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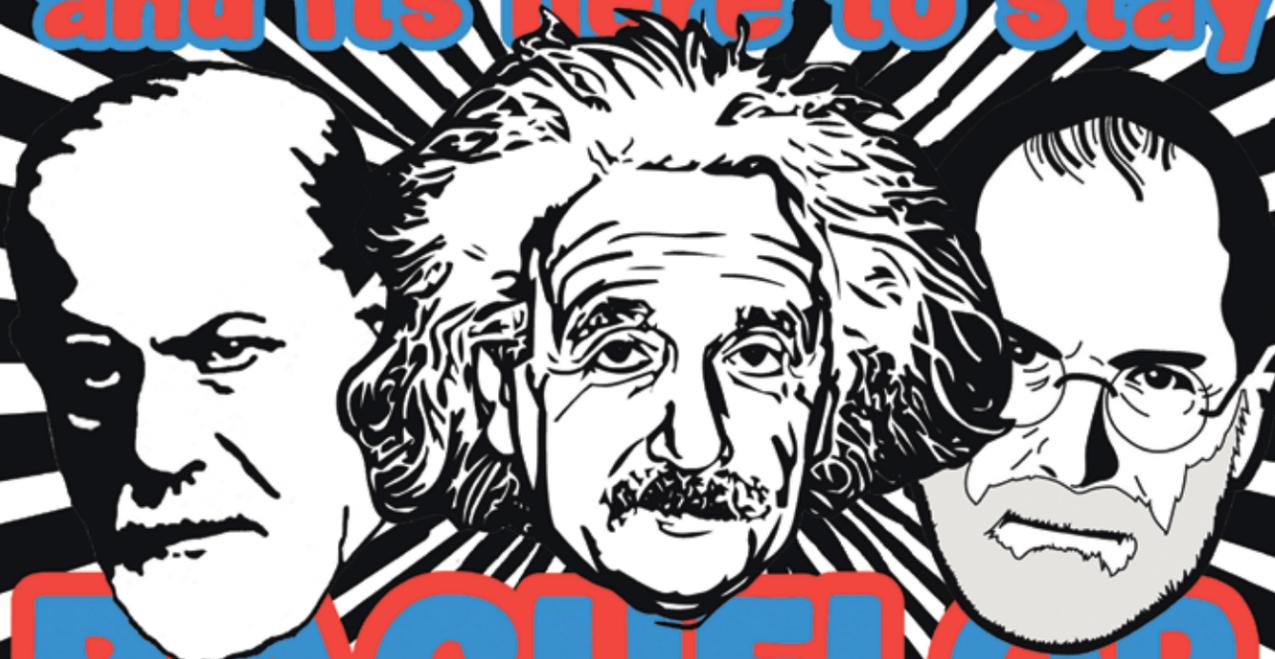
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COLLEGE**

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but science superheroes**

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with a twist

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Demigod of the Bachelor College

It's exactly a week before Lex Lemmens, Dean hopeful of the Bachelor College, will deliver his *urbi et orbi* on the official start of our educational revolution's promotional campaign. During the latest University Council meeting this tireless individual has already been referred to as a demigod. But what kind of demigod will Lemmens turn out to be? Two mythological demigod role models spring to mind: Hercules and Prometheus. Let's start off with the first: Hercules, son of Zeus, ruler of the gods, and

Alkmene, a mortal, was the true he-man of Mount Olympus. To pay for slaying his children, he was required to fulfill twelve labours ranging from killing a many-headed snake and cleaning out the stables of Augean to kidnapping the three-headed hound Cerberus. Feel free to compare above mythological tasks and see which one best fits the one Lemmens is currently facing.

Prometheus, son of Iapetus and Themis, was the one to steal fire from the gods and give it to the people. The literal translation of his name is 'the Forethinker', and Lemmens has been agonizing over his task ever since June of last year. However, things didn't end well for Prometheus: Zeus punished him for thieving and chained him to a rock where an eagle stopped by every day to eat Prometheus' liver, which then grew back again.

Let's hope for Lemmens the Hercules script plays out. To be fair, I think it's the part he deserves.

Biases biased

After a three-month internship it's time for me to return to my world of ultimate soft science: Journalism (in Tilburg!). To me, TU/e has been a kind of brave new world as it's been partly incomprehensible, but mostly wildly interesting. What has struck me most was the student community. Doing interviews I was continually surprised by the spontaneity of these supposed hard-science nerds. It turned out they didn't match my secret biases at all. Take Omar Richardson, for example (page 23 in the Dutch version):



he's been blessed with mathematic genius, but even more so, he's a fun and social guy.

