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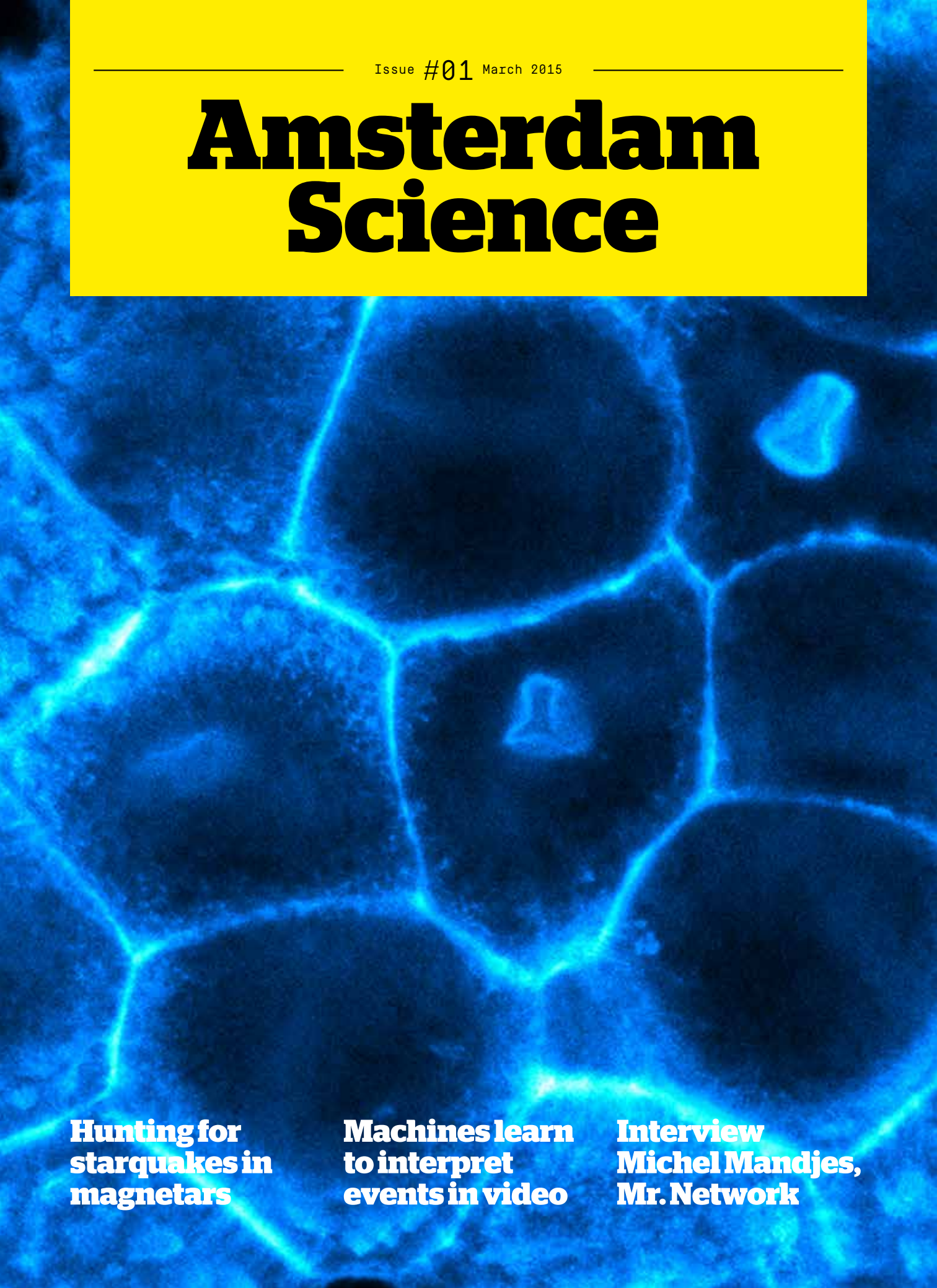
Amsterdam Science



Hunting for starquakes in magnetars

Machines learn to interpret events in video

Interview Michel Mandjes, Mr. Network

WELCOME TO AMSTERDAM SCIENCE !

Welcome to the very first edition of the magazine *Amsterdam Science*. Why this combination? Amsterdam has a history as a city of scholars. With two universities, two academic medical centres and more than a dozen research institutes and national research centres, the Dutch capital offers a unique environment for all those captivated by nature and the science developed to describe and understand it.

In an effort to make this science accessible to all we decided to make a popular science magazine for Amsterdam. Almost a year ago the first steps were taken: organisation of an editorial board, financial support, developing a format with our designers. Although this initiative was born in the Faculty of Science of the University of Amsterdam, the editors of *AmSci* soon realised that the many interactions we have with the whole Amsterdam science community called for a wider scope. Scientists from the VU University Amsterdam and CWI were welcomed to the editorial board and the team behind the magazine you are now reading took form. We cover all research areas being pursued in Amsterdam: mathematics, chemistry, astronomy, physics, biological and biomedical sciences, health science, ecology, earth and environmental sciences, forensic science, computer science and logic. The core of the magazine is formed by articles from Master's and PhD students, as well as from postdocs and senior researchers. The goal is the same – that of communicating the newest and most interesting science taking place in Amsterdam to a broad audience. This is an opportunity to show each other, and the rest of the world, the enormous creativity, quality, diversity and enthusiasm that characterises the Amsterdam science community. Each issue also carries an in-depth interview, a column and information for and from alumni.

We are proud of the first edition. It has been quite an adventure, creating a magazine starting from scratch, and we hope you enjoy browsing through some of the best science Amsterdam has to offer. We will have reached our goal if this first issue stimulates you to participate and to submit a contribution via our website: www.amsterdamscience.org. If you have any remarks about the content of the magazine or if you have suggestions for interesting subjects, then please contact us (magazine-science@uva.nl). Our special thanks goes to all those who have contributed articles and other material for the inaugural issue, to the other members of the editorial board and to our highly organised and irrepressibly cheerful magazine manager, Heleen Verlinde.
Finally, we wish you an inspiring and informative read.

On behalf of the Editors-in-Chief,
Michel Haring

ABOUT THE COVER IMAGE:
The earliest cell cleavage stages in an embryo of the sea anemone *Nematostella vectensis*. Individual cells are made visible by injecting RNA that encodes a fluorescent fusion protein. More information on pag. 5.

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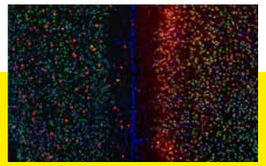

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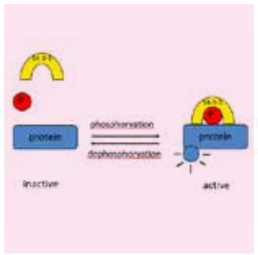
PAULA VAN KLEEFF

PAULA VAN KLEEFF obtained her PhD in Biology from the VU University Amsterdam in September 2014. She is currently working as a postdoc in the Plant Physiology group at the University of Amsterdam.

Guardian proteins protect plant's stress sensors



→ Plants grow wherever their seeds have landed. From that point on, they do not have the ability to migrate to a more friendly environment, so they must be able to adjust to their surroundings. This requires a mechanism that perceives external conditions, referred to as stress, and then switches on – often multi-step – signalling pathways leading to adaptations on the physiological level.

Often this is achieved by modification of proteins, for example by attachment of a phosphate group to specific amino acids; a process known as phosphorylation. This process changes the properties of these proteins such as their activity. To maintain a stress signal long enough, the signalling protein has to be protected from enzymes that would remove the phosphate group via dephosphorylation. Eukaryotic cells have proteins, called 14-3-3, that are able to bind to the phosphate groups on other proteins, thus stabilizing and protecting their signalling status. In some ways, the 14-3-3 proteins are guardians of signalling processes. It is therefore not surprising that plants carry a collection of genes that encode for these guardian proteins. The model plant species Arabidopsis has thirteen of such genes.

So what happens if we knock out these guardians? In order to study the role of the 14-3-3 guardian proteins, we created a collection of 24 mutant plant lines in which different combinations of the 14-3-3 genes were inactivated (two, three or four genes at a time). We then studied plant growth and development for all these mutant lines. The results indicated that specific combinations of different 14-3-3 proteins are required for proper root growth, meaning that not all 14-3-3 genes have the same function2. One mutant that had four inactive 14-3-3 proteins, did not flower under short-day conditions, while other mutants flowered early. These observations allow us to conclude that specific 14-3-3 proteins are important in either root or shoot growth. In on-going work, their role in other processes like stress responses or defence against pathogens is now being assessed in a similar way. Ω

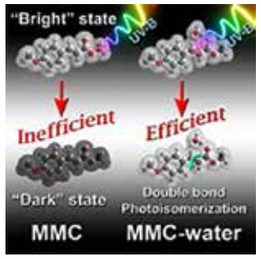
References:
1) Van Kleeff, P.J.M. (2014). Arabidopsis Non-Epsilon 14-3-3's: Analysis of Their Mutants and Targets. http://dare.ubvu.vu.nl/handle/1871/51554

2) Van Kleeff, P.J.M., Jaspert, N., Li, K.W., Rauch, C., Oecking, C. and de Boer, A.H. (2014). Higher order Arabidopsis 14-3-3 mutants show 14-3-3 involvement in primary root growth both under control and abiotic stress conditions. J. Exp. Bot. 65: 5877-5888

ERIC TAN

ERIC TAN was awarded a PhD from the University of Amsterdam on 25 November 2014 for research conducted at the Van 't Hoff Institute for Molecular Sciences (HIMS).

