Geosciences Union (EGU) called the research on hydrology and water management conducted over the past decades by **Professor Dr. Ir. Huub Savenije** (1952) of the Faculty of Civil Engineering and Geosciences. According to the organisation, the Delft professor has stimulated the knowledge about water management in no small way, especially in Africa. His efforts have contributed to the fight against hunger and poverty, for which the EGU will award him the prestigious Henri Darcy Medal this spring. This is the first time that a researcher at a Dutch university receives this award.



Dr. Jim Barth, of the Optical Particles research group of the Faculty of Applied Physics, passed away on February 18. Barth, born in Mattoon, Illinois (US) in 1935, worked at TU Delft for more than 40 years. Many undergraduate and graduate students of the optical particles research group benefited from his superior knowledge.



The art of drawing

The artistic component of design theory at Delft University of Technology is based on a strong tradition, greatly enhanced by efforts of teachers such as Paul Tetar van Elven and Bram Gips. It hasn't always been plain sailing, though.

JOS HILKHUIJSEN

In the nineteenth century, training to become an architect at Delft Polytechnic Academy (the precursor of Delft University of Technology) included following courses in decorative art, draughtsmanship, and sculptural modelling. For almost fifty years these arts classes were taught using practically the same methods: drawing from nature using an educational collection of authentic building ornaments and utensils from various periods.

Plaster models

Between 1854 and 1894 the drawing classes were given by historic painter, Paul Tetar van Elven (1823-1896). He had started teaching out of necessity, being unable to get by on the sales of his paintings and so required an additional source of income. Having given drawing classes for some years at the academy of arts in his native The Hague, in 1854 he managed to improve his position by accepting the post of arts teacher at the Royal Academy in Delft. Tetar van Elven wasn't happy as a teacher. A sensitive, romantic soul, he led a rather isolated existence in the provincial town that was Delft. In his opinion Delft was a cultural backwater, even though he faithfully attended the soirees of Musis, the local cultural society, which focused on music. He entered his paintings in national exhibitions, and achieved a certain fame as a copier of considerable skill. The years of teaching rather took their toll on him. Tetar dreamt of life on a superior aesthetic plane, but, as he once remarked, he saw it unfold amid mechanics and butter traders. His misery was compounded by lack of appreciation of his subject and a pittance for pay. Draughtsmanship was considered an essential ingredient of technical training. Its purpose was to improve the powers of perception and imagination for structural compositions, and to develop observational skills for typical shapes and colours. Most of the classes took place during the evening, at the expense of study and leisure time, but the time had been expressly chosen so as to extend the opportunity to attend classes to non-students.

In his drawing classes, Tetar paid ample attention to the great masters of the Italian renaissance and the Dutch seventeenth century, who often provided him with subject matter and inspiration. His teaching method involved copying lithographs of landscapes, antique

statues and heads, studies after old and new masters, and ornament studies. For drawing from nature he used plaster casts of classical heads, sculptures, and ornaments as models. These he obtained from the educational collection of building fragments and utensils of the department of fine arts. His sketching classes were considered rather dull. Just like the arts and crafts schools and art academies, the Royal Academy, or Polytechnic School, had its own model workshops, but many of the plaster casts, photographs, and lithographs came from abroad. In 1864 Tetar van Elven and his colleague, sculpture teacher Lacomblé, visited the Musée de la Sculpture Comparée in Paris and the Museum of Fine Arts in Brussels to order casts of freezes, leaf patterns, and decorative borders. They also placed orders with the Rijksmuseum in Amsterdam and the Museum of Antiquities in Leiden.

Revolution under Gips

With the appointment in 1894 of Van Elven's successor, A.F. Gips (1861-1943) the drawing classes underwent a fundamental change. Gips had been an arts teacher at a secondary school in Bergen op Zoom. He was to become known as an architect-decorator (interior designer), creating advertising posters, book covers, and silver dinner sets for which he received international awards. He was also familiar with the Polytechnic School, after training there, carrying out incidental decorative design work for it, and in 1886 designing and carrying out a ceiling decoration in the house of his predecessor, Tetar van Elven.