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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?

New TU/e secretary from UvA

February 16, 2012 - Dr. Nicole Ummelen has been appointed TU/e's new secretary. The Executive Board published the news on February 16. Ummelen (1968) used to work at the

University of Amsterdam as director of Academic Affairs. On June 16, she'll be succeeding ir. Harry Roumen, who'll be retiring.

Soon at TU/e: payment by debit card

February 16, 2012 - No cash for your sandwich or bowl of soup? From early March, TU/e cafeterias will allow payment by debit card. On February

15, Eurest catering ordered all payment devices to accept this third method of payments as well, next to chip and cash.

Professor Renz van Luxemburg dies unexpectedly

February 14, 2012 - Prof.ir. Renz van Luxemburg, who at age 61 was appointed professor of Architectural Acoustics in 2010, died of a stroke on February 12. Van Luxemburg was an

authority in the field of acoustics and sound and gained international renown and praise for his prestigious projects that highlighted his expertise.

"Reorganization ST has bad timing and is moving too quickly"

February 13, 2012 - The Departmental Council of Chemical Engineering & Chemistry (ST) thinks it unwise to have major reorganizations in a time of important educational changes.

And it's moving too quickly at that. It shows from ST's provisional reorganizational plans that some seventeen full-time jobs are at stake, including for professor positions.



Photo | Visie via IEC

◀ Flashback

Document in spotlights 1957 versus 2012

It was quite the festivity when Queen Juliana and Prince Bernhard signed the document in light of the opening of the Technische Hogeschool - as it was still called back then- in the Eindhoven Philips Schouwburg theater on 19 September 1957.

On February 9 last, there was another celebration when the same parchment document was presented, now fully restored. When Paul Dumay of Restoration studio Dumay in Nuenen (left of the framed document in the recent photo) happened upon the faded signatures he offered to restore the document in all its glory and reframe it.

The result has been presented to the University Club, but that's not where it was put up. Harry Roumen will have the document on display in his room until his retirement. After that, the keepsake is supposed to go to MetaForum. (NS)



Photo | Rien Meulman

≡ Clmn Holiday paradox



Recently, I read the results of this one survey and found out that more than 64% of the Dutch population consider themselves either atheists or non-religious. It surprised me because the Dutch are more than willing to celebrate public holidays that are rooted in religion, such as Christmas, Easter, Pentecost and Ascension Day. However, when I thought of the origins of some modern Kazakh holidays I realized a similar paradox exists.

For example, February 23 is Defender of the Fatherland Day. It was declared by USSR government to celebrate the day the Soviet Army was established. It was later changed into a day celebrating all men, regardless of their affiliation with the military. They're all congratulated by women who show their respect and love. It's still celebrated in Kazakhstan today, although the Soviet Army doesn't exist anymore. Similarly, March 8 celebrates Women's Day, a day for Kazakh men to show their love for their wives, moms, sisters, girlfriends and colleagues by giving warm regards and gifts. Originally, it was established by communists to appreciate Soviet women's contribution to the building of a socialist community. Another holiday that's rooted in communism is celebrated on May 1. Originally, it was meant for 'showing solidarity with workers in Western countries who desperately suffer from capitalists'. Nowadays, it's the Day of People's Unity when Kazakhs demonstrate their tolerance towards ethnical and cultural diversity. Thinking of all those holidays I'm not surprised anymore. Yes, the religious past of the Netherlands affects the current Dutch community just like the communist past of Kazakhstan affects modern Kazakh society. In the end, any holiday is a good reason to meet friends and relatives in order to show your love and respect to them. The origins linger in the background and make a good subject for socio-historical research.

Sultan Imangaliyev, from Kazakhstan, is a student of Systems & Control at the Department of Mechanical Engineering

Prof.dr. Sandro Etalle, professor of Security of Embedded Systems, Department of W&I

Can hackers be kept at bay?

It's hardly surprising for companies to be hacked these days and it seems to be the rule rather than the exception. Last week, both KPN and Philips were targeted. Although the personal data of hundreds of KPN customers turned out to come from the website of Baby-Dump, it proves difficult for major companies to properly protect their sensitive data nonetheless. And last week it was revealed that it's child's play for hackers to crack operating systems of bridges, sluices and pumping stations.