Better sunscreen? Just add water!



→ Sunscreens are something that we all use; here comes the sun and along comes the UV radiation. Exposure to UV radiation can cause sunburn and even skin cancer. Ideally, the chemicals in a sunscreen convert this harmful radiation to (harmless) heat on a picosecond timescale. However, prolonged exposure of the sunscreen still leads to harmful reactions. Why this occurs is still a big mystery – after all, what can happen on a timescale of picoseconds?

With this question in mind, we used high-resolution spectroscopy to demystify the photoprotection mechanism of sunscreens by studying the octyl methoxycinnamate (OMC) molecule which is widely used as a UV-B filter. This molecule is believed to absorb the UV radiation and go into a 'bright' excited state thus using up the energetic radiation before it reaches our skin. Then, in a step where it falls back to the original ground state, it releases this UV radiation as heat. Contrary to this expectation we found[1] out that the OMC molecule makes a small detour after absorbing the UV radiation where it goes into a 'dark state'. The amount of time that it spends in this intermediate state is actually more than ten thousand times longer than the desirable 'bright state' which in turn makes it almost a million times less effective than nature's own UV filter, that is, melanin. Moreover, this extended period in the dark state can also lead to formation of unwanted harmful photoproducts.

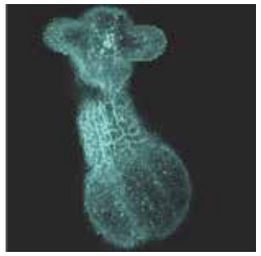
Additionally, we also found a plausible solution to this problem by using a similar molecule called methyl-4-methoxycinnmate (MMC). Using a technique called microsolvation, the MMC molecule was attached to one molecule of water, and used as a UV filter. We found that under these conditions the bottleneck created by the unwanted 'dark' state was no longer present, and that the MMC was more efficient than the widely used OMC molecule. Thus, the answer to better sunscreens might lie in just adding water! For practical applications, such conditions can easily be created by dissolving the UV-B filter molecules in reverse micelles of which the outside is hydrophobic and the inside hydrophilic. Ω

References:
1) Tan, R.W., Hilbers, M. and Buma, W.J. (2014). 'Excited state dynamics of isolated and microsolvated cinnamate-based UV-B sunscreens', J. Phys. Chem. Lett. 5, 2464–2468

ADA DATTOLI

ADA DATTOLI performed her doctoral research in the section of Molecular Cytology at the Swammerdam Institute for Life Sciences of the University of Amsterdam.

Lighting up animal development



↑ Figure
A juvenile Nematostella polyp (about 5 mm in size) lights up under the fluorescent microscope. The brightest signal is visible in an area where cells contract as the animal moves around.

Photo credit:
A. Dattoli

→ The sea anemone *Nematostella vectensis* looks deceptively simple, but it uses many of the same regulatory genes as more complex multicellular animals, including humans. This is because humans and sea anemones share a common ancestor, which lived more than 700 million years ago. By studying our closest living relatives, such as *Nematostella*, scientists hope to understand how humans, and other complex animals, have evolved and how developmental processes are organized.

Our group focuses on early embryonic development in Nematostella. To study this dynamic biological process we have developed a novel live imaging technique: by injecting RNA that encodes a fluorescent fusion protein, we are able to specifically visualize the actin and tubulin proteins in the cells that make up the 'cellular skeleton' of an animal. These proteins play an important role in maintaining the structural integrity network of the cell.

This approach has allowed us to image different stages of *Nematostella* development, from the earliest cell cleavage events to the adult polyp. By literally making the skeleton of a subset of cells light up, we can follow individual cells as they divide, yielding sharper and more informative images than ever before. For example, we found that cell division in *Nematostella* occurs through a mechanism that involves nuclear envelope breakdown, in a way that is very similar to the process that is employed in higher vertebrates. As some of these fluorescent proteins are stable in vivo for up to two months, we can still observe organ boundary dynamics and muscular contractions in moving adult anemones.

The technique described in our recent publication can be used to answer important questions beyond evolutionary biology, too: other types of fluorescent fusion proteins could be used to reveal how *Nematostella* succeeds in efficiently regenerating damaged tissues, a fundamental research question in stem cell biology. Needless to say, we expect to uncover many more exciting details about cellular mechanics in these tiny animals in the future. Ω

References:
Link to publication:
http://www.ncbi.nlm.nih.gov/pubmed/25433655
DuBuc, T.Q., Dattoli, A., Babonis, L.S., Salinas-Saavedra, M., Röttinger, E., Martindale, M.Q. and Postma, M. (2014) 'In vivo imaging of Nematostella vectensis embryogenesis and late development using fluorescent probes'. BMC Cell Biol. 15(1): 44

RIK VAN LIESHOUT

RIK VAN LIESHOUT is PhD student at the Anton Pannekoek Institute for Astronomy at the University of Amsterdam.

The comet-like tails of evaporating planets

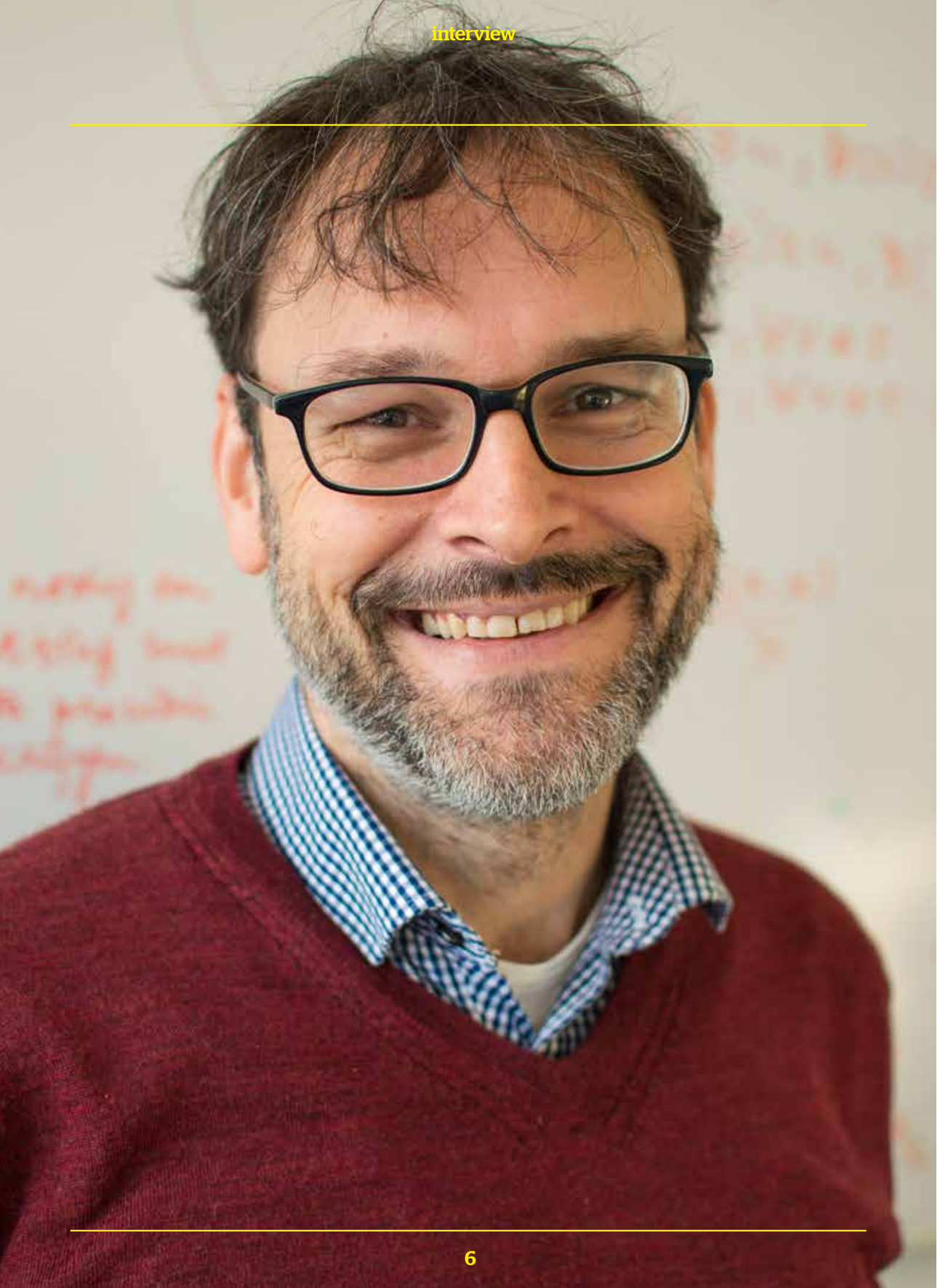
Photo credit:
NASA/JPL-Caltech

→ The interior composition of planets orbiting other stars than our own Sun provides a valuable constraint for theories of planet formation and evolution. However, this knowledge is currently very limited. The recent discovery of two peculiar planets, known by their catalogue numbers KIC 12557548b and KOI-2700b, may change this. These planets orbit so close to their stars that the stellar radiation heats them up to the point of evaporation. The evaporation peels off their outer layers, leading to the ejection of large amounts of dust, which form a tail like that of a comet.

