

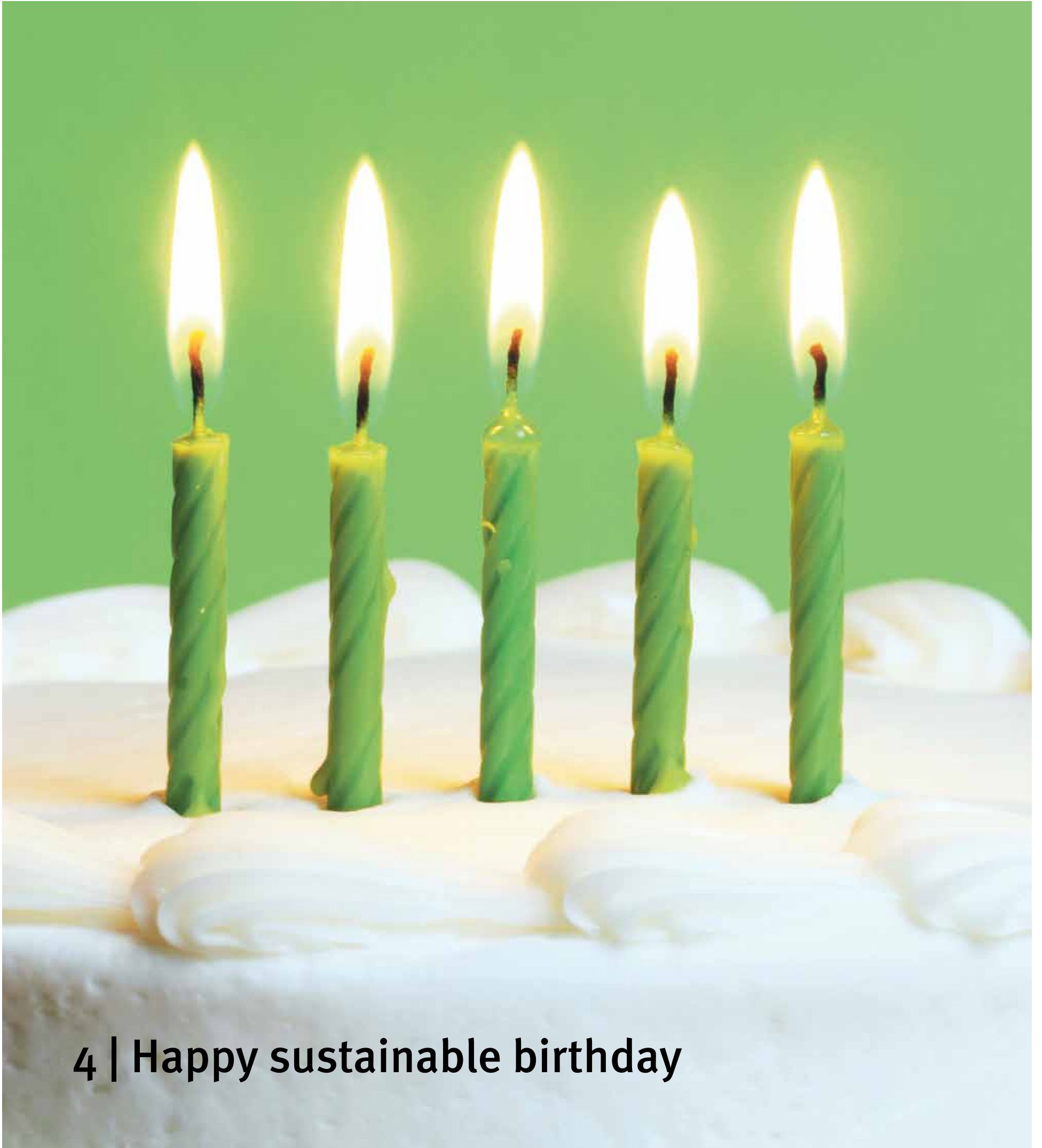
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# Cursor

April 19, 2012 | year 54



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For news: [www.tue.nl/cursor](http://www.tue.nl/cursor) and follow tuecursor on Twitter and Facebook



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### Talk and pictures

Friday after next, our university's 56th anniversary will be all about sustainability. The Executive Board has asked the green consultancy Urgenda to draw up a plan on how to work with sustainability more. The request resulted in a bulky memo bearing the inspirational title 'City of Tomorrow'. One of the tips is to clearly visualize

in what ways the university is being green already. Unfortunately, one of the devices that's been helping us in our quest for sustainability for years now has been tucked away underground. I'm talking about the heat-cold storage, the existence of which is apparent only from a number of concrete cubes scattered around university grounds, and the cooling towers at the far end of campus. Visualize that.