Everything seems to be hackable these days. Does that have to do with security standards, or do hackers get smarter by the minute as well? Can companies stay ahead of hackers? And what can we do to protect our privacy online?

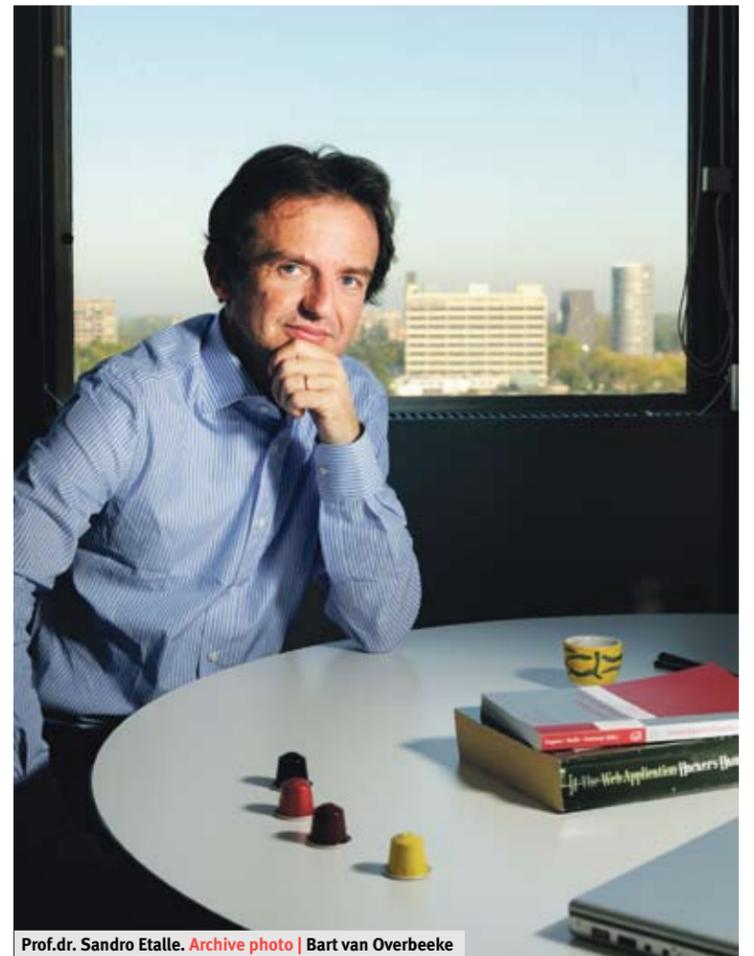
"There's definitely an increase of hacking activity. What we're seeing now is merely a tip of the iceberg", says Sandro Etalle, professor of Security of Embedded Systems at the Department of Mathematics & Computer Science. "Still, websites like KPN's being hacked are not even the most worrying trend. Hackers are professionalizing, it has turned into big business. Because of

that, we've seen a recent rise in company espionage aimed at unlocking important company data, and that's definitely cybercrime. These boys are no amateurs fiddling about from their homes; they have the money and the means to hack a company or institution. Take Stuxnet, which was developed to sabotage the Iranian nuclear program. That operation cost millions. These aren't little guys we're talking about, there's probably an entire government behind it."

"It's becoming more and more clear that so-called critical infrastructure can be a piece of cake to hack. Some sluices haven't even been protected by a proper password, which means anyone may flood the Netherlands just like that. It seems unbelievable, but sluices and bridges date from before the Internet era. The development of computerized controls changed as technology progressed, so new functionalities were added all the time. At some point, all these controls are connected, and that's where your security system can become very vulnerable. It would be unfair to blame the institutions, especially when considering hackers' current level of

professionalism. Anyway, it does result in us inhabiting a world that's not safe."

"It's a cat-and-mouse game, really. Still, since it's so hard to protect yourself, hackers are usually ahead of us. It's the reason we're trying to think of new philosophies to outsmart them. And while we can't do that in every respect, we do manage in some. The 3TU spinoff SecurityMatters is currently working on intrusion detection systems that sound the alarm whenever there's a raid. Our group at TU/e is working on the engineering of safe systems mostly: marketing an infrastructure that's thought out well and has a good encryption key. A lot of research is being done on Internet security in the Netherlands, and the resulting valorization routes lead to innovations that can definitely help us be safe. Unfortunately, there's no way to keep hackers at bay anymore. We can make it hard for them, but there's no way to warrant your safety. The question we should be asking ourselves is this: how much damage can hackers cause - can anyone intrude, or is it just the smart ones? Individuals should be