These discoveries were made using the Kepler satellite, a space telescope monitoring thousands of stars for periodic dips in brightness. These dips indicate a planet passing in front of the star, temporarily blocking some of the starlight. Because planets are almost perfect spheres, the dips caused by planets tend to be symmetric in time. The dips made by KIC 12557548b and KOI-2700b, however, are asymmetric because their dusty tails block part of the starlight.

By analysing the exact shapes of the dips in starlight, we were able to measure the tail length and investigate how this constrains the composition of the dust in the tail. As dust grains drift away from the planet, they evaporate. The pace of this process depends on the material properties of the dust: volatile materials evaporate quickly and produce short tails, while refractory dust species survive for a longer amount of time, yielding long tails. The observed tail lengths of our two planets suggest that the dust in their tails could be an iron-rich silicate or aluminium oxide. Considering that the tail is due to a peel-off process, this information provides insight into the interior composition of the planets, which can be put to use for the development of theories on the formation and evolution of planets such as our own Earth. Ω

Reference:
R. van Lieshout, M. Min and C. Dominik, 'Dusty tails of evaporating exoplanets - I. Constraints on the dust composition', A&A 572, A7



An interview with Michel Mandjes of the Korteweg-de Vries Institute for Mathematics at the University of Amsterdam

Mr. Networks

authors:
Dorota Kawa, PhD researcher Plant Physiology UvA and Mark Golden, professor of Condensed Matter Physics UvA

The consortium you head has just won a 29M€ Gravitation grant from NWO. What's the main aim of this project?
The project NETWORKS is rooted in mathematics and theoretical computer science, and aims to provide the fundamental mathematical tools to deal with large-scale networks. We take inspiration from networks that are unpredictable and difficult to describe. We use two types of methodologies to study their structural properties. Firstly, in stochastics, we try to say something about the probabilistic properties of the networks. The randomness can come from the use of the network or the structure of the network itself. The second branch is algorithmic, meaning: given a network, how can it be controlled in an optimal manner? Motivating examples include: road traffic, (tele)communication, logistics networks or the energy grid. My own area is operations research. That's all about the allocation of scarce resources, and this comes back in many of the real-life networks where a balance is required between performance and cost. In the end, the global aim is to know how to design, control and manage such networks so as to keep the network's customers happy.

How does this work? For example when a bike rider or car driver uses a traffic network?
On a more global level, insight from math can be crucial in designing a good network. What are the data volumes that are entering it and what variability in demand can you expect? Zooming further in on the individual user, we contribute to strategies to help the traffic flow go smoother, much as the matrix signs above the motorway try to influence driving behaviour. You can imagine that the advent of driverless cars will also mean a re-think of the design and management of road traffic networks. The internet is no different: data streams need to be merged smoothly and resources need to be distributed in a fair way, meaning interaction between customers is also an important factor.

“We take inspiration from networks that are unpredictable and difficult to describe”

Mandjes collaborates with more than 30 scientists from all over the world. The list includes scientists at Exxon Mobile and financial institutions, as well as academia and the telecom companies one may expect. All in all these institutions represent an immense amount of private capital. So, can't these companies be mobilised to support fundamental research in this area?
Not every aspect of mathematics fits the interests of industry. What we are doing now, or the work I was involved in when I was at Bell Labs is very much at the fundamental end of the spectrum. My KPN period was closer to the centre-ground between the fundamentals and immediately applicable work. Nowadays, in the case of fundamental projects, the private sector doesn't want to pay. It's about the time horizon. You

cannot promise you will come up with brilliant ideas, especially if that has to happen in a five-year time period. Ironically, this lack of private funding for fundamental research is even an issue in financial mathematics. Although my kind of work has - together with my colleagues doing statistics - the closest links to industry within our math department, still only a few of my PhD students are funded by the private sector.

So, how do you see the balance between fundamental science such as that supported by NWO's Gravitation programme and the more applied form of research, which is very much at the centre of attention nowadays?
I don't see the interest in applied research as a problem. It is a cyclic system, with fundamental research like ours being very much inspired by the real world. We model this at a higher level of abstraction and there is a lot of interesting math going on. The output from that math can then improve the real applications and thus this cycle continues. This is close to the ideal picture of what science can be and how it can interact with society. NETWORKS gives us the space to invest seriously in fundamental research, to think deeply about the underlying math, unhindered by the short-term horizon of the market. This is important because if it all has to be directly related to industry then the stream of good new ideas will simply dry up. Upwards of two thirds of NETWORKS' 35 PhD positions are highly fundamental, but almost ten are dual in nature with one leg in academia and the other in industry. This mirrors my belief that there is no single type of math student: either pure or applied. I think these two groups can exist next to each other. As far as this is concerned, I think that I'm a kind of bipolar person and I like both poles.

Let's fast-forward to 2024, when the NETWORKS project has run for 10 years. Where will this research have got to?
Math grows in an organic way: each new, thin layer is built onto previous ones. My hope is that the algorithmics and the stochastics will have grown closer together. In particular, we should have algorithms that can deal effectively with local disturbances without compromising the performance of the network as a whole.
Generating good models for user behaviour remains a big challenge: for example, how users react to getting a better (or worse) performance from the network. When we arrive at a general framework for this, it will be for the psychologists and others to fill in the relevant individual and social-behavioural models, which sometimes involve game theory, for example.
In 2024 we also should be better at setting up a simulation of a network that's good but economic, not by simply measuring everything going on. These are areas where our research will start to meet big-data approaches. Although this is not such a central theme in NETWORKS program right now, in time it could become one.

Mathematics is the language of science, and thus is crucial to all the disciplines covered by the Amsterdam Science magazine. Are there other research fields that mathematics cannot do without?
Yes! I think in terms of inspiration for problems for math to solve, other disciplines play a vital role. It gives me a buzz to see how math inspired by needing to describe resource allocation in a wireless network can also be set to work in the setting of prices at an auction in a marketplace setting. Mathematicians are good at stylizing their model of reality, considering the evolution of the system towards an asymptotic result, rather than describing the moment-by-moment details. This is what makes math both valuable and at the same time transportable to wholly new areas.

What role do you think you can play in advancing the general public's understanding and appreciation of mathematics?
Outreach is of great value, and thus it is extremely important that some people do it. There are examples of people doing this excellently, such as Robbert Dijkgraaf and Ionica Smeets. At present, I don't see this as my primary task, partly as I have my hands pretty full at the moment. Some colleague mathematicians find it hard to do outreach, as you may have to oversimplify things and some of what you say may not be strictly correct. I don't have such a big problem with that, and I see I am able to get things across to people outside the field, as I saw when I gave a 'Wakker Worden' Sunday morning lecture for young kids at the Science Centre NEMO. However, right now I feel more comfortable appearing in, let's say, the science supplement of the newspaper than becoming a household name on TV. I think Robbert and Ionica do a marvellous job, but I am happy for now not to be asked for my opinion on each and every item that comes along with a math angle…

Born
1970, Zaandam, The Netherlands

Study
1988-1993, MSc Econometrics [cum laude] and MSc Mathematics [cum laude], both at the VU University Amsterdam

PhD
1996, Operations Research, VU University Amsterdam

Work
1996, KPN Research, Leidschendam, The Netherlands

1999, Mathematical Sciences Research Center, Bell Laboratories/Lucent Technologies, Murray Hill NJ, United States

2000-2004, Full Professor of Stochastic Operations Research at the University of Twente, The Netherlands

2000-2006, Department of Probability, Networks and Algorithms, Center for Mathematics and Computer Science [CWI], Amsterdam, The Netherlands

Since 2004, Full Professor of Applied Probability at the Korteweg-de Vries Institute [KdVI] for mathematics at the University of Amsterdam

Family
Married, father of a daughter

"When I was a kid, the idea of becoming mathematician had never crossed my mind"

The structure and role of NWO has been subject of much discussion recently. How do you look back at your period as staff member of the NWO institute CWI ?
I enjoyed it a lot that there was a chunk of my early career in which I could really focus on research. For mathematicians in particular it's necessary to have room to focus. Having said that, it is also important to move on to another place, thus making room for new, young people in an incubator institute like CWI.

My six years at CWI showed me what a key place it is for the mathematics and computer science communities across the Netherlands. For myself, the network of ex-CWI people was vital for the writing of the NWO Gravitation grant. This is a huge investment of time and so a lot of trust is required between the partners that they all will pull their weight. This factor of trust enabling sharing of the risk is often underestimated by policy makers at universities pushing for large-scale grants.

Of course CWI has to have a clear message as to why they are relevant, and the current line with a stronger focus on research done together with companies and NGO's is a good development, as I for one am convinced that scientific excellence can go hand in hand with direct connections with the outside world.

During your recent sabbatical stays in the US you were affiliated to a Management Science and Engineering school at Stanford and the Business School in New York. Is the Dutch way of organising maths departments the best? Why Amsterdam?
That's a good question. I think a major part of this is down to tradition. I collaborate with colleagues from math faculties in Cambridge or Melbourne. Other collaborators - for example one in Jerusalem - work in a humanities faculty. In the US my colleagues are indeed in business schools, operational research departments but also in electrical engineering. At the Master's level, I studied mathematics within a science faculty as well as operations research within an economics faculty. The VU has a business analytics programme and a maths one, side by side. If the departments at the two Amsterdam universities were to grow into one, this could give a really strong combination.
I don't see my current maths/science affiliation as a problem. When I graduated from high school, it was cool to do business school and stay away from difficult topics. Nowadays it's different. Young people want to distinguish themselves and it is cool to study complicated issues; we benefit from that here in the science faculty. I'm really pleased when young people ask for the details of proofs and techniques and they are genuinely curious about how the world works.

