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# Cursor

December 1, 2011 | year 54



Biweekly magazine of the Eindhoven University of Technology  
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www.tue.nl/cursor

**Print**  
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**Advertisement**  
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### Cut the crap and get to work

Next year will see some serious budget cuts for departments as well as services. It will undoubtedly result in many vacancies, due to either retirement or early leave, that won't be

filled. Thankfully, those left behind will be kept quite busy: apart from the work load of colleagues leaving, there's the imminent Bachelor College. Heaps of energy have been put into that already, but we'll be working even harder in 2012. Last Monday, personnel party PUR tried to touch on the issue of 'work load' with the Executive Board. What's cooking with the board chefs? It turns out the Board doesn't think they're the ones to solve the problem. Board member Jo van Ham feels the immediate supervisors are responsible. The sous chefs, so to speak. Even Rector Hans van Duijn, who was appropriately wearing suspenders, and in my mind had rolled-up sleeves too, kept stressing it was going to be a tough period. The title of this article sums up what this boils down to. Just so there won't be any misunderstandings.

### Sint

At Cursor it's a simple fact, to journalists it's quite correct That incidentally some freedom's great, like when you and Sint have a date Two-faced is the saintly man, yet speak only one face can Then interpretation is the thing, and you're allowed creative quoting Page four you'll see is quite a sight, hopefully reading it will bring delight It's an interview with TU/e's children's friend, forgetting his university he can't For the record: no one's lying. But look at these men - just keep eyeing Then you'll understand the article's scope,



so nothing has to be rectified we hope **More on page 4-5 in the Dutch section**

**TU/e** Technische Universiteit  
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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?

### TU/e launches New Energy House

November 30, 2011 – Yesterday, November 30, TU/e presented the New Energy House (NEH) during the Smart Energy Regions Conference. TU/e launched the initiative to transform the energy issue in the built environment into business opportunities.

Over the next six years, the province of Noord-Brabant will contribute six million euro to NEH, businesses will provide 3,5 million, and TU/e will participate by sponsoring 660,000 euro.

### AMIGO unveiled at European Robotics Week

November 29, 2011 - This week saw the start of the first-ever European Robotics Week. TU/e is present, too: from Thursday, December 1, Tech United will make available the full

blueprint of their service robot AMIGO as Robotic Open Platform (ROP). On Friday, December 2, there's a webcast on the RoboEarth project, including an interactive workshop.

### The Netherlands still paying for foreign student

November 23, 2011 - State Secretary Halbe Zijlstra doesn't mind having a chat with his foreign colleagues about

the price tag of foreign students. Still, he doesn't think the Netherlands will be reimbursed any time soon.

### Plan psychological and biomedical majors approved

November 23, 2011 - Last week, the Executive Board approved the proposal to start a new major, 'Psychology and Technology', as part of the bachelor programme of Innovation Sciences.

There'll also be a new major for the bachelor program of Biomedical Engineering. Both majors will be part of the new Bachelor College and up and running in September of 2012.



## ◀ Flashback

### Student protests 1969 versus 2011

The Groep-één activists received a warm welcome last Monday, November 21. They presented a critical Sinterklaas rhyme and a bag of chocolate coins by means of protest against the proposed cutbacks on the annual grant budget. Executive Board member Jo van Ham and University Secretary Harry Roumen accept the 'gifts' with a smile and sincere interest.

In 1969, things were very different. On October 23, several students invaded the -now gone- administrator's office in the Hoofdgebouw where the administrators (similar to members of the Board of Trustees) were in a meeting with Rector Van Trier at the time. The students demanded such meetings to be public and refused to leave the room. The occupation did not end well: 'A group of students that disagreed with the occupants finally cleared the room rather violently', says TH berichten, Cursor's predecessor. (NS)