Prof.dr. Sandro Etalle. Archive photo | Bart van Overbeeke

careful about entering private data but there's often no way around it, even though most of the information is irrelevant anyway. So, that has to stop. On top of that, companies have to make sure their sensitive data isn't lying

around. Compartments can go a long way to that end. These are ways for us to prepare ourselves for the big guys, because sadly the days of adolescent computer fanboys are long gone." (NT)

Transformation old boiler house

The last **2** boilers the university ever used were active until 2005. They were dismantled last year. August of 2010 saw the start of the demolition and restoration of the old boiler house Ceres.

The building measures **25** by **45** meters and is **26** meters high and will be the new home of the Institute of Complex Molecular Systems.

The new accommodation will include **20** office areas and **2** labs for about **45** employees. There will be a central, multi-purpose area for meetings, receptions and lunches featuring **20**-step stairs wide enough to serve as a **10**-row bleacher. The renovation is expected to be completed by July 2012.

The former boiler house will secretly keep its function as power house. **2** large diesel generators the size of ship engines will remain on the ground floor of the building. Should a power outage occur, two emergency generators are on stand-by. (FvO)



Photo | Rien Meulman

Setup Bachelor College requires diplomacy and trust

The preparation of the new bachelor education is halfway. Time to discuss the progress to date with Lex Lemmens, the intended Dean of the Bachelor College to be. Is the timetable still being followed? And what is his view on the sneering remarks that the new education will only lead to an *ir. Light*?
“I dare to say that we are not going to deliver any second-class college kids.”

Six months have passed since Lex Lemmens threw himself into the reform of the bachelor education at TU/e. Six months so full that he has difficulty finding a slot in his agenda to talk to Cursor. The working days stretch until late at night, deep into the weekend. Still, the desired Dean realizes like nobody else that propagating the Bachelor College is one of the factors determining its success. The hectic schedule does not appear to affect him, for that matter. With great élan and infectious enthusiasm he rushes by the results that have meanwhile been achieved. “No, I haven’t had to pull the emergency brake. Preparations are actually running much more smoothly than I expected initially. I have experienced a lot of cooperation, because everybody is aware that changes are necessary. There is the fact that you need to explain to every new group, each new layer that you get to within the organization why we are doing this. First the Deans, then the Program Directors, and now I am gradually working my way down to the teachers who will have to carry everything out, the people arranging the teaching periods, the administrations, the ICT staff.”

What have been your greatest doubts lately?

“The question whether the timetables would match. How many options are there? And will it all fit together? In the Campus 2020 plan it has been assumed that there would be no growth of the student population, whereas we are now faced with the task of growing by fifty percent over the next eight years. At the same time, the fire brigade has forbidden us not to get involved in anything much anymore from the 10th floor of the Hoofdgebouw in the next academic year. I can feel the pinch there. Nevertheless we have made good headway. On February 1 the programs were known and we have passed the point of no return. We are now dealing with the timetables and the first quartile of the new academic year fits, which gives us courage for the rest of the study periods.”

Speaking of costs: how big is the budget for the introduction of the Bachelor College?

“There are funds within 3TU, part of which is earmarked for the Bachelor College. Relatively speaking that amount is far too meager, meaning that it will not suffice to pay for the extra efforts at the departments. It concerns 4.5 million euro for a three-year period. This money will be spent on matters like ICT, communication, the education innovation fund, teacher support and the bureau budget.”

Won't you get stuck financially with all this?

“The reason we are doing this is precisely because we are losing market share year after year and are forced to economize every time. Consequently there are few funds that you can devote to this at the moment to get it all done. The motto being: come on boys, we know that this will imply an extra effort on your part, but we can see no other way. And everybody involved is fully awake to that reality, so the extra hours are put in.”

Is that willingness really there?

“Yes, and growing too. Also because the Executive Board has said that this effort will not harm the careers of teachers. Educational efforts must be valued on a par with research efforts. The tenure tracks have been discussed, which contain a lot of information about research and little about education. If you want to deploy those career paths for educational innovation, you will need to renegotiate the terms of the contracts. To show that you appreciate the efforts. Ever since matters like this have emerged, I have noticed the willingness to put in the extra hours.”

The media have picked up on the new bachelor education in particular as a study cut down to the bone which will make for an easier score. It is alleged to result in a kind of *ir. Light*. And the business community is hammering on indispensable professional knowledge that may be jeopardized.