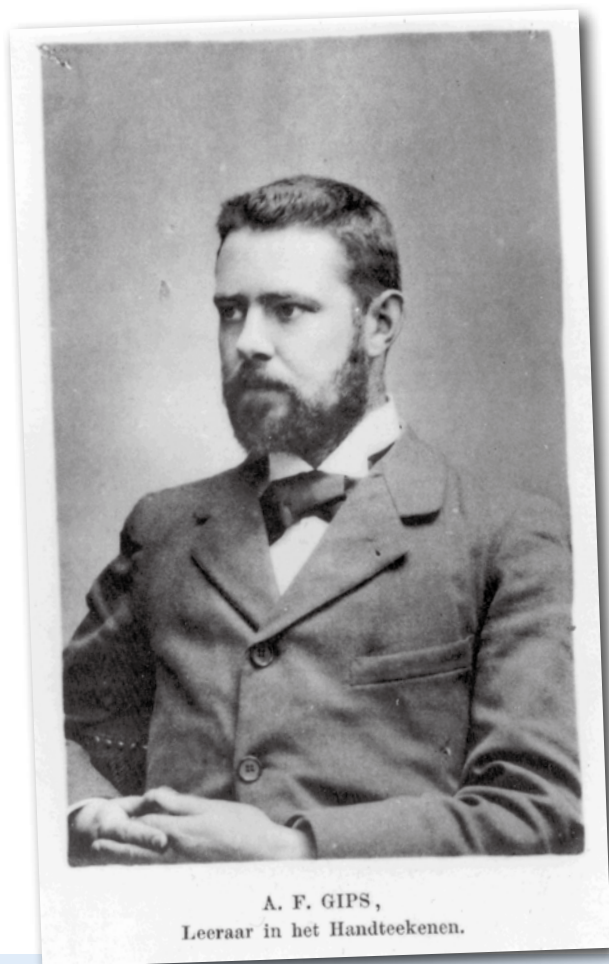
The drawing studio was on the top floor of the Polytechnic School building on the Oude Delft. It was lit by skylights and featured an amphitheatre and rows of tables. In addition there was what was known as the Sculpture Gallery, which doubled as a classroom for art history. Gips had his students measured and drew exclusively from authentic objects in a variety of materials, which he selected from the educational collection. The students could also do still life sketches and even sketch live, needless to say, dressed, models. For his lessons he added architectural and decorative fragments to the collection in order to provide an almost complete review of styles through the ages. Gips considered sculpture particularly important for his teaching method, since a well-carved statue allowed a

“Tetar van Elven's drawing classes were considered rather dull.”



Paul Tetar van Elven

PHOTO: ARCHIVE DELFT MUNICIPALITY



Architecture in Delft

Increasing trade, shipping, and agriculture, growing industrialisation, the advent of the railways, and improvements to the network of roads and waterways in the nineteenth century boosted Holland's prosperity, creating a need for an educational system better geared to trade and industry. Secondary education and vocational training were almost non-existent. To meet the demand for trained workers, professional training institutes had to be set up. Drawing and arts classes were considered the main instruments for stimulating industry. Architectural training was also in need of reform. The demand for better-trained engineers and skilled architects increased with the demand for new structures from industry and the railways. In 1843 the Royal Academy in Delft was established to train civil engineers and architects. For the first time in history, the art of architecture was no longer taught in conjunction with the arts of painting and sculpture, as it used to be at the existing academies for the visual arts in Amsterdam, Rotterdam, The Hague, Den Bosch, and Breda. The event was to become a hotly debated controversy for the ensuing decades.