The memo included only a single artist impression picturing the green future we're aiming at. It's a picture of the Hoofdegebouw bearing five windmills and an Auditorium chock full of solar panels. Delft presented a far better impression of their Green Campus last year (yep, they too are going green!). There was an impressive wind turbine (The Harp) for me to admire, for example, and a cool sound barrier with windmills that caught particulates at that. Oh well, maybe instead of presenting the pictures, we rather talk the talk.

### Neglected nanowire

He was all over the news this week: nanoscientist Leo Kouwenhoven and his Majorana find. And rightly so, because it was quite the discovery. Explaining the details about this particle that's its own anti-particle at the same time proved to be an art form in itself. In talkshow Pauw & Witteman, we saw Kouwenhoven going at it with a big box of duplo bricks. The yellow blocks represented the essence of his Majorana device, and that's the nanowire made in Eindhoven. So despite our crucial contribution to the find, the media seem to have overlooked the Eindhoven part entirely.



To make up for that, page 8 (Dutch section) has an elaborate story on the neglected Eindhoven nanowire.

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## ◀ Rewwwind www.tue.nl/cursor

Our Rewwwind feature provides you with snippets of last week's news. What happened online after the previous Cursor magazine was published?

### 'Majorana' discovered with the help of Eindhoven nanowire

13 April 2012 - Kavli Institute scientist of TU Delft and the FOM Foundation are the first to have detected a Majorana particle. In the thirties of last century, genius Italian physicist Majorana deduced from quantum physics the possible existence of

a special particle, one that was its own antiparticle: the Majorana fermion. The 'Majorana' has now been detected at the tips of a special nanowire that was produced by TU/e researchers at Photonics and Semiconductor Nanophysics (Applied Physics).

### Bruekers managing Director Applied Physics

13 April 2012 - Ir. Alfons Bruekers will be the new Managing Director at Applied Physics. He will start his new job no later on July 1 at the latest and will be succeeding ir. Tiny Verbruggen who had to resign due to health problems. Bruekers is currently

Managing Director at the Department of Mechanical Engineering as well. He'll be combining the two positions. To prevent Bruekers from having to do everything twice, both departments are in search of proper support.

### EOD removes explosive picric acid from N-laag

13 April 2012 - Last Friday, the Explosive Ordnance Disposal Service (EOD) was deployed to remove crystallized picric acid from a lab at N-laag, which is currently being used

by the Department of Biomedical Engineering. EOD brigades entered the building's evacuated B wing. Nobody was hurt during the operation that lasted under an hour.

### Increased appreciation Student Sports Center

13 April 2012 - From the survey sent out by the Students Sports Center earlier this year it shows appreciation for the SSC has increased compared to three years prior. On average, visitors

rated the sports center with an 8.1, while three years before that mark was still 7.8. The survey was returned by over 1,500 people.



1963. Photo | Archive IEC

## ◀ Flashback

### Cafeteria litter 2012 vs 1976

Once again, it goes to show littering has always been a nuisance. The black-and-white picture shows a reception at the cafeteria of Chemical Engineering & Chemistry, in the gangway between Vertigo and de Zwarte Doos (known as T-hoog and T-laag at the time). As far as Johan Wijers is concerned, who retired from his position as associate professor last year, the sign had always been there. It was there when he started his freshman year in 1963. "I remember it being a decent cafeteria. It was meant especially to remind people to return their silverware and coffee cups because they tended to leave it thinking someone else would take care of the clean-up. Who knows, maybe it's thanks to the sign that everyone now clears their tables."