Photo | IEC archive

## ≡ Clmn Dutch life mathematics



I was confused when I first saw 'OP=OP' on a poster in a supermarket. I thought: "What a weird expression. Obviously, X is always equal to X". Later, I came to understand that it presents a very important formula reflecting a Dutch approach to time. However, let's take a step back to my past experience first. I must confess that before coming to Eindhoven I wasn't very organized at all. I used to be late or arrived at meetings at the very last minute. After a few weeks of living here I realized that if I was to continue in the same manner I would never be successful. This simple idea came to me after a rather painful time collision. One day I

missed my bus by one minute and had to wait for the next one for half an hour. Subsequently, I missed the train and had to wait for the next one, which involved a transfer. Eventually, I was going to be late for an important appointment and had to cancel. The next possible date was two weeks away. So this one lazy minute in the morning cost me two weeks of undesired delay and seriously affected my plans. I learnt to appreciate time the hard way. Now, returning to 'OP=OP', I would like to extend its regular meaning to a more complex one. In fact, as a mathematician, I would rewrite it as a functional equation  $OP_1(t)=OP_2(t)$  where 't' refers to time. That way it may be interpreted as 'effectively utilize every minute of your life before it's gone misused'. This little bit of Dutch education won't be reflected in my diploma supplement but I don't care, because some life lessons are more important than formal courses and grades.

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

## Vox Academici

Prof.dr.ir. Gerard de Haan, professor of Imaging for Multimedia Systems

# Will the electronic lens replace the computer screen?

Projecting directions on your lens while driving, secretly checking the Internet in your eye during an exam - it may all become reality with the new contact lens with built-in computer screen. Last week, American and Finnish researchers published promising results, but how does an electronic contact work?

Are the uses that are expected from the lens realistic? And is the idea safe for the human eye and the visual faculty?

The American and Finnish researchers have managed to create a contact with a built-in LED that lights up whenever a wireless signal is received. Tests conducted in rabbit's eyes didn't show any negative side effects. This rudimentary system could be the first step towards a comfortable screen lens. "Although the experimental lens has a mere one-pixel display, the great thing of this study is that there are useful applications already in this stage", says Gerard de Haan, part-time professor at the Electric Systems group (EE) as well as image/video processing expert at Philips. "Imagine the hard-of-hearing receiving a light signal for dangerous

situations behind them. And even for navigation only a few pixels are needed for directions. I do think the projection lens can be useful for the near future. Still, for the lens to replace computer screens altogether, much more time is needed."

"Basically, the system is nothing but a synthetic lens containing a circular antenna with a group of pixels in its center, or in a LED in this case. When worn on the eye, the display is too small to notice, meaning you won't focus on it. It's like a speck on your glasses: it sits there unnoticed; it may cause a slight lack of focus, but that's all. By adding a tiny Fresnel lens to each pixel (a special lens used for lighthouses, navigation light and in many SLR viewfinders, ed.) they are in fact focused on the retina. According to calculations the display can carry several hundred pixels-with-lenses without influencing our vision. And that would already make a useful screen."

"A possible downside to the screen lens is the energy supply. The antenna provides enough energy to feed the

chip, over 100µW. That's enough for one pixel and control. But will it be enough for a greater number of pixels? I'm not entirely sure. For the energy to reach the small system, the antenna can only be two centimeters from the lens, and that's not a lot. After all, the antenna is not out in the open, but lodged in the vitreous. Because of that salty liquid in the eye, the antenna's efficiency diminishes. But you can't change the fact a contact is on the eye."

"A stronger transmitter isn't an option, because we have to take into account the overall heat development. Any more energy could damage the eye and the brain. In the current design, researchers closely followed the existing guidelines; the safety norm is easily met. Rabbits can now wear the contacts for forty minutes without any negative side effects, which is why I don't expect any problems for humans. And as far as the impact on the total visual system is concerned, the way people respond to this artificial, extra information in the eye: I'm confident there's already a large amount of information on that from the



Prof.dr.ir. Gerard de Haan. Photo | Bart van Overbeeke

world of augmented reality. I think especially short-term use is completely safe."