“I dare to say that not one university will be delivering second-class college kids. To look at ourselves: we have made sure that the final quality of the bachelor program can be higher than it is at present, by allowing for an extensive optional space of 45 credits. If a student decides within those 45 credits to choose far more disciplinary subjects, the depth of the quality will increase. The broadening within those 45 credits also enables an improvement of the quality. So only those who think that Architecture, Building and Planning has less quality than Physics will say that quality is being diluted or reduced here. There may still be some of them with that intuitive inclination, but when you probe them they cannot maintain that the quality of the program will really be weakened. No way. I anticipate, by the way, that eighty percent of students will decide on that deepening, especially in the first year.”

Still, not everybody trusts this. Students of architecture fear the worst, and their fears are shared by the administration of their unit.

“You need to take away that anxiety by showing how you proceed. Students of architecture can fill their

whole optional space with architectural subjects. Nobody is going to stop them in this. We shall even encourage them to do so if that is their career prospect. Also, you need to clarify how the quality will be assured by Examination Boards. In the Bachelor College there will be an Examinations Advisory Board with representatives from all Examination Boards. Together they will discuss the quality of the optional courses. Once they have convinced each other, there’s nothing wrong. And if they agree that the quality is insufficient, that will not be accepted to obtain the diploma.”

“I dare to say that we are not going to deliver any second-class college kids”

So students can forget about a fun combination of subjects?

“Yes, but the combination will be more agreeable. It will link up more with students’ own interests. If you do chemistry, for example, and you want to be an entrepreneur, you can prepare yourself for that properly within the optional space. Then you earmark 15, 30 or even 45 credits within which you can elaborate that plan. The same goes for somebody who wants to focus entirely on process technology. Everybody has a free choice, while the Examination Board will check whether it results in the right combinations.”

What does that imply for the connection between a bachelor study and a master study?

“What it means in particular is that we look at our bachelors in the same way as we look at foreign students and a portion of the higher professional education students entering the master. So we don’t pay attention to the specific subjects they have followed, but just look at what they have done, what they intend to do and make appointments with them about what they need to do during their master program.”

Back to the teachers. They will be coaching students. Has that been accepted by now?

“That is not an easy matter. So far teachers have not worked like that. Although they do coach students in a final project, that is not the same thing as coaching them in the choices that must be made with a view to the professional future. I’m making a tour of the Program Directors and try to keep the spirits up. They will have to select people who like coaching and actually

have the skills required. We have also agreed that the time spent on coaching is regarded as classroom time. This way you avoid taking up extra research time of the teachers. For example, a teacher may now spend eight hundred hours on teaching and next that will be seven hundred hours, plus one hundred hours of coaching. So far this subject has raised the largest number of questions and queries, which means that it has not been embraced fully. We must tread carefully here, but at a pace, for the first intake interviews with the new students are coming up in June. It will lead to better selection at the gate.”

When you are Dean of the Bachelor College, can you take decisions?

Firmly: “No. We have decided in any case to keep working like we are doing now for two more years. Why? Because it works perfectly. The Executive Board has a number of powers and responsibilities in respect of education. It issues a guideline, which has been partly translated into the Education and Examination Regulations (OER). This lays down most of the playing field within which the departments can materialize their own responsibilities. I direct the drafting of the guideline and

will check it. It’s been agreed that I can use the powers of the Board. We’ve examined how this is organized at other universities, such as the American MIT. And it has come out that someone in my position usually needs to rely on persuasiveness and authority, not on powers and things like that. That will work well here also for the time being, because rector Hans van Duijn has decided, also because of the Bachelor College, to stay on for another term. In two years we shall evaluate this structure.”

And what if a new Dean is needed?

“It is clear to me even now that that will then have to be someone from inside, otherwise we’re never going to pull it off. You need to know this place very well indeed. You also need a great amount of diplomatic trust. People will give that more easily if you are from inside. If an outsider is required, you will have to think about mandates and delegating a number of powers of the Executive Board. However, the urge to find a solution together is shared.”

Interview | Frits van Otterdijk
 Illustration | David Ernst



Chemistry with a twist

She comes up with solutions that are different and it's working out great for her: last year, prof.dr.ir. Maaïke Kroon was appointed the chair of Separation Technology at TU/e. On Friday, March 2, the youngest female professor in the Netherlands will be delivering her inaugural speech.