Like many maths institutes, the Korteweg-de Vries Institute doesn't seem to have many senior female staff. Do you have an explanation?
Actually, the majority of my current PhD students are women. In our BSc programme, I think women account for around 35% right now. However, after you obtain your PhD in mathematics you need to develop some kind (healthy) obsession to become really good. What I see is that this last step seems to be hard for women here in the Netherlands. I think this has a lot to do with the role-model issue. Looking at Amsterdam with our high density of women in scientific leadership roles - for example at the faculty and university level - this should work out well here!

With your experience and huge network of collaborators, you could probably find a good position anywhere. Why Amsterdam?
I like Amsterdam and feel very much at ease in the UvA and am happy with the freedom in my research that the university and faculty grant me. Now the NETWORKS programme is my new little baby, and that also keeps me here. My wife is in the process of getting her doctoral degree in Medicine here, which is also a natural binding factor. I cannot exclude the possibility that I will leave in the future; I enjoyed my sabbatical time in Stanford a lot, for example, although for such a singular 'year out' one can choose exactly what one does and does not do, which after a time at any new place is no longer the case.

What influenced you to take path of maths?
When I was a kid, the idea of becoming mathematician had never crossed my mind. In high school I realised that math is a field in which once you understand a topic you can easily solve a lot of problems and it doesn't require a lot of study to do well. Initially, I chose econometrics, and during my first year I got interested in pure mathematics and ended up studying both. As a teenager, I also liked writing a lot and I still like it, but in the end, it has not become more than a nice pastime.

"Math grows in an organic way: each new, thin layer is built onto previous ones"

Mandjes is an engaging character, continually seeking eye contact with his interviewers and using measured yet animated hand movements to underscore his points. He weighs his words and certainly thinks before he speaks. His English is fluent, the US years occasionally making themselves heard in words such as 'model' (mahdel) and 'math' (singular).

You often hear that in mathematics if you haven't had your brilliant idea before you're 30, it is not going to happen. As someone aged 45, what's your view on that?
Certainly the pure brainpower that you can mobilize starts to decline at a certain moment. At the same time, having an overview in a field or discipline helps. Further on in your career you simply know more and in my work I'm aware that I take advantage of this. If it's all about proving an extremely deep conjuncture it's probably true that young is better, but when it comes to questions that ask for the combination of different paths and require well-developed intuition into different types of math, then age and experience are certainly assets.
Anyway the Abel Prize doesn't share the Fields Medal's age limit, so there's hope for me yet - at least in principle! Ω

Electronic corkscrews

© JASPER VAN WEZEL
Assistant professor in Condensed Matter Theory at Institute of Physics University of Amsterdam.

The regular arrangement of atoms within a solid, crystalline material forms a constant background to which its electrons must conform. We recently discovered that it is possible for electrons in certain materials to break free from the rules imposed by such atomic arrangements, and assemble into collective structures shaped like corkscrews. The possible applications of these electronic corkscrews in technology as well as fields of science ranging from chemistry to robotics are currently being investigated at the University of Amsterdam.

→ It has been known for several decades that given the right circumstances, electrons in semiconducting materials refuse to march in time with the atomic lattice in which they live, and instead gather into collective structures that do not fit snugly into their atomic backgrounds. Typical arrangements formed by the electrons as they rebel against the order of the atomic lattice include stripes, checkers, honeycombs, and their three-dimensional equivalents (see Figure 1). We recently discovered that it is also possible for electrons in some crystals to congregate into spiral structures. These electronic corkscrews are special because, in addition to not fitting into the atomic harness, they also spontaneously develop a handedness. That is, corkscrews look different from any of their mirror images, just like your right hand always looks the same as your left hand when viewed in a mirror.

How to become a spiral

Spiral structures are well known to develop in magnets, where they also emerge being neither left nor right-handed despite the underlying atomic lattice. In these cases, however, the corkscrew is formed by the microscopic bar magnets that make up a magnetic material, while the electrons themselves do not form a spiral. The bar magnets are good escape artists, easily escaping the restrictions of the atomic background because they can rotate the orientations of their north and south poles around three independent directions. Electrons, which do not have a north or south pole, are unable to copy this rotation trick and need to be much more organized in order to generate a corkscrew structure.

The first step for the electrons is to assemble into lines, standing a little more closely together than normally between every third pair of atoms (see top of Figure 2). Next, three sets of such lines, each oriented along a different direction, combine in such a way that the densely packed regions of electrons are linked in a spiral shape (bottom of Figure 2). We have recently been able to experimentally confirm our theoretical description of this highly orchestrated assembly of electrons into corkscrews patterns.

→ **References**

1] Van Wezel, J. (2011). 'Chirality and Orbital Order in Charge Density Waves', Europhysics Letters 96, 67011.

2] Castellan, J.-P., Rosenkranz, S., Osborn, R., Li, Q., Gray, K.E., Luo, X., Welp, U., Karapetrov, G., Ruff, J.P.C. and Van Wezel, J. (2013). 'Chiral Phase Transition in Charge Ordered 1T-TiSe2' Physical Review Letters 110, 196404.

"We recently discovered that it is also possible for electrons in some crystals to congregate into spiral structures"

Corkscrew technology

The presence of a collective organisation of electrons defying the rules of the underlying atomic structure brings with it significant consequences for the material properties of their host. The characteristic features of traditional patterns such as stripes of electrons, for example, are used in switches and memory devices and even feature in sustainable energy applications. The corkscrew's special contribution of developing a handedness could find use in areas such as molecular motors for nanobots, specialized light detectors and in steering stereospecific chemical reactions. Next to these more applied aspects, electronic corkscrews have been argued to be important in the fundamental physics of superconductors: a mysterious and currently poorly understood class of materials that lose all electrical resistance when cooled with liquid nitrogen. Our ongoing work at the University of Amsterdam, supported by an NWO Vidi grant, will thus help define the role played by electronic corkscrews both in future technologies and fundamental aspects of science. Ω

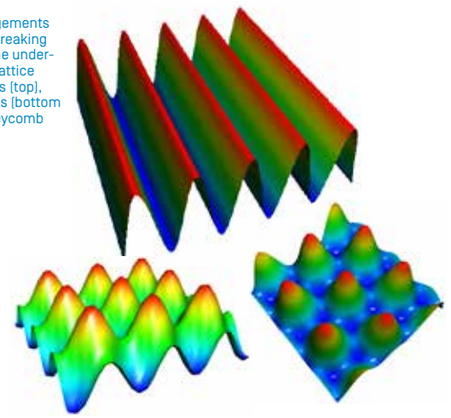


Figure 1: Typical arrangements of electrons breaking the rules of the underlying atomic lattice include stripes (top), checkerboards (bottom left) and honeycomb structures.

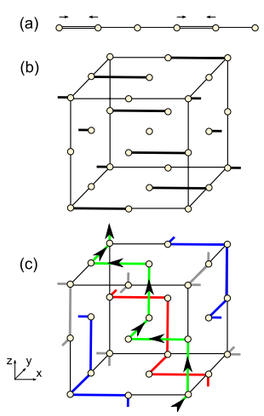


Figure 2: Step-by-step instructions for the formation of an electronic corkscrew.
(a) Electrons line up, bunching together between every third pair of atoms.
(b) Many such lines together fill up the cubic arrangement of atoms in the material.
(c) Finally, putting together three sets of lines, running in three orthogonal directions, yields a spiral pattern, shown here as coloured lines.

Figure reproduced from: Van Wezel J. and Littlewood, P. (2010). 'Chiral symmetry breaking and charge order', Physics 3, 87

Hunting for starquakes in magnetars

Photo credit: NASA's Goddard Space Flight Center/S. Wiessinger

© DANIELA HUPPENKOTHEN was awarded a PhD from the University of Amsterdam on 14 October 2014 for research conducted at the Anton Pannekoek Institute for Astronomy

→ **References**

Huppenkothen D. et al. [2014] Quasi-periodic Oscillations in Short Recurring Bursts of the Soft Gamma Repeater J1550-5418, Astrophysical Journal 787, number 2

→ Off all phenomena that our universe has to offer, neutron stars are undoubtedly among the most extreme. They are remnants of stellar explosions and the densest objects we know. We can use them to study properties of matter that we cannot reproduce in an earth-based laboratory, which may help us constrain theories of nuclear physics. There is just one big problem: how does one look inside a solid ball of matter hundreds of light years away?

Magnetar Bursts and Starquakes

One possible solution comes in the form of a magnetar, a type of neutron star. Magnetars have the strongest magnetic fields ever detected: about a quadrillion times that of the Earth's magnetic field. Changes in these strong magnetic fields cause the magnetars to emit bright flashes of light at random intervals. These flares are often relatively faint and short-lived, which makes them difficult to detect. But sometimes — very rarely — the flash is so bright that we can measure its effect on the Earth's magnetic field. In the tails of these bursts scientists have detected oscillations in the light intensity with frequencies that exactly match those one would expect if parts of the star itself were oscillating. But how could this happen? The leading hypothesis is that the magnetic field of the star slowly changes over time. At the same time the magnetic field pulls on the crust of the neutron star with sufficient force that it cracks. What happens next is reminiscent of tectonic plates grating past each other: a starquake occurs. The star oscillates and waves travel through the interior of the neutron star, which provides the remote observer (us) the opportunity to effectively probe the interior parts of the star that we cannot see.