Cleaning up your own mess isn't that self-evident in the pantry at Laplace. In 2012, Anneliese Verhoeven of the Communications Expertise Center felt the need to put up a printed 'sign' herself, and it's one that doesn't beat around the bush. And it works: "It's been on display for three weeks now, and so far only two plates have been left." (NS)



## ≡ Clmn The Ambassadors



I observed that many of my international colleagues envy their Dutch fellows. Mainly, it's because of the financial benefits provided by the Dutch government. Free public transport pass, tuition fees that are one-seventh of theirs, grants for accommodation, permission to work - all these benefits make life easier. However, being an alien in the Netherlands has the benefit of fighting stereotypes.

Indeed, all foreigners face stereotypes upon their arrival in a foreign country, such as 'the Chinese are hard-working', 'Indians are noisy', 'Mexicans like parties', 'Russians are tough'. Some of them are positive, some are negative. It's our mission

to break negative and create new, positive ones by becoming cultural ambassadors. Realizing you represent millions of people from your country adds motivation and encourages hard work. Such a great opportunity is usually reserved only for famous sportsmen defending their homeland's honor at the Olympics. Isn't it great? If we succeed in leaving a good impression of our home then we'll have eased the life of our successors in the Netherlands, and I think that's worth accepting the tough challenges of studying at a Dutch university. Surprisingly, it is a process that works both ways. After all, we also become Dutch ambassadors for our native people. For example, recently my friend in Kazakhstan was accepted to two universities, one in the Netherlands and one in Germany. He called me to ask about my Dutch experience. I provided honest feedback and told him about all milestones and pitfalls on the way to receiving my master's here. My enthusiasm and arguments helped him decide and this autumn he is going to start on a program in Utrecht.

So, what is more important for you: a comfortable, easy life or the greatest personal growth you'll ever experience outside your comfort zone? The final choice is yours.



Prof. dr. Klaas Nicolay, professor of Biomedical NMR,  
Biomedical Engineering Department

## How can we use nanoparticles to target cancer cells?

Although chemotherapy is a widely used treatment against cancer, it also comes with great drawbacks. Often the medication is not very specific and also kills many healthy cells apart from the tumor cells. And that is precisely the reason for nasty side effects, such as a strongly reduced defense mechanism, nausea and hair loss. This means it would be great if the medication were absorbed only by the tumor cells, and it seems as if nanoparticles charged with medication can achieve just that. Last week there were even several researches about these minute particles that hit the news. How do all these particles differ from each other? Are we looking at pioneering research and how far has the actual application in humans developed by now?

“At present a lot of research is being conducted into the use of nanoparticles to attack cancer cells. They are regarded as smart particles and this is proved by more and more studies”, says Klaas Nicolay, professor of Biomedical NMR at the Biomedical Engineering Department.

“The overall principle is the same for all different nanoparticles: they are absorbed easily by cells and by filling them with a specific medicine, this can then end up in the cell. The surface of such a particle can be covered with proteins that bind to cancer cells, so that the absorption by these cells is promoted. And once the medicine is inside the cell, it can go about its job and kill the cancer cell.”

“It has now been demonstrated that a certain type of nanoparticle is not only absorbed in the cell, but is also transported in the direction of the cell nucleus - where the genetic material is stored. There it can actually regulate the cell nucleus and bring about cell death. In and of itself this may be very fine, but today’s literature is full of similar studies, in which they try to record the absorption process in isolated cancer cells by means of high-tech imaging techniques. Although fundamental research is tremendously important, too little is known yet about the real value of the use of nanoparticles in

patients. A finding which I therefore consider to be far more spectacular, is that nanoparticles are being developed that can stay in the bloodstream long enough without being scavenged. A tumor has other blood vessels than elsewhere in the body, they are more permeable. As a result of this increased permeability they can absorb nanoparticles more easily. By playing with different covers, researchers have succeeded in making nanoparticles stay in the bloodstream long enough to permeate the tumor blood vessels so that they end up less in healthy organs, like the liver and the spleen. A tumor getting smaller and a simultaneous reduction of the often atrocious side effects - surely that sounds fantastic. While results are positive in mice and monkeys, that does not mean it will work in humans as well. Nevertheless a first study in humans appears to catch on, the body seems to tolerate these nanoparticles and CT scans show that the tumors are shrinking. We do need to be cautious with too positive statements. Indeed, a great deal of



Klaas Nicolay. Photo | Bart van Overbeeke

research still needs to take place before it may be applied in a treatment of cancer patients.”