Maaïke Kroon specialized in the art of separation. "My research isn't about chemical reactions converting one chemical into another, but quite literally about separating chemicals" (in Dutch, 'scheikunde' translates as "separation science", ed.). The work of the professor of Separation Technology focuses on so-called affinity separation, for which an agent's affinity is used to selectively extract chemicals from a mixture.

It has shown from the skyrocketing career of the 31-year-old Kroon that there's room for improvement where old-fashioned separation is concerned. After all, she didn't become the youngest female professor of the Netherlands just like that. According to Kroon herself, her success is based on her ability to approach a problem from an unusual perspective: "I think I'm especially good at finding creative solutions".

One of the findings that illustrate Kroon's skill was done several years ago during a stay at the MATGAS research center in Barcelona. She discovered a new way to remove propane from a propane-propene mixture. The latter chemical is the main component in polypropylene (PP), a high-grade plastic of which carpets, jerry cans, and garden chairs are made, for example.

Kroon explains: "Propane and propene are very similar, which is why it's hard to separate them: the propene in the naphtha cracker (a device that creates propene from petroleum, ed.) will always contain some propane. And when you want to create PP from propene, those propane molecules are in the way. Although you can separate these

chemicals through distillation, their boiling points are only five degrees apart, and because of that you can only take very small steps at a time. You need a distillation column of up to ninety meters, so it goes without saying that this separation method is extremely energy-consuming."

There's another way to do it: propene can be removed from a mixture by attaching it to an adsorbent. Still, adsorption is very laborious as well, says Kroon: "Generally, you start out with a mixture containing much more propene than propane, so it doesn't really make sense to adsorb all propene, since you'll have to get it all out of the adsorbent and that process of desorption is, once again, very energy-consuming. The only reason people try to remove the majority component anyway is because propene is more chemically active than propane and therefore attaches to the adsorbent more easily".

Kroon opted for an entirely different approach and created a metal-organic framework from a micro-porous material made from aluminum atoms and organic molecules. By choosing a specific pore size and shape and initiating the right molecular interactions, it's propane that attaches to the material rather than propene.

Kroon found a new way to remove propane from a propane-propene mixture

"Traditionally, everyone was focused on removing the most reactive component, while for me it seemed more logical to remove the minority component", Kroon explains on being the first to come up with the idea. "Even after my publication I haven't seen many articles on this new approach."

There are more mixtures that resemble propene/propane for which Kroon's metal-organic frameworks seem to work. "Every chemical calls for a different pore size and different intermolecular interactions within the framework. So there's no one universal material." Yet there's a universal idea, an approach - remove the minority component - that has become the starting point of several lines of research Kroon has been setting up at TU/e since last summer. In the meantime, she's also supervising five PhD students back at her former employer TUDelft.

A second line of research at Kroon's group concerns the removal of salt from seawater by means of ionic liquids. These liquids, also known as liquid salts, are liquid at room temperature. That's because the ions are quite large and shaped in a way that makes it hard for them to form a grid, unlike say, common salt, which consists of much smaller sodium and chloride ions.

"I think I'm especially good at finding creative solutions"

Kroon: "You could compare the ions of a liquid salt to pears and bananas; they don't stack easily". Similar molecules dissolve well ('like dissolves like'), and so sea salt dissolves well in these liquid salts, Kroon says. "The great part is that some liquid salts, the ions of which have long, lipid-like tails, don't dissolve well in water at all." If water comes into contact with an ionic liquid, the salt from the seawater dissolves in the ionic liquid, and fresh water remains. That separation process is called extraction. "The only problem we still have to tackle is how to get the sea salt out of the ionic liquid for recycling. We're currently researching the best way to do that." Above desalination process is another example of Kroon idiosyncratic mind: traditionally, seawater is desalinated by evaporation or by pumping the water through a membrane. But because seawater is over 96 percent water and only a few percent salt, it makes much more sense to remove the salt from the water than vice versa, Kroon thinks: "Removing or even evaporating all that water's silly, really".

Another important focus of Kroon's research is biorefinery. Above liquid salts are traditionally extracted from petroleum, but Kroon consciously tries to use ionic liquids from biomass more and more often. "Plants contain many different ions, such as residual groups of malic acid, for example. I want to use those as solvents for biomass conversion and separation processes. Think of separating proteins from sugars, or removing toxic components from a plant so it becomes edible. We can even extract starch using these solvents that occur in biomass naturally. Isn't that just fantastic?" (T)



Photo | Rien Meulman