Finding the (Oscillating) Needle in the Magnetar Burst Haystack

The oscillations described above have only been found in the brightest of bursts, known as giant flares. Because only three giant flares have been observed so far, there are few signals on which scientists have been able to base their theoretical models of these sources. That is why we undertook a study of hundreds of much fainter bursts. Naturally, oscillations are much harder to find in these weaker bursts, and the methods developed for the giant flares are less well suited for the more complicated cases we were now confronted with. Imagine standing at a still pond. If you throw in a pebble, the ripples it produces are easy to see. Now imagine doing the same from the deck of a ship, on the ocean, during a storm. The waves already present make it extremely hard to see the ripples your pebble produced. This was the situation we found ourselves in: trying to see tiny ripples on top of much larger variations in the magnetar bursts we observed.

We developed a new method that could detect ripples even in a storm or, in our case, in the complex patterns of the light that we receive from magnetars during a burst. In common with previous approaches to this problem we used a special representation of the data, called a Fourier transform. The transformed data were compared to a model of the noise (the storm) and outliers were identified, corresponding to the periodic signals of the bursts. Unlike previous studies, we found a way to characterize the special and complicated noise in our data (the ocean waves during a storm), thus boosting our sensitivity to the signals we were actually looking for (the ripples). Using Bayesian statistics, in which probabilities are seen as a measure of belief in an outcome, we could incorporate previous information into the analysis, and thus rule out false detections much better than ever before.

Our newly developed methods succeeded in detecting several of the elusive oscillations, even those from fainter bursts. These newly discovered bursts are important as constraints for theoretical models of magnetars, especially of the origin of the light we observe as magnetar bursts. Ω

Fifty years ago

In 1965, the Nobel Prize in Physiology or Medicine was awarded to François Jacob, André Lwoff and Jacques Monod for their 'discoveries concerning the genetic regulation of enzyme and virus synthesis'. This brief snippet from the award ceremony doesn't really do justice to the importance of their work. It even manages to make it sound a bit boring. But looking back, one might argue that these scientists laid the foundation for our present-day understanding of how each cell in our body is able to use the information encoded in its DNA to make the right proteins at just the right time.

© RENÉE VAN AMERONGEN assistant professor at Swammerdam Institute for Life Sciences, University of Amsterdam

→ Weblinks

1) http://www.nobelprize.org/nobel_prizes/medicine/laureates/1965/press.html
2) https://www.pasteur.fr/ip/resource/filecenter/document/01s-000046-03t/genetic-regulatory.pdf
3) http://home.medewerker.uva.nl/f.m.j.jacobs/
4) http://www.vanamerongenlab.nl

→ Think about it for a second. Human beings are complex, multicellular animals. Our bodies not only contain a lot of cells (approximately 10^{13}, in case you were wondering), but also many different cell types. Each type fulfills a distinct, specialised function. Neurons are dedicated to transmitting electrical pulses to transport and store information. The enterocytes in our gut are experts in absorbing nutrients. Lymphocytes travel through our blood stream to help fight infections. All of these cells carry the exact same DNA sequence in their nucleus. Yet they each use this genetic information very differently, as if they are only reading and executing a portion of their code.

In the mid-20th century, the so-called one-gene-one-enzyme hypothesis, which postulates that each protein is encoded by a distinct structural gene, was well accepted. What was unknown, was how this genetic information was translated into the actual synthesis of a polypeptide chain. Moreover, it was clear that cells were able to respond to changing circumstances, such as the presence or absence of specific growth factors in their environment. Obviously, protein synthesis was regulated… but how?

Twenty years of hard work by Lwoff, Jacob and Monod at the Pasteur Institute in Paris led to two important discoveries. The first was that of so-called messenger RNA (mRNA), a single-stranded nucleic acid that is dynamically transcribed from (and therefore complementary to) the DNA sequence of a given structural gene. This mRNA travels to the ribosomes, the protein factories of the cell, where it is used as a template for protein synthesis – although it took until 1968 before scientists finally figured out the precise way in which that occurs. To date, however, Jacob and Monod remain best known for their second discovery, which every student in the biological and biomedical sciences still encounters in their genetics courses: the famous gene regulation model of the bacterial lac operon (see Figure 1).

Although the precise genetic regulatory mechanisms are different for bacteria and higher eukaryotes (including humans), these experiments continue to impact present-day science. In fact, when the human genome project was completed early in the 21st century, it came as quite a shock to many that our DNA contained only 20,000 structural genes. This means that the remainder of our DNA, a whopping 98%, may have a regulatory function. As such, the fundamental work of Jacob and Monod has become indispensable to research now being carried out across the world, including myriad Amsterdam laboratories. Examples at the Amsterdam Science Park include the research by Dr Frank Jacobs on neural gene regulation, as well as my own Vidi research programme into the genetic mechanisms that control mammary stem cell activity. But it all started fifty years ago, when Jacob, Lwoff and Monod discovered how bacterial cells control the rate of protein synthesis. Their work is an excellent example of a fundamental research breakthrough that has become an integral part of modern-life science research and teaching. Ω

"What was unknown, was how this genetic information was translated into the actual synthesis of a polypeptide chain."

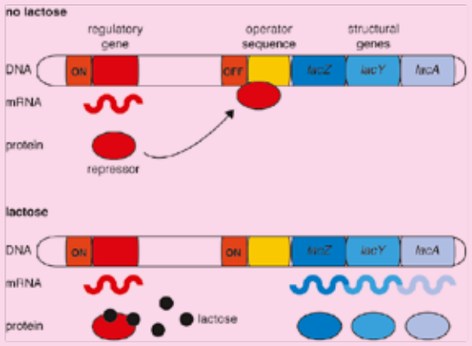


Figure 1:
Gene regulation in the bacterial lac operon.

In trying to understand how bacteria use lactose as a food source, Jacob and Monod were intrigued by the fact that the enzymes required for lactose processing (encoded by the structural genes lacZ, lacY and lacA) were only produced in the presence of lactose. In its absence, the bacteria didn't waste precious energy producing enzymes for which there was no need. Jacob and Monod found that the so-called lac operon (an operon is a stretch of DNA containing a cluster of co-regulated genes) harbors more than just the structural genes (blue) encoding the required enzymes; it also contains a regulatory gene encoding a repressor (red), which is always actively transcribed. The encoded repressor protein binds to a so-called operator sequence in the DNA (yellow), thereby preventing the structural genes from being transcribed into mRNA and, consequently, from being translated into protein. Repression is relieved in the presence of lactose (black), which blocks binding of the repressor protein to the operator sequence.

Neuregulin-3 tagged as impulsivity gene

© SABINE SPIJKER, professor Molecular Mechanisms of Cognition, VU University Amsterdam

MAARTEN LOOS, scientific officer, Sylics, Amsterdam

In the October 2014 issue of Biological Psychiatry, Maarten Loos and co-workers describe how they detected a gene named Neuregulin-3 (or Nrg3 in short) that is responsible for impulsivity in mice.

"Mice with extra Nrg3 were indeed more impulsive!"

Why did you start this research line?
"Impulsivity is a prominent symptom that occurs in several psychiatric diseases. It is one of the hallmarks of attention deficit hyperactivity disorder (ADHD), but also occurs in substance abuse, bipolar disorder and schizophrenia. Because there was no genetic screening that showed causal involvement of genes contributing to impulsivity, we set out to do so using a panel of mice, and measuring their impulsivity," clarifies first author, Maarten Loos, whose PhD graduation in 2012 was based on part of this work.

How did you measure impulsivity in mice?
"Impulsivity is the inability to inhibit or hold back a response. For example, you could think of having difficulties waiting for one's turn, or blurting out answers before the questions have been completed." explains Maarten. "In patients this can be measured with computerized response tasks. These tasks have excellent rodent counterparts, such as the five-choice serial reaction time task, which has been used in this study. In this task, mice can obtain a food reward when they respond to a light stimulus. Impulsivity is defined as a response in the absence of the light stimulus, a so-called premature response."

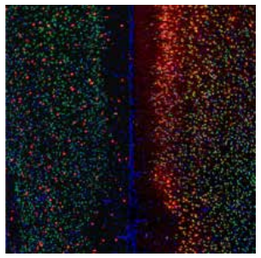
How did you find Nrg3?
"We used a genetic approach starting with two mouse strains that differed in impulsivity. From these parents, a so-called recombinant inbred population was generated and for 41 individuals a correlation was made between the origin of their genes and their level of impulsivity. Doing so, a part of chromosome 14 was identified as having a significant contribution in explaining the differences between different mice in terms of their impulsivity. In this part of chromosome 14, the gene Neuregulin 3 (Nrg3) was located. From then on, we had to prove whether this gene was causally involved in impulsivity."