The training for architects in Delft included mathematics and technical subjects. The arts curriculum, which covered only three years out of the four-year course, comprised mainly structural and ornamental drawing. This was why it was said that Delft produced neither architects nor artists, just 'capable structural engineers'. Those wanting to become full-fledged architects generally continued their studies abroad, or completed their training with long tours of other countries. The 1863 Secondary School Act resulted in a separate chair of architectural arts and the introduction of the secondary teaching certificates for drawing and sculpture. The Royal Academy was abolished and replaced with the Polytechnic School. A young German architect, Eugen Gugel (1832-1905) became its first professor. For almost 40 years he was to leave his mark on architectural teaching in Delft. The decorative arts, sketching, and sculpting became a compulsory part of the curriculum.

great deal to be discovered, and they increased students' professional knowledge.

As the remaining photographs of that time show, the drawing studio combined the atmosphere of a museum with that of a classroom. Gips set great store by the close-up experience of beauty. He added many casts from the Musée de Sculpture at the Paris Trocadéro, the Museum of Monumental Art in Brussels, the Rijksmuseum in Amsterdam, and the Museum of Antiquities in Leiden to the small collection of Greek and Renaissance statues started by Tetar van Elven and Lacomblé. On the walls he put water colours of monumental buildings and photographs of famous paintings and sculptures, completing the catalogue of available styles.

Just like his colleague Karel Sluyterman (who taught decorative art) Gips put together a collection of photographic slides to provide illustrative material for his subjects, sketching and art history. It all helped to make the classes more exciting than they were wont to be, and the interest shown by the students increased accordingly. Former student Leliman wrote: 'Drawing was neither highly regarded nor enthusiastically attended. Where crowds were to be expected only incidentally an individual would report to the drawing studio, quite timidly as though the demonstration of so much zeal might earn him the dreaded reputation of being a swot. However, since 1895, the importance of drawing skills had been increasingly stressed, the attendance of classes had witnessed such a reversal that the last decade had seen the doorsteps worn down more than they had been in the previous half century, and the available space had become so small that it was always fully booked in advance and numbered tickets were required, and [...] an assistant was found to be necessary.'

Protest

The fresh breeze Gips sent through the arts department as a result of his less abstract teaching methods came from the arts being recognised for the first time as an essential addition to the science curriculum. As a result the position of the teachers in the arts department improved considerably. Gips himself had contributed to the situation. Following the example set by the Association of Civil Engineering, in 1896 he urged the School's Board to add classes on the history of painting and architectural art to the curriculum, suggesting that he himself teach the subject. The proposal met with approval, and the first classes were given in February 1897. From the very start his classes were enthusiastically attended. His use of slides – a novelty in those days – contributed greatly to the success.

Gips displayed great commitment to his subject. When, as a result of the transition from Polytechnic School to Polytechnic Academy, the art classes came under of the General Sciences heading, and art history was in danger of becoming an elective subject, he lodged a personal protest with the reorganising committee. To Gips sketching for architects was both a means and an end. He failed to convince the committee. In a speech in 1925 Gips

Lovely evening

It's three a.m. and I'm walking the dog. It's a beautiful night, a little hazy with a full moon just shining through. I'm actually on holiday, far from home in beautiful Switzerland, and so I'm restricting my workload to just a couple of hours a day. This evening I sat down to do 'a few things', work on a paper, reply to some e-mail, and write this column.

Things often get late, especially when there are deadlines for papers to meet. Normal working hours are spent on meetings, hardly ever on production work. I go home on time, walk the dog, eat a bit, then fall asleep in front of the television. Around ten 'o'clock I'm usually awake again and switch on the computer for another couple of hours. After that it's another quick walk with the dog, then off to bed. Most days I'm in bed by two a.m. and every morning at nine you can find me at TU Delft.

It wasn't until I gained my doctorate that I really began to understand the essence of being a scientist and really went for it. Your time as a graduate and doctorate student, so I learned from a colleague, is just to show that you can do it, that you have the talent. It doesn't make you a scientist though. You have to go the whole way, show discipline in the way you work and live. He compared it to professional sports. Anyone can dabble in science, but you can only reach the top if you tackle the job with the zeal of a dedicated sportsman.