"Scientifically speaking, the screen lens isn't spectacular at all. It's a nifty functionality, that's for sure. But I think this design represents something else. It's a wonderful example of how various disciplines at a university can success-

fully cooperate, because that rarely happens. Precision mechanics, high-frequency technology for the antenna design, semiconductor technology for chip and LED, optics for the Fresnel lens design – an impressive number of departments have worked on this design, and I think that's marvelous. TU/e should learn from that." (NT)

## First paperless TU/e dissertation in App Store

**651,2 megabytes** is the size of the iPad app containing PhD student Ambra Trotto's dissertation, which should result in the first TU/e PhD graduation with a paper-free dissertation on December 12

**307 pages** is the paper version she had to hand in at the Bureau Promoties en Plechtigheden (Graduations and Ceremonies) anyway

**8 workshops** were needed for her to shape a manifesto that calls for the realization of a better world through design

**22 nationalities** were involved in the project called 'Rights Through Making'

Prior to Trotto, only **1 Dutch researcher**, from the Rotterdam Erasmus University, had ever presented a dissertation in the form of a web application.

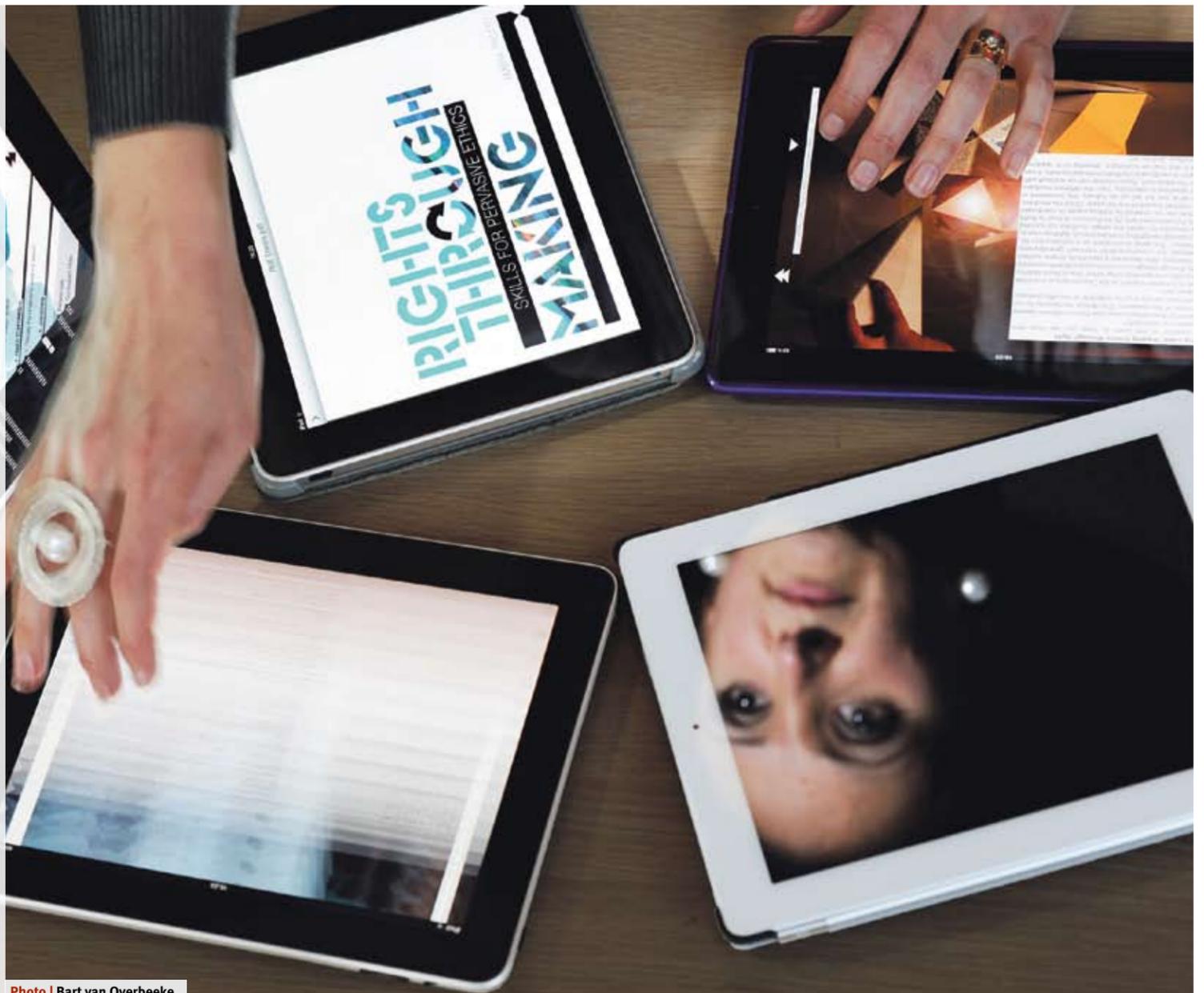


Photo | Bart van Overbeeke

# “Keep the science service complete”

Interview | HOP  
Archive photo | Rien Meulman

**While a distinct profile is valuable, universities should not focus only on their strengths. Together they should uphold all disciplines, according to scientist and KNAW president Robbert Dijkgraaf. Before long he will move from the Netherlands to accept a dream job as director at the Institute for Advanced Study in Princeton, once the workplace of Einstein.**

*You studied physics and mathematics, yet in the meanwhile you also took up painting at the Gerrit Rietveld Academy. In these days of high tuition fees for long-term students and second study programs, could you have developed to become the person you are now?*

“Let’s be honest: it is getting more and more difficult. In this day and age I might have decided to attend a broad program like the one offered at the university college. We sometimes seem to forget that there is a certain rhythm in the way students develop. In the Netherlands we pretend that secondary school is the period when you can spread your wings, after which when you turn eighteen you go and study with one specific goal in mind. When I was eighteen, it so happened that this was applicable to me, but when I turned twenty I began to feel an itch again. Don’t underestimate the human spirit. Occasionally it may appear to an outsider as if someone has lost the way, when all he or she is doing is looking around. If you’re up to it, it should be possible to roam in total freedom. Students themselves also need to understand that they can always go in all directions. Some of them think that they’re boarding a high-speed train. They’re starting on an economics program and when they’re fifty they are still economists. It is more of a slow train, however. It calls at many stations: you can always change. That’s why it’s useful to distinguish clearly between Bachelor and Master, so that students are forced to keep reflecting on their choices.”