How did you link Nrg3 to impulsivity?
"First, we used recombinant viruses to add more Nrg3 to the brain and tested what this did. More specifically, we added the Nrg3 to all neurons of the medial prefrontal cortex, a region known to be involved in the control of impulsivity, because all neuron types express Nrg3 (see figure). And… mice with extra Nrg3 were indeed more impulsive! In addition, we tested mice that lacked the Nrg3 gene, so called Nrg3 knockout mice. They showed a decrease in impulsivity," says Maarten enthusiastically. "We were in the fortunate position of having collaborators at the Max Delbrück Center for Molecular Medicine in Berlin - Dr Thomas Mueller and Professor Carmen Birchmeier - who generated these Nrg3 knockout mice, but our German colleagues had not yet identified what the effect of knocking out the Nrg3 gene was, something that we then could bring to the collaboration. Finally, we tested whether bringing back Nrg3 in these adult knock-out mice would 'cure' them from their reduced impulsivity. However, this was not successful. This shows that when Nrg3 is not present when the brain develops, this leads to irreversible changes that impact impulsivity. However, in a relatively 'normal' brain, increasing levels of Nrg3 in the prefrontal cortex could make an individual more impulsive," explains Maarten.

How long did this work take you?
"We started in 2007 and half-way through 2009 we found the Nrg3 gene. The functional studies proving the link between Nrg3 and impulsivity each took about 6 months. Before my thesis defence in May 2012, I started to work at biotech company Sylics, here in Amsterdam. Luckily, together with my former group, and with the help of various HLO internship students, we were able to finish all the experiments smoothly."

What do we learn from this?
"Nrg3 is a growth factor, which binds and activates Erbb4, a receptor tyrosine kinase that regulates cell proliferation and differentiation, and could be implicated in the construction and development of neuronal networks. This could entail, for example, the migration of neurons to their final destination, or the formation of contacts between certain neuron-types. Moreover, both Nrg3 and other genes from the Neuregulin family have been suggested to play a role in schizophrenia. This study was well-received in the field, as classical studies have always been aimed at detecting associations for genes related to neurotransmitters, such as dopamine and serotonin. This study adds the concept that the wiring of the brain set up during development is also critical for aspects of behaviour we see in societally important psychiatric diseases. In this respect, it might come as no surprise that Nrg3 is involved in other developmental diseases, such as ADHD and schizophrenia." Ω

→ References
Maarten Loos, M., Mueller, T., Gouwenberg, Y., Wijnands, R., van der Loo, R.J., Neuro-BSIK Mouse Phenomics consortium, Birchmeier, C., Smit, A.B. and Spijker S. (2014) 'Neuregulin-3 in the mouse medial prefrontal cortex regulates impulsive action'. Biological Psychiatry, 76(8): 648-55.



→ This image shows where Nrg3 mRNA (green) is located in the medial prefrontal cortex of mice. In two different experiments, merged into this one picture, the red colour depicts the expression of a marker for inhibitory neurons (left side) and for excitatory neurons (right). Overlap in localization of Nrg3 with these neuronal markers is visible by the yellow colour. Nrg3 mRNA is present in the both types of neurons.

Flame Nebula: a view from A'dam

➔ The Anton Pannekoek Observatory, located on the roof of the UvA's Science Faculty building, houses the largest optical telescope in the country. We used it to take this picture of the Flame Nebula - an interstellar gas cloud - as seen on a clear January night. The beautiful structure is not on fire, but the light comes from gas atoms in the cloud, which are ionized by radiation from a nearby star. First, four separate black-and-white images are taken, each in a different portion of the electromagnetic spectrum. Then, each image is assigned an individual colour after which the four images are combined into the full-colour photograph. Ω

→ Image
ADRI DUIVENVOORDEN
Master's student in Physics at the UvA,ELINE WIELDRAAIJER
Master's student in Physics at the UvA,
ELINE WIELDRAAIJER
Master's student in Physics at Nikhef

© text
SARAH BRANDS
Master's student in Astronomy & Astrophysics at the UvA

"Gas atoms are ionized by radiation from a nearby star"

Philosophy: an adventure for science students

→ 'Philosophy is no longer cool. Useless stuff, so away with it!'
I think this is shortsighted and senseless, for philosophy gives us the ability to review issues of the day from an often surprising perspective.
An example: In 1990 - at the time of "die Wende" - most students at the Humboldt University in the former DDR studied philosophy or history. Nowadays the popular courses there are economics and law.
I was there in 1991 and got involved because the Rector, Heinrich Fink, was dismissed by the Federal Republic of Germany on the charge that he had been an *Informeller Mitarbeiter* (IM) of the Stasi during the DDR. I was a member of the international Informelle committee that was going to dispute those charges. Successfully, at first.
It is certainly not my intention to use a first column in this eminent scientific magazine to defend communism. It is just that the memory of this experience illustrates the connectedness of students' choices of courses to the dominant ideas at a certain period in time. A generation ago, students at the University of Amsterdam were popping into courses on critical methodology and on the sociology of knowledge. Nowadays the popular courses are economics and law, and increasingly science-based subjects. The Minister of Education should be aware of this and should take a long-term perspective.
Dear Jet Bussemaker: please find the time to read a philosophy book, for example René Munnik's *Time Machines: the submission of transience and permanence to technology*. It may not be a page-turner, but it certainly is fascinating for science students. Munnik defends the proposition that 'to the extent that we realize ourselves as rational beings and experience our world as rational, to the same extent our world is becoming increasingly mythical'.
At first sight you may say: 'Huh? Seems illogical to me...' But after having read the book you might say: 'OK, that makes sense!'
Munnik argues that we are all busy expressing everything in technical, scientifically sound terms: quantification, efficiency, effectiveness, all of which are taken to be indifferent to the historical context. But beware: the way people experience those 'facts', depends on the dominant beliefs of that particular time period.
We need philosophy to help us take the correct steps in our everyday life, also as we approach the next turn. Sometimes it may lead us down the wrong path, but so what? Just enjoy the experience of trying and learning. Ω

© JACQUELIEN DE SAVORNIN LOHMAN

Prof. Jacquelien de Savornin Lohman obtained her PhD in Criminal Law from the University of Amsterdam, where she also worked as a professor from 1982 to 1995. After a long career in science and politics, Jacquelien de Savornin Lohman is now an author, educator and theatre personality, bringing her one-woman show *Liedvermaak* to theatres throughout the Netherlands.

ARGONDE C. VAN HARTEN

ARGONDE C. VAN HARTEN, obtained her PhD in November 2014 for research done at the Alzheimer's Centre of VUmc.

Predicting Alzheimer's disease using cerebrospinal fluid

→ Cerebrospinal fluid is a fluid found in the brain and spine, important for waste clearance and protecting the brain's cortex. We found it can be used as an early warning of Alzheimer's disease: the fluid shows changes many years before patients develop this disease. Especially a decrease of a protein called 'amyloid-beta42' is an early sign of subsequent cognitive decline over time.

The brain and spinal cord are enveloped by cerebrospinal fluid. The contents of this fluid reflect many of the biological processes taking place in the brain. Could it also signal the onset of Alzheimer's disease? To look for so-called biomarkers in cerebrospinal fluid we investigated 132 men and women with a mean age of 61 years (and replicated our findings in an overlapping sample of 224 persons), all of whom came to our outpatient clinic with so-called subjective complaints. This means they experienced memory deficits, but their performance on cognitive tests was normal. Most of these patients remained stable over time but 10% did show cognitive decline in the subsequent 2-4 years.

For this study, we measured cerebrospinal fluid concentrations of three proteins known to play a role in Alzheimer's disease: amyloid-beta42, Tau and hyperphosphorylated Tau (pTau). Amyloid-beta42 is thought to reflect toxic amyloid accumulations found in the brain of Alzheimer's disease patients, while (p)Tau mainly reflects loss of nerve cells as Alzheimer's disease progresses.

We found that abnormal values of these proteins in the cerebrospinal fluid predicted future cognitive decline in patients who, at the moment of the investigation, only showed subjective complaints. The cognitive decline that then followed for the patients with abnormal protein readings was not restricted to memory alone: global cognition and the ability to do multiple things at once was also affected. We also found evidence of an order in which these proteins change over time: patients with abnormal levels of amyloid-beta42 had a ten times increased risk of developing a very early stage of Alzheimer's disease, or dementia due to Alzheimer's disease. Patients with a combination of abnormal levels of amyloid-beta42 and (p)Tau had a 23 times increased risk compared to those with normal biomarker levels. With this research it is possible to make Alzheimer's disease visible at an earlier stage with the possibility to interfere with the disease sooner than before. Ω

Thesis A.C. van Harten
The road less traveled. CSF biomarkers for Alzheimer's disease: predicting earliest cognitive decline and exploring microrna as a novel biomarker source. (7 november 2014)

RI Scans Show Images of Amyloid Plaques in Rabbit Model
Source: http://www.healthinformer.net/alzheimer-disease-plaques-seen-with-conventional-mri-in-animal-model-for-the-first-time.html

Link to the NYM system: http://newyorkmelange.com

New Amsterdam Melange

→ When visiting a new city we are faced with the dilemma about what places to visit, or where to go to eat. Nowadays, people use Foursquare, Yelp or TripAdvisor to help them make such choices. While these are excellent resources when looking for venues enjoying great general popularity, they rarely reflect the individuality of a city's inhabitants, or that of the visitors. Understanding a visitor's preference towards a particular venue in the city and the aspects that make two venues similar is a non-trivial task.

Assuming these aspects may be encoded in a large-number of venue-related images and associated metadata hosted on social media sites, we devised the New Yorker Melange (NYM), an interactive city explorer that navigates New York City venues through the eyes of New Yorkers who have similar tastes to those of the interacting user (the visitor).