He was right to criticise my way of working. In my years as a student and during my doctoral research I had had it too easy. I'd never had to work really hard. On the other hand I did complain that he, with fifteen years' extra experience, knew more than I did, was able to see more connections than I could. I'm embarrassed to remember it. The arrogance of youth! His words also helped me in another way: I was able to choose and go for my work! There is nothing abnormal about spending lots of time on something you really enjoy doing. It's not all fun and games. Seeing papers and research proposals rejected can be annoying. Sometimes I get angry with the stupid referees, sometimes I get angry with myself because I made a mistake in my writing. Those are the easy rejections. Other times I have doubts about myself, can I actually do this? Is it really a good idea? Those doubts are much harder to tackle than simple anger. You have to be able to find the discipline to try again, and it's hard.

I love my work, especially working together with colleagues and students, with the kick you get from the discoveries you make in research and teaching. I do the preparations for those meetings, whether they be lectures or staff meetings, in the evenings and the weekends. The production work, preparing for research, working out research ideas, I love it all. It's lovely to have a good product at the end of the evening.

Catholijn M. Jonker is professor of man-machine interaction at the faculty of Electrical Engineering, Mathematics, and Computer Science.



touched on the matter again by pointing out that field sketching was a compulsory subject in the curriculum of the upper years. He supported his views by quoting a recent proposition by a doctoral student stating that 'proper draughtsmanship is essential, and so drawing and sketching are [...] of dominating importance to the trainee architect.' [...] 'the art of sketching is a necessity to the architect, [which] has not yet been recognised.'

Exhibitions

So drawing remained controversial, and its importance kept having to be demonstrated. A tried and tested means were the annual exhibitions of building and decorative art organised in Amsterdam. Since the 1880s decorative art teacher Adolf le Comte had his students enter designs for ceiling and wall decorations, door surrounds, and facade decorations in the competition. It is not clear whether the entries came entirely from architecture students and whether students seeking a certificate to teach art were excluded. No records of names or entries survive. Whatever the case, the collective entries were intended to demonstrate the quality of the decorative arts teaching in Delft. From the beginning the contributions from Delft were well received and they earned awards on a regular basis. Starting in 1900 Gips and Le Comte's successor, Karel Sluyterman, arranged exhibitions from time to time demonstrating their students' educational progress in studies in oils, water colours, pen drawings, and pastels. Gips and Sluyterman called themselves architect-decorators, what we would call nowadays interior designers. The Polytechnic School taught students the basics of decoration on flat surfaces and this qualified them for the arts teaching certificate, but it did not make them architect-decorators. For that additional courses had to be followed at art academies.

Many architects, architect-decorators, decorators, and others active in the applied arts took lessons from Le Comte, Sluyterman, and Gips. Memoirs and publications by former students show that the lessons left a lasting impression. Those students included, in addition to Leliman, J.B. Kam, J.F. Klinkhamer, J.R. de Kruijff, C. Muysken, M.A.C. Hartman, A. Labouchere, E.J. Niermans, F.J. Nieuwenhuis, C.T.J. Louis Rieber, P. du Rieu, J.L. Schouten, C.C. Th. Six, J.A.G. van der Steur, J.A. Pool, P.J.W.E. van der Burgh, and G. Knuttel, all of whom had a great affinity for architectural decorative arts and applied arts in general. Remarkably, they were predominantly architects and not architect-decorators like Gips and Sluyterman.

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PROPOSITIONS

Spammers and virus programmers have a positive effect on employment

Jelmer Braaksma

ELECTRICAL ENGINEER

Just because your computer is calculating doesn't mean you're doing something productive.

Wouter Caarls

BSC IN ARTIFICIAL INTELLIGENCE

A society in which everybody works, does not work.

Hamilcar Knops

BSC IN PHYSICS, MA IN LAW

The recycling system is governed by the laws of Nature, not by laws of Humans. No legislator can change the laws of Nature!

Olga Ignatenko

CHEMICAL ENGINEER AND
MSC IN ENVIROMENTAL
MANAGEMENT

If the trend of classifying increasingly smaller particles in the air (particulate matter, CO₂) continues, we will come to the conclusion that mankind is better off in vacuum.