“Everything seems to indicate that nanoparticles are a powerful approach to killing cancer cells. Already there are therapies with simple nanoparticles, consisting of fat globules -liposomes- charged with medicines. In some tumors this works very well. Not all tumors are the same, however. And precisely because there are so many kinds of tumors, many different nanoparticles are required as well. With a different cover, composition and shape or, indeed, a different

manner in which they can release medicines. For instance, our group is working with temperature-sensitive nanoparticles. Via the bloodstream they end up in the tumor. By then heating the tumor with ultrasound, the particle starts to leak and medication is released very locally. This method could work with primary tumors, but in case of metastases a different treatment is necessary and it would probably be better to use the nanoparticles from the above-mentioned study. A lot of research is still required to find the right approach, but believe me: we shall be hearing a lot more about these smart particles.” (NT)

## Cherry picking at Helix



Photo | Bart van Overbeeke

On Tuesday morning, **April 17**, a cherry picker lifted a chemical vapor deposition reactor into the Helix building.

The price tag of the reactor (meant for Energy Materials and Devices’ prof.dr. Peter Notten’s lab): more than **1 million euros**.

The reactor consists of **4 parts**, the heaviest weighing in at **1500 kilos**.

The window on the **5th floor** of Helix was removed before the clock struck **7am**.

The operation that required **4 movers** was completed at **2.30pm**. (T)



# TU/e wants sustainability that's talked about

**Can sustainability and the visible dissemination of its pursuit in education, research and on campus have an attractive effect for TU/e? Stichting Urgenda thinks so. This consultancy agency was commissioned by the Executive Board to write an extensive memo, entitled 'City of Tomorrow', which explains how TU/e can set to work with this theme.**

**In his lecture during the Foundation Day celebration of April 27 Arno Peels, chairman of the Executive Board, will talk about the ways in which TU/e is going to work more emphatically on sustainable innovations and about the pursuit of an energy-neutral campus.**

The figurehead of Stichting Urgenda is director Marjan Minnesma, who in 2011 was selected as the most influential person in the area of sustainability in the Netherlands by the newspaper Trouw. In Slash, the relations magazine of TU/e, Minnesma recently said that a university in particular should be honest in the development of sustainable solutions. Practice what you teach. "If you teach that new buildings should be energy-neutral, make sure you live up to this yourself as well", says Minnesma in Slash, "and inspire others. The university has a great many contacts with enterprises: challenge them to take things a step further and train students who will later make another voice heard within enterprises".

## Practice what you teach

The Executive Board wants to make the TU/e grounds an internationally renowned breeding ground for sustainable innovations. This endeavor should be applied visibly within the three strategic areas -Energy, Smart Mobility and Health- and tested in practice on and around the campus in talked-about cycles. Technology that leads to sustainability will be taken in hand even more expressly and if that message is disseminated in properly, it will attract new students, staff members and enterprises. Executive Board chairman Arno Peels: "We want to become more sustainable. Whilst there are several initiatives being developed at present, they are too fragmented and are consequently given short shrift. By bringing them together it becomes more visible how we are

working on new sustainable technology." What Peels thinks should be done anyway and what is also emphatically recommended by Urgenda, is to show as soon as possible what TU/e is already doing in this area. Peels, walking towards his window and pointing at the grey boxes on the verge of the lawn in front of the Auditorium: "Those boxes form part of the greatest heat-and-cold storage (WKO) of Europe. Why don't we enhance the visibility of such an installation? In the further development of the campus, too, sustainability must become a more prominent theme - think of the dynamic street lighting at De Zaale, for instance. And later, on the Green Strip, you want things like that to be a permanent feature. Still, they must be things that have attained a certain degree of maturity, for their nature should not be too experimental. Wherever you are on campus, inside or outside buildings, you should be able within a matter of minutes to see a couple of things in the area of high-tech sustainability. Things that have emerged from the university. Make innovation visible".