The system introduces a novel way of analysing content originated from different social media platforms, and iteratively learns relevant preferences through interaction with the user. The system works with a large-scale dataset of New York's places of interest, their associated photos and text descriptions. Using state-of-the-art machine learning techniques, NYM automatically analyses visual content of the images as well as the associated text and extracts topics describing venue properties and the preferences of social network users. NYM matches topical preferences of the interacting user with those of the like-minded social network users and recommends relevant venues as part of their profile.

New Yorker Melange is going mobile and international. Want to help build the New Amsterdam Melange? Ω

"NYM matches topical preferences of the interacting user"

JAN ZAHÁLKA
PhD candidate,
STEVAN RUDINAC
postdoctoral researche and
MARCEL WORRING
associate professor
from the Intelligent Systems Lab at the Informatics Institute UvA won the recent Grand Challenge 1st prize award at the ACM Multimedia 2014 conference with their contribution 'New Yorker Melange: Interactive Brew of Personalized Venue Recommendations'.

infographic

Amsterdam, city of science

1 VUMC
VU University Medical Centre Amsterdam (VUmc) is part of the VU University Amsterdam campus. With over 700 beds and a staff of nearly 7,000 VUmc also houses VU's Faculty of Medicine.
Research area: human health & life sciences; focusing on five themes: cancer & immunology, neurosciences, cardiovascular disease, public health, primary care & long-term care and human movement sciences.

2 AMOLF
FOM Institute AMOLF is one of the research laboratories of the Foundation for Fundamental Research on Matter (FOM), part of the Netherlands Organisation for Scientific Research (NWO). Its mission is to research complex molecular and materials systems.

3 ARCNL
The Advanced Research Center for Nanolithography (ACRNL) is a collaboration between ASML, FOM, NWO, UvA and VU. With the first research groups already in place, the AMOLF-based collaboration will become an independent institute in 2015, growing into a centre of expertise consisting of 100 researchers.

Research area: fundamental physics for current and future key technologies in nanolithography, primarily for the semiconductor industry.

4 NIKHEF
Nikhef is the Dutch National Institute for Subatomic Physics and part of the Netherlands Organisation for Scientific Research (NWO).

Research area: the interactions and structure of all elementary particles and fields at the smallest distance scale and the highest attainable energy.

5 VU-FEW/FALW
Faculty of Science of VU University Amsterdam.
Research and education areas: computer sciences, physics and astronomy, chemistry and pharmaceutical sciences, mathematics, earth sciences, ecological sciences and various areas of the life sciences (e.g. biomedical science, neuroscience).
Research and education at VU-FEW are done in strong collaboration with the Faculty of Science of the University of Amsterdam (UvA-FNWI).

6 UVA-FNWI
Faculty of Science of the University of Amsterdam.
Research and education areas: physics, astronomy, chemistry, mathematics, logic, biodiversity and ecosystem dynamics; life sciences and computer science. Research and education at UvA-FWNI are done in strong collaboration with the Faculty of Science of VU University Amsterdam (VU-FEW/FALW).

7 AMC
University Medical Centre of University of Amsterdam. With about 1.000 beds and 7.000 staff, AMC also houses UvA's Faculty of Medicine.
Research area: human health & life sciences; focusing on cardiovascular diseases, gastrointestinal diseases, infection and immunity, metabolic disorders, neurological and psychiatric disorders, oncology, public health and epidemiology.

8 ACTA
The Academic Centre for Dentistry Amsterdam (ACTA) is a joint institute of the University of Amsterdam and VU University Amsterdam.
Research area: the physiology and pathology of the tissues in and around the oral cavity, like infectious diseases such as caries and periodontitis.

9 NKI
The Netherlands Cancer Institute (NKI), including its 180-bed Antoni van Leeuwenhoek Hospital, is the only dedicated cancer centre in The Netherlands and plays an important role as a national and international centre of scientific and clinical expertise, development and training.
Research area: human health (biochemistry, cell biology, oncology, immunology, radiotherapy)

10 CWI
CWI is the national research institute for mathematics and computer science in the Netherlands, part of the Netherlands Organisation for Scientific Research (NWO).

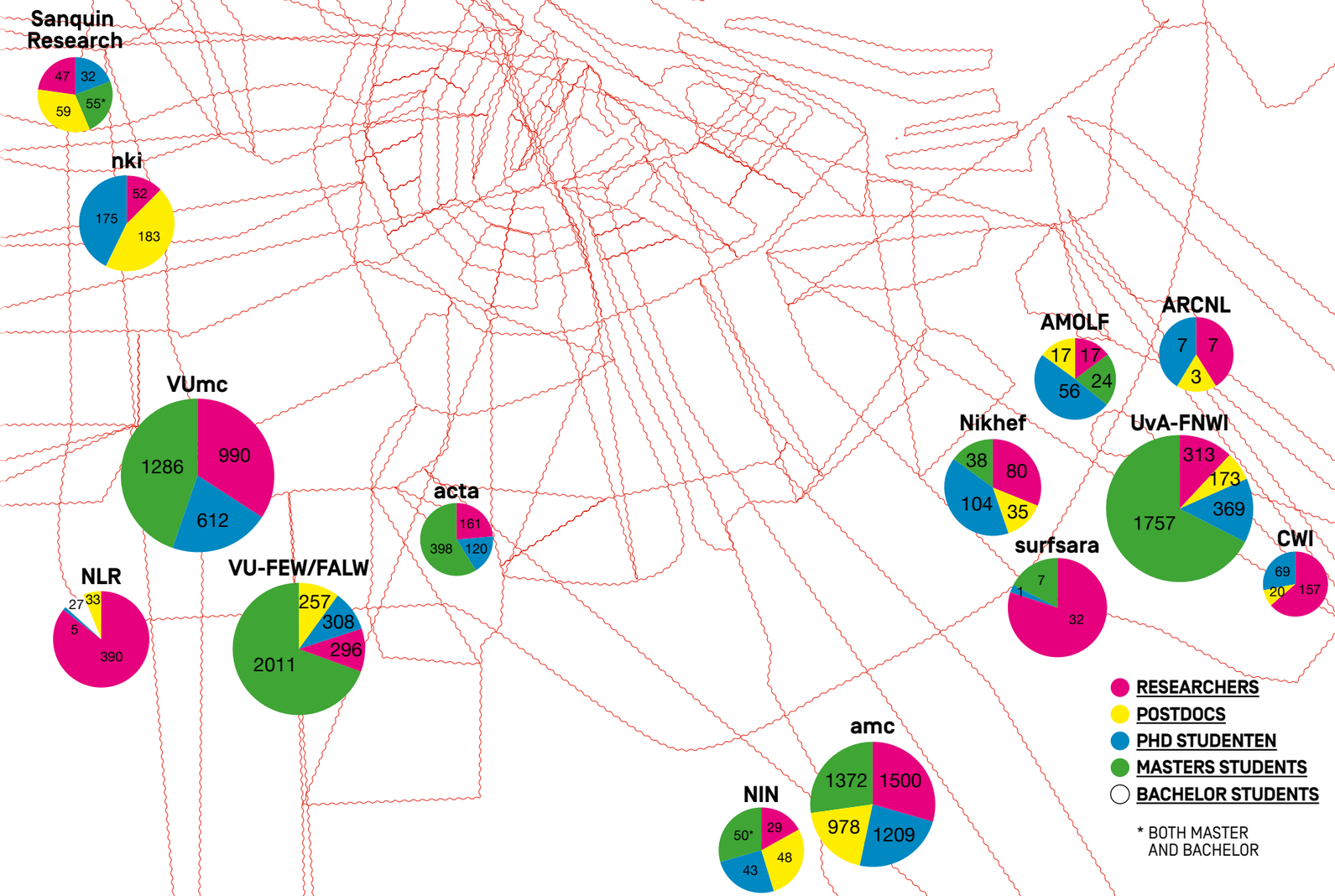
Research areas: mathematics and computer science. CWI concentrates on five broad, societally relevant themes: software, information, life sciences, logistics and energy

11 SANQUIN RESEARCH
Sanquin Research deals with a complementary range of subjects including fundamental biology and biochemistry of blood cells and plasma proteins, hematopoiesis, immunohematology, coagulation, immunopathology, blood-borne infections, blood transfusion technology, transfusion monitoring, transfusion medicine, and donor studies.

12 SURFSARA
SURFsara provides a complete package of services in the field of high-performance computing (HPC), networking, data services, visualization, e-science support and cloud services. SURFsara works together with the academic community (including researchers, educational institutions and academic medical centres), industry and SMEs.

13 NIN
The Netherlands Institute for Neurosciences (NIN) focuses on how networks of neurons enable the cognitive functions of the brain, including consciousness, perception, movement, learning and social interaction, in health and disease.
Research areas: NIN addresses three levels of biological complexity: genetic and molecular approaches, cellular approaches and network function, and system and behavioural approaches.

14 NLR
The National Aerospace Laboratory (NLR) is the independent knowledge enterprise in the Netherlands on aerospace. Its overall mission is making air transport and space exploration safer, more sustainable and more efficient through a multidisciplinary approach.
Research area: new and cost effective technologies for aviation and space, from design support to production technology and Maintenance, Repair and Overhaul (MRO)



VideoStory: teaching machines to interpret events in video footage

About the authors

AMIRHOSSEIN HABIBIAN is a PhD candidate at the Intelligent Systems Lab of the University of Amsterdam. He received his BSc in Software Engineering [2008] and his MSc in Artificial Intelligence [2011] from the Electrical and Computer Engineering Department of the University of Tehran, Iran. His research interests include computer vision, machine learning and information retrieval.