Ezra van Lanen

ELECTRICAL ENGINEER

Overtime is a form of hidden employability.

Marco Zoetewij

PHYSICS ENGINEER



Verbal intimidation of his computer relieves the stress of a programmer and his surroundings.

Ton van der Laan, AEROSPACE ENGINEER

[Sound]BITES

"The risk is that people will switch on their headlights simply because it's the law and to avoid a fine. That won't make them more observant in traffic."

Traffic safety expert Dr. Ir. John Stoop in NRC HANDELSBLAD

"Users have higher expectations from luxury products. If you buy an expensive mobile phone, you expect it to come in a nice box, and you will expect pleasure from unwrapping it, with tissue paper and lots of small boxes."

Dr. Ir. Ilse van Kesteren, who completed a doctoral thesis on materials experience, in TROUW

"Yes, Big Brother scenarios with injected microchips could become reality. It is a justified fear, new technology should be handled with care. Right now you can always choose not to apply the sticker and switch off your mobile."

Dr. Ir. Wouter Serdijn, assistant professor of Electrical Engineering, in NRC HANDELSBLAD

"The thing to do is to instil a bit of the arts into the engineering types, which this country needs. Area developers should have plenty of arrows to their bow. Lunch with a deputy mayor today, throwing off a quick sketch for local residents tomorrow. Or they could even decide to speed up the process and organise a weekend for all the parties involved to find common ground."

Mr. Friso de Zeeuw, professor of applied area development and one of the managing directors of Rabo Bouwfonds in NRC HANDELSBLAD

PROPOSITION

In twenty years hearing aids will become as trendy as the mobile phone today.

DEFENCE

"By 'trendy' I don't mean that hearing aids will be used as much as mobile phones, but rather that they will be just as fashionable and 'in' as mobile phones. At the moment, to put it bluntly, a hearing aid is regarded as something for 'sad' people who can't hear well. There are trends with gadgets, such as mp3 players and mobile phones. You can integrate these in hearing aids, perhaps also for people with perfect hearing who will be able to hear you better by reducing background noise and integrating speech signals "

Richard Hendriks

ELECTRICAL ENGINEER



PHOTO: SAM RENTMEESTER/EMAX



A TU Delft alumnus writes a column and passes the pen to another alumnus of his or her choice.

My choice of university subject was a bit out of the blue. I'd done mathematics and science at school and, not to put too fine a point on it, I found them fairly easy-going. Even so my careers master's initial advice was to try psychology or educational science. I soon discovered that they were not my cup of tea. A friend of mine went to the THEA event in Eindhoven, which was an information session, organised by the technical universities especially for girls. They only organised them for a couple of years, which is a pity, I think. That's where I immediately became hooked. So it had to be a technological university, and it had to be Delft (of course). My subject was mechanical engineering.

After having spent a few years working for an engineering firm, I got seconded to the Aalsmeer flower auction, where a monorail system was being installed. It was an ambitious and innovative project, something you don't see often in Holland. I became assistant project manager of the construction team. My strength soon turned out to be supervising the general course of a project, finding the right people for the team, and maximising their performance. I don't mind leaving the purely technical side of things to the boffins of the team.

Once the project was completed the auctioneers offered me a job as a technical project manager. I then did a personal development course and after that a management job followed as head of the technical project office within the property department. A great job. I love supervising professionals, and boffins, especially these. In spite of wide-ranging careers, most of them had never had a female supervisor. As a technically-minded woman within a virtually male-only team (hardly surprising) I was really able to add something. But what? You won't believe it but a girl power seminar really did help me identify what it was. I was good at observing and sensing the state of mind of colleagues, of making contact, being relationship-focused, at team-building, facilitating, coaching and giving leadership, creating a growth climate, being intuitive. Yes, even after spending 18 years in a man's world I still had some of that left in me.