*If State Secretary for Education Zijlstra gets what he wants, a portion of the education budget will be earmarked to finance quality. Is that a good idea?*

“You should guard against too narrow a view of quality. An institute may excel with a university of applied sciences degree program for people at a lower level, who would otherwise drop out of the system. Or through cooperation with the business community. Or with a Master’s program for the top-notch students. You need to take such diversity into account. Yet it is important that there should be a certain competitive element in education. For scientific research the role of NWO (the Netherlands Organization for Scientific Research) has been

very important. There you need to fight to obtain funds and it has certainly improved the quality of science. A similar thing could well be done in education too. You do have to be honest, though: this can only be done with extra resources.”

## “Don’t underestimate the human spirit”

*The VVD (liberal party) then always says: if you can distribute new funds wisely, you can also do this with the existing budget.*

“You should not build a mountain by digging a hole somewhere else. That hole cannot be dug out just like that. You would be unleashing too much negative energy. And if you really decide on a profile, we are talking about entire research groups and parts of curriculums that are switched to other institutes. The cost estimates of alterations are invariably too optimistic in their prognoses.”

*The government also wants university research to acquire a more distinct profile, under the motto ‘focus and mass’. What is your greatest concern in this respect?*

“That white spots might develop on the map of scientific research. If all universities make choices and only wish to do what they’re good at, aren’t we losing any disciplines then? Take astronomy, a small specialist field which is close to my heart. It is scattered over various universities. In Utrecht they decided to discard astronomy. It would be a pity if the other universities made the same choice. If a university drops a beautiful cup, then that’s regrettable, but it’s only one cup. In fact, however, it means that the service is not complete any longer. Who worries about the whole science service? That task lies with the KNAW and should be the concern of The Hague. So the question is not only: how are the separate institutes doing? It is also: how is the whole field of science doing?”