How did Urgenda proceed? Peels: "We have put teams consisting of our own professors and other staff members together with people from Urgenda and this collaboration has resulted in a first inventory. This progressed rather in line with our campus strategy and our three strategic areas. We asked Urgenda: 'Show us what it means to put sustainability into practice'. Then we tried to find out whether there was support for this, among others from the University Council, the deans and the front-runners of our clusters. Urgenda has also made it clear what we have already at this moment. This formed the basis for the elaboration of three scenarios with

appropriate levels of ambition: very high, average and low. It goes without saying that we will not decide on the last-mentioned scenario, otherwise we would never have started on this at all.

**"We have to innovate in order to become entirely energy-neutral"**

Today's technology does not allow us yet to realize the 'high' scenario. That is, not with the financial resources that we can afford. Nonetheless, as a university of technology we cannot simply acquiesce in the state of the art. We have to innovate in order to become entirely energy-neutral. The Executive Board regards the middle scenario as an important milestone on the route leading there. In addition, you need to consider the return time of certain investments. If you recoup an investment within ten years and then start to save



on it, it is interesting to put money into it." According to Peels the inventory has shown that there is a tremendous number of possibilities. "We should ask ourselves: what does it mean if this were an energy-neutral campus? In other words: if as time goes by we generate as much energy as we consume. The geothermal heat storage installation is already contributing to this, for instance. Still, what does it really mean? I don't know whether there are any energy-neutral campuses already, but I do know that people in several places are working on energy-

neutral buildings. That is the direction in which the world is moving. With our Strategy 2020 we want to flesh out this theme across the board. Sustainability is not something to strive for per se. However, for the Green Strip and the compact campus you should attempt to make this more visible, to create a high-tech look and feel and to show your innovative nature. That will bring the campus to life far more." (HK/MvdV)

Illustration above | iStockphoto  
Illustration left | Urgenda



**The choice of the Executive Board for the sustainability plan has resulted in the Urgenda scenario with an average level of ambition. In this scenario an investment of 8 to 9 million euro has been estimated for the period from 2013 to 2015. In the five years after that this amount will increase to 10 to 11 million and the estimate for the period 2021-2030 is 15 to 16 million. The operating benefits are stated as well: in 2013-2015 they will total four to five hundred thousand euro over a period of 15 to 20 years. The next five years that amount will run up to eight to nine hundred thousand euro, also over a period of 15 to 20 years. The ten years then following will lead to the actual gains, according to Urgenda: then a benefit ranging from 14 to 15 million euro will be reaped over a period of five years.**

# ‘Philips takes better care of its lamps than a hospital of its patients’

**“The appointment committee asked me if I ever came into hospitals. I said: “Once every two years, with a bunch of flowers”. Nowadays people tell me all sorts of anecdotes about things going wrong - when it stands to reason that a great many things are going well in hospitals and people work there with total commitment. Yet I dare to allege that, if you look at the system, Philips takes better care of its lamps than a hospital of its patients.” Prof. dr. ir. Ward Cottaar is director of the School of Medical Physics and Engineering. Tomorrow, Friday April 20, he will present his remarkable inaugural lecture.**

Cottaar (1956) likes to talk about his work and does not shirk sweeping statements, regularly with a laugh that puts things into perspective. Continuing in dead earnest two seconds later. He studied Applied Physics at TU/e, obtained his PhD in 1985 and worked all across the globe for Philips in various production centers, as project manager, senior engineer and manager. For a year now he has been director of the School of Medical Physics and Engineering at TU/e.

From that position he keeps a very close eye on healthcare. In his view hospitals are losing money unnecessarily, when this could be prevented easily. Cottaar: “Hospitals purchase more and more equipment without properly implementing it, technically speaking. There should be more engineers working together with doctors, so that the latter understand what they are doing and are aware how (un)reliable figures may be. When I introduce a new pair of scales into the industry, I check with everybody

who will be using them whether they actually know how to handle them correctly. For it is surprising how often you get different measurement results when different people use the same instrument; everybody has their own way of handling it. Whereas such scales are perfectly in conformity with the specifications. You need to be aware of what can go wrong, especially when people are concerned.”