Given the imminent shortage of engineers I feel that more women should be persuaded to go for technology. That's why I have been involved in Technika 10 Rotterdam since 2003. It's a foundation that arranges courses at primary schools. Originally it was only for girls, but these days boys can join in too. The purpose of the foundation is to instil an affinity with technology in young children so that they will later go for a technological career. By the way, we're always looking for new sponsors!

At the beginning of this year I started a new and challenging job as Head of Rental & Services. So, goodbye technology. I can't rule out the possibility of returning to a technological job some day, though.

Bianca Lambrechts (37) studied Mechanical Engineering at Delft University of Technology from 1988 to 1995. She is Head of Rental & Services at the Flora Holland flower auction, Aalsmeer. Bianca passes the pen to Civil Engineering alumnus Ir. Marjorie van Breda, department head at Zuid-Holland Provincial Authority.

Hydraulic squeeze sensor



PHOTO: SAM RENTMEESTER/FMAX

CONNIE VAN UFFELEN

Picking up an egg with your fingers is easier than picking one up with a pair of pliers. Touch sensors in our muscles prevent us from inadvertently squashing the egg, but it is difficult to judge the amount of force applied by the pliers. The same goes for minimally invasive surgery, or keyhole operations, in which a surgeon operates through holes in the abdomen or knee, manipulating a camera with one hand, and a pair of forceps with the other. The force the surgeon applies when squeezing the forceps does not follow the force applied to the tissue, because the instrument contains all sorts of joints and hinges affected by friction. Damage from excessive squeezing can be a problem, especially during intestinal surgery. "If the intestine is pierced, its contents can enter the abdominal cavity," John van den Dobbelsteen says, "and that could result in a potentially fatal septicaemia." Van den Dobbelsteen tried to find a way to measure the pressure exerted on the tissue. "You need a force sensor for this. These devices measure one centimetre square, and they don't fit into the forceps' beak. So, I had to look for another solution. A force sensor needs to be a deformable element, and that is the hardest part to make. It also requires highly miniaturised electronics. Combining the two is virtually impossible."

What put Van den Dobbelsteen on the right track was the technique used in the Dotter method, in which a balloon is inflated to widen a blocked coronary artery to restore the blood flow. "This is a safe method, as the balloon is able to withstand high pressures and can be manufactured in a range of sizes."

Van den Dobbelsteen attached a balloon to the beak of the forceps. As the balloon is pushed against the patient's tissue, it is compressed, forcing liquid inside the balloon out through a small tube leading to the grip of the instrument, where the pressure can be measured, thus revealing the relationship between the force applied to the instrument and the pressure exerted on the tissue. "A balloon like this is relatively easy to make, as it doesn't require any electronics, and compressing water or air is very safe for the patient."

Van den Dobbelsteen has been granted a patent for his invention, and instrument makers of the Biomechanical Engineering department are currently building a prototype. The principle could perhaps be applied to detect tumours as well. "In many cases, tumours will be harder than healthy tissue. This means that you could find tumours you would not normally be able to see, simply by testing tissue for hard spots."

More information:

Dr. John van den Dobbelsteen, j.j.vandendobbelsteen@tudelft.nl
www.misit.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.

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

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Mekelweg 4
NL- 2628 CD Delft
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2628 BC Delft
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NL-2628 CD Delft
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NL-2628 CD Delft
Telephone +31 15 278 6666

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

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NL- 2628 CD Delft
Telephone +31 15 278 4568

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NL- 2628 CD Delft
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NL-2628 BX Delft
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NL-2628 BC Delft
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telefax +31-15 278 6522

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Liaison between business and research:

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Information on research fellowships:

Mrs. M.Y.M. Spiekerman-Middelplaats
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General information on university education in the Netherlands:

MIN. OF EDUCATION, SCIENCE & CULTURE CENTRAL INFORMATION DPT.

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(vocational courses)
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www.delft-toptech.nl

INSTITUTE FOR BIOTECHNOLOGY STUDIES DELFT LEIDEN (BSDL)

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Telephone +31 15 278 2355

For information on courses in the Dutch language:

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