*So if a Department becomes too small, it should merge with a sister Department at another institute?*

“Not always. It is necessary, for example, to offer a study like maths at different universities, even though it may be a small program. Many students first decide on a certain city and only choose their study program after that. So the number of maths students would drop dramatically if they all had to study in the same city. Besides, a discipline like maths has a serving function: other sciences benefit when there are good mathematicians affiliated with a university. This is also true for certain humanities, of course. A proper university should provide certain study programs, even if hardly anybody enrolled in them.”

*Dutch scientists are performing remarkably well. Why should we adjust anything at all?*

“Think of the Queen of Hearts from Alice in Wonderland: she has to keep running to stay in her place. Flows of subsidies tend to change. Europe is becoming more and more important and may well decide to double its budget. There will be more large-scale subsidies for big projects. You must take that into account. It is true, though, that I tend to react with some measure of reserve. We are the ninth country globally in the number of citations in science. For a small country like the Netherlands that is enormous. Our scientists are nearly the most productive in the world; only Switzerland is above us. We don’t need to make distinct choices time and again. The offer can stay complete alright.”

*You are pleading for extra funds for science, yet the Dutch scientific world is doing well paradoxically enough, even though resources are scarce.*

“In actual fact there is no paradox. I’ve read that Dutch physicists are on average the best in the world, when you consider the impact of their research. However, there aren’t that many Dutch physicists. Only the very best ones become professors, for there are only a few chairs to be divided. I wouldn’t mind if the Netherlands dropped to the second place in that respect, if it meant that we would have a couple of extra professors of physics. Moreover, you shouldn’t forget that today’s good scientists are in the middle of their careers. They’ve had a run-up of twenty years. You might compare that to the stars we actually see twinkling: it is the light of decades ago. I do worry. When I see what today’s options are for young people, I predict that Dutch science will definitely not grow.”



## Who is Dijkgraaf?

Robbert Dijkgraaf (1960) studied physics and mathematics in Utrecht. Between whiles he temporarily switched to the Gerrit Rietveld Academy. Later he obtained a PhD cum laude at Nobel Prize winner Gerard ’t Hooft and engrossed himself in string theory: the school in theoretical physics which postulates that all phenomena (light, energy, matter) have the same basis at the minutest level, just like strings in various excitations produce different sounds. He was visiting professor at Harvard, Berkeley and Kyoto and at the MIT, among other places. He worked at Princeton for a while and is now university professor at the University of Amsterdam (UvA). He will not complete his second term as president of the KNAW (Royal Netherlands Academy of Arts and Sciences). He is to become director of the Institute for Advanced Study in Princeton, where he was active during two earlier stints. He will continue as professor at the UvA and as co-chairman of the international association of scientific academies: the InterAcademy Council. In 2003 he was awarded the highest Dutch scientific distinction: the Spinoza Prize. The money coming with the prize he used to finance [www.proefjes.nl](http://www.proefjes.nl), a website with everyday tests for children from eight years old. He is broadly commended for the zeal he displays in making science accessible to outsiders.

# In search of well-trodden paths

**With an h-index of 85, prof.dr.ir. Wil van der Aalst is the most cited computer scientist of the Netherlands, and belongs to Europe's top 3. And TU/e as a whole is profiting from that: in the Shanghai Ranking for universities, TU/e climbed some seventy spots, all thanks to Van der Aalst's new status as 'ISI Highly-Cited Researcher'. And only recently, the professor of Architecture of Information Systems was the first one ever at TU/e to be elected as a member of Academia Europaea, the European equivalent of KNAW.**

The much-cited Van der Aalst is 'home-grown': He graduated and received his PhD in Eindhoven, and has spent most of his working life at TU/e. He's currently studying distributed processes, in which several people or machines influence each other during a process - think of handling a benefit application, an insurance application, or hiring a new employee. "Our research group has three main focuses," says Van der Aalst. "First, there's the mathematical description of process models. TU/e has been doing exceptionally well in that department for

years, and until the mid nineties it's what I was engaged in myself most of the time. After that, my attention shifted to information systems based on these formal process models; you could say it's the engineering aspect of the same design. You're talking work flow systems created by companies like IBM and Oracle, or SAP company software that's used by nearly all major companies."