**“Although hospitals monitor patients well, they don’t monitor themselves properly”**

An example he mentions is the measurement technique to determine the condition of a person’s heart. It can be done by means of an MRI or CT scan or by means of ultrasound. The findings yield a number, which is the basis for the subsequent decision by a doctor. Cottaar: “If I measure that again or with a different technique, clinically relevant differences emerge, for the same patient. That poses an awkward problem, which is not easy to solve at once. As a doctor you should be aware of this, but such awareness is often simply absent. Although hospitals monitor patients well, they don’t monitor themselves properly. And another thing they fail to do, is systematically improve things on the basis of the data obtained.”

In hospitals, measurement techniques are not validated and processes are not checked, as Cottaar alleges in his inaugural lecture: “Experience has shown that if you fail to validate, you won’t even know that you are acting foolishly”. Which is why Cottaar advocates the deployment of medical engineers who introduce industrial methods into healthcare, just like the industry once learned from Japan, so that we are driving in much more reliable cars these days. Their task will be to solve the right problem in the proper manner on the basis of -medical-knowledge, communication and a full understanding of the processes involved. Their resources are, for starters, control charts, process control

and validation of measuring instruments. That clarifies problems, which you can then tackle together with the people who are doing the actual work. Cottaar would prefer some three percent of staff to be made available for this, as is the custom in the industry: “They are structurally focusing on innovation to improve matters, together with other people on the shop floor. They don’t all need to be medical engineers; many things can be done just as well by people with different levels of vocational schooling or by nurses. For example, in the issue of medication there was a lot going wrong at the Máxima Medisch Centrum; it was the final task of the night shift. Now this is done by several members of the morning shift, who have been exempted for this especially. This yields far better results because they are not distracted.”

Every hospital should begin with a check of measuring systems and process control, Cottaar posits: “That will bring out clearly what needs to be tackled and how. This may be all kinds of things: a device that is not accurate enough, the training of staff, improvement of the discipline in a ward where staff does not do something because they find it awkward, when it should definitely be done. Often the working methods need to be changed, which is by no means easy. The best approach is to go through the whole process together with the staff members and to draw conclusions. Medical engineer is a many-sided profession – they also need to learn, for instance, to “translate” their knowledge adequately, because they work together with a great many different people: specialists, nursing staff, technical personnel, IT buffs.”

**“Without validation, you won’t even know that you are acting foolishly”**

A useful tool in this context are control charts, which are in many cases manually realized diagrams. On the basis of those you can see things before they happen. Cottaar: “You can see it when something suddenly goes totally differently, worse or better. Such a chart gives you a clue to find out and grasp

why things are changing. In factories people always used to say: “Do I really need to keep track of all that?” I said “Yes - and there are a lot of things of which you are keeping track for nothing.” It is a bit like an insurance premium: you hope nothing will happen, so that your premium is a waste of money. Sometimes merely conducting such a process analysis results in problems being (nearly) solved. On other occasions you need to adopt a project-based approach. Often they are simple things, which will rarely bring you the Nobel Prize, but they do work.”

It is not as if engineers will now simply solve all problems in hospitals; there are also problems that they cannot do much about. “In a certain hospital the radiology ward introduced a new system for the order planning, for making appointments, timetables and such. The system had trouble generating the accompanying illustrations, though. The planning people were happy, whereas the radiologists were not. The company that supplies the system for radiology is not prepared to explain how its system is constructed, so that it is impossible to make an application to link those two systems. And I’m not going to tell a trainee: “You take care of that.” Those packages are just too big and complex for that.”

When coming into a hospital now, is he checking everywhere to see whether things could be improved? “I occasionally do think: I should do this myself for a while, for free, in a ward where you suspect that things are in a bit of a mess. Maybe things will quiet down after my inaugural lecture, so I can reserve some time for that. And perhaps also to find out even more clearly where I am wrong, for that will undoubtedly happen as well. And I’m quite prepared to admit that. I’m sure, though, that the toolbox meetings from the industry have added value, although things may be more difficult to apply in hospitals due to their complexity and the great(er) variation in problematic cases.”

*The inaugural lecture ‘We make things better!’ about engineering in healthcare will be presented on April 20, 16.00 hours, Blauwe Zaal, Auditorium.*

Text | Gerard Verhoogt  
Photo | Bart van Overbeeke