About ten years ago, Van der Aalst dived into the area for which he and his research group Architecture of Information Systems (AIS) are currently

being applauded for: process mining - the analysis of digital information flows recorded in event logs. Think electronic payments, orders, e-mails, tests in hospitals and exam efforts at TU/e.

**"Process mining can also uncover fraud or favoritism"**

These information flows show how company processes work in practice and they can be used to improve these processes. "When the dataflow started up, I seized the opportunity to empirically test the theories on company processes. Until then I had only been working with model-based analyses of information systems, and to be honest, I thought they were too subjective. Process mining enables you to see whether process models work properly, and whether people stick to them in practice."

Because according to Van der Aalst, that's the pivot: in many cases, company processes don't run as planned at all. "Based on the data it's possible to form an empirical model that does in fact describe the actual processes. You can demonstrate the differences between what organizations say they do and what they do in reality." He takes out a copy of the book 'Process Mining: Discovery, Conformance and Enhancement of Business Processes' that was published earlier this year and is the very first of its kind. The diagram shows the process of one of the dozens of municipalities Van der Aalst carried out his analyses. Municipalities are known for their high level of conformance - they tend to follow the rules. "Still, it shows that in some respects the actual process differs from the desired process. Cases like these can be analyzed by mapping their social networks in order to unveil fraud or favoritism, for example. Process mining is not exclusively explanatory; it can also be used for checking."

Should the process model that's reconstructed by means of process mining not correspond to the way the process is constructed in theory, it can mean two things, according to Van der Aalst: either reality is faulty - people don't do what they're supposed to - or the procedure's faulty, which may be a reason to change the formal processes based on reality. "It's similar to the desire lanes you see here on campus. They're there because the official route takes you to the exit via a detour. Dwight Eisenhower, who later became president of the United States, had a wonderful solution to that when he had Columbia University campus built. At first, they simply didn't lay any foot paths. It was only after a year that they checked at what locations the ground was trodden bare and that's where they laid the paths."

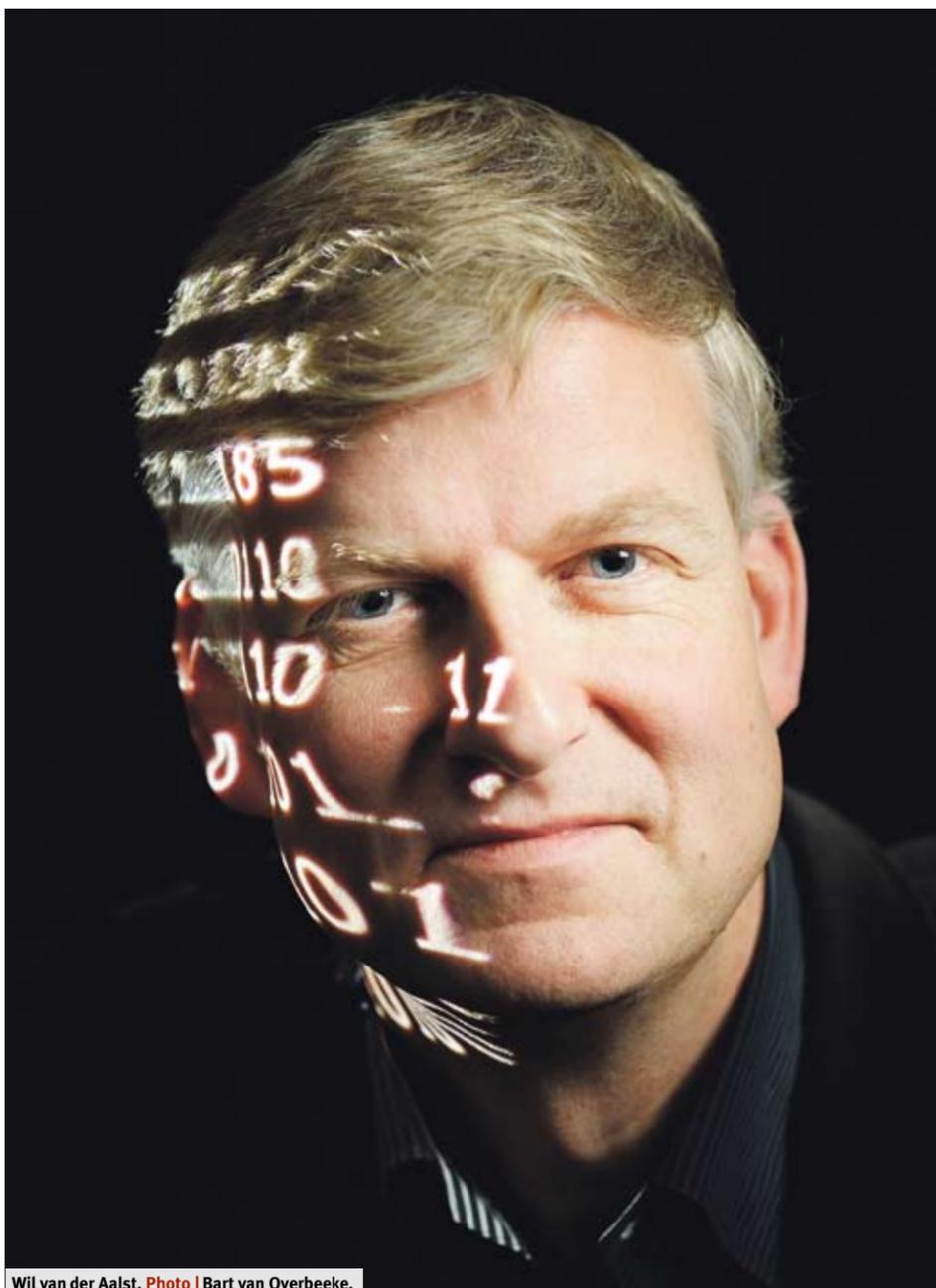
Process mining has rapidly become the third research arm of the AIS group, and it's one that's still maturing.

With his colleagues, 45-year-old Van der Aalst developed open-source software package ProM, which is currently being used by researchers all over the globe. So far, hundreds of tools have been developed for the package by researchers everywhere. "In our field, ProM is by far the most advanced software out there. And because it's open source, any researcher can build on existing technology, and so their contribution can be implemented immediately."

Van der Aalst has also set up two modest spin-offs, Fluxicon and Futura Process Intelligence. The first is a developer of commercial software that enables organizations to analyze their own processes. "The focus here is on user-friendliness", says Van der Aalst. He considers ProM more of a tool for experts, "a kind of Unix" that not just anyone can work with. Future Process Intelligence, the other startup, has been around for a while longer and has been implemented in the Pallas Athena software that's being used by over eighty percent of municipalities right now, for instance. "In five years, I expect there to be at least one hundred commercial tools using our techniques."

**"I consider the h-index of 85 my scientific age"**

Last month, Van der Aalst was elected as a member of Academia Europaea, and he used to hold a chair at the Royal Holland Society of Sciences and Humanities. What's the secret to his success? "I think my strength lies in the fact that I don't linger until a topic has been flogged to death. As soon as I spot new developments, then that's the direction I take and I make sure I stay the course, even when the road is bumpy." (TJ)



Wil van der Aalst. Photo | Bart van Overbeeke.

## The h-index

The h-index, or Hirsch-index, is a way to measure the impact of a scientist's scientific output. The index was proposed in 2005 by physician Jorge E. Hirsch. An h-index of 85 like Van der Aalst's indicates he's published 85 articles that have all been cited at least 85 times. Using the h-index as an indicator for citation impact prevents a researcher from scoring very high with only a single much-cited publication, as well as having someone collect citations by publishing many mediocre articles. The h-index has become quite influential rather quickly, witness the Shanghai ranking for universities. Van der Aalst: "I consider the h-index my scientific age. I can already retire, but my articles on process mining are still too recent to have had any real impact on the index; we'll reap a profit from those in ten years." It seems there's still more to come for the researcher - who's actually 45 years old, so not yet elderly at all.