CEES SNOEK is a Principal Engineer at Qualcomm Research Netherlands and an Associate Professor at the Intelligent Systems Lab of the University of Amsterdam. Previously he was at Carnegie Mellon University, UC Berkeley and Euvision Technologies. His research interests focus on video and image retrieval.

THOMAS MENSINK is a postdoctoral researcher at the Intelligent Systems Lab of the University of Amsterdam. He received a PhD degree from the University of Grenoble [France] in 2012, and a cum laude MSc degree in Artificial Intelligence from the University of Amsterdam in 2007. During his doctoral research, Thomas worked both at the LEAR team of INRIA Grenobe and at the Xerox Research Centre Europe. His research interests include machine learning and computer vision, with a special interest in learning semantic representations for images.

→ References

Amirhossein Habibian, Thomas Mensink, and Cees G. M. Snoek, "VideoStory: A New Multimedia Embedding for Few-Example Recognition and Translation of Events," inProceedings of the ACM International Conference on Multimedia, Orlando, Florida, USA, 2014, pp. 17-26.

→ Teaching computers to automatically interpret events in a video is an important and long-standing challenge in the field of **artificial intelligence.** Given the growing popularity of social media and video sharing websites such as YouTube, Snapchat and Vimeo, there is also a large societal demand for this technology. Automatic recognition of events in a video could enable numerous new applications in robot perception, surveillance and environmental monitoring. Recent advances in the field of multimedia retrieval of information promises an exciting and feasible solution to this problem. We have recently proposed a new method to advance the automatic interpretation of events in video. Our research was awarded the best paper award at the 2014 ACM International Conference on Multimedia, which is the worldwide premier conference in the multimedia field.

In this paper we describe an algorithm that projects the pixels of thousands of videos and their noisy (in the sense of inexact) user-provided description onto an intermediate multimedia representation, which is called a VideoStory. This new representation is exploited in two innovative video search engines. The first search engine allows automatic recognition and retrieval of videos containing complex events such as 'birthday party', 'flash mob', etc. The second search engine automatically translates any video into a set of keywords best describing its visual content, thereby making digital video as searchable as text, a medium in which Google and other search engines are already fluent. The results show that our method outperforms the most advanced algorithms for recognition and translation of complex events in videos measured, using standardized datasets.

How do computers perceive videos?
The first and most important challenge involved in automatic interpretation of videos is to find an efficient and informative representation of the video. A representation is an encoding, which encapsulates information present in a video in a form that can be understood by computers. One way of representing videos is as a collection of thousands of **meaningless low-level visual features** extracted from the content. Examples of these could be a **histogram of edges** as illustrated in → **Figure 1** (left). However, even the most advanced visual representations of videos developed to date have failed to enable the interpretation of these videos. It is mainly because there is a large semantic gap between the low-level visual descriptors, such as edges and corners, and the high-level human understanding of the videos.

From pixels to VideoStories
VideoStories can be conceived as a projection of video pixels into a set of words. The projection is learned from a large training collection of videos and their textual captions by means of machine learning techniques. The training collections can be movies and their subtitles, news videos and their transcription, web videos and their surrounding comments; or YouTube videos and their titles, as shown in → **Figure 2.**

How does the training work? Assuming correlations exist between the video pixels and the occurrences of words in the captions, we aim for learning a high-dimensional joint space that embeds the pixel and word correlations, as illustrated in → **Figure 3.** The learned pixel-to-word correlations are then used by the system to predict the relevant words for each new input video, resulting in its VideoStory representation.

Often, the pixel-to-word correlations cannot be effectively extracted for individual words. In cases when words in captions appear too infrequent to allow VideoStory to learn a valuable pixel-to-word correlation, the authors propose an algorithm that learns to **combine** the interrelated words so that their correlation with the video pixels become more visible. As an example, consider the words 'bike' and 'motorcycle'. Instead of extracting the correlation of each word individually with the video pixels, they are first combined to give a more abstract concept, **i.e**. 'vehicle'. Then the algorithm learns how the 'vehicle' concept is correlated with the video pixels. As is experimentally validated in the paper, by grouping the interrelated words together their connection with the video pixels is captured more effectively. We also show that the inexact nature of the title words used for learning is no obstacle to obtaining high-quality annotations, as long as large quantities are used. Moreover, for video interpretation, VideoStory outperforms best-in-class low-level representations, with the additional benefit that interpretation of the video content is provided for free.

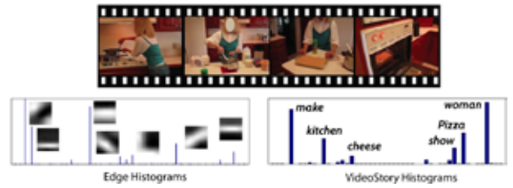
Towards intelligent machines
VideoStory represents videos by its salient concepts, which are automatically detected from the video content. → **Figure 4** highlights three example videos and their salient concepts. VideoStory is not just a nice idea; experiments on more than 700 hours of internet video footage demonstrate that VideoStory provides a much better representation for searching events in video than is currently possible using low-level representations. Moreover, VideoStory allows translating video pixels into text, a capability that existing methods cannot achieve. It is a step toward the ultimate goal of developing intelligent machines, which can understand whatever they see. Ω

→ In order to fill the semantic gap between the visual features and the video content, we proposed a high-level video representation, in which each video is represented by its salient concepts, as shown in Figure 1. This new representation, called VideoStory, is able to solve problems for which the traditional low-level representations are not applicable, including:

1] **Event search**, where given a particular video as a query, the most similar videos are found from a large collection. For this purpose, the similarity between the query and each video is measured by matching their VideoStory representations. The experiments by the authors validate that the VideoStories are more effective than the current state-of-the-art approaches.
2] **Video translation**, whereby descriptive texts are generated by rendering the analysed video concepts into sentences. These translations can be used to summarise what is happening in the video in a few words, or to serve as input for traditional text search engines like Google.

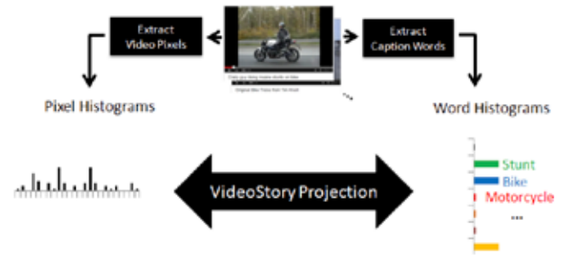
"The first and most important challenge involved in automatic interpretation of videos is to find an efficient and informative representation of the video"

→ Figure 1:
Left: traditional, low-level representation of the video shown at the top.
Right: the results from the semantic VideoStory representation of the same video.

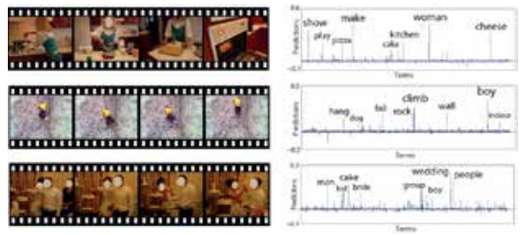


→ Figure 2:
Examples of the YouTube videos and their captions that were used to train VideoStory.

→ Figure 3:
How VideoStory learns.



→ Figure 4:
VideoStory representation for three video examples. Note how the content of the video footage on the left is described using the predicted terms in the representation on the right.



How mites, moths and butterflies acquired a bacterial gene to survive on poisonous plants

© NICKY WYBOUW and THOMAS VAN LEEUWEN

Thomas van Leeuwen, Associate Professor in the group Evolutionary Biology at IBED
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References

1] Grbić, M. et al. (2011). 'The genome of Tetranychus urticae reveals herbivorous pest adaptations.' Nature 479.7374: 487-492.

2] Jensen, N.B. et al. (2011). 'Convergent evolution in biosynthesis of cyanogenic defence compounds in plants and insects.' Nature Communications 2: 273.

In the evolutionary arms race against herbivores, plants have developed diverse and sophisticated defence mechanisms. Plants can defend themselves against herbivores by, for instance, forming defensive physical barriers, like thorns, or by releasing poisonous biochemical compounds, like cyanide. Over time, some herbivores have caught up, developing the tools to counteract plant defences. The plant-herbivore arms race has been going on for millions of years, and only recently are we beginning to unravel how some herbivores have surpassed even the most toxic of plant defences.

When plants kill enemies with cyanide

A great number of plants, including the lima bean, elderberry and passionflower, are able to synthesize molecules enriched with cyanide, so-called cyanogenic glycosides. As such, cyanogenic glycosides are not harmful to the plant or to the herbivores: cyanide is only poisonous in its gaseous phase. When herbivores feed on them, however, cyanogenic plants cleave the chemical bond between the cyanide and the sugar molecule, releasing the deadly cyanide gas.

In spite of the efficiency of plants' cyanogenic defences, mites, moths and butterflies have shown a surprising resistance to cyanide, thriving on cyanogenic plants. Some butterflies, like the six-spot Burnet moth, are known specialists and feed exclusively on cyanogenic plants. Spider mites, like the two-spotted spider mite *Tetranychus urticae* **(Figure 1)**, generalist herbivores feeding on a broad range of plant species, have also been recorded living and feeding in great numbers on cyanogenic plants. How these two arthropod lineages have managed to survive cyanogenic plant defences has puzzled scientists for over a century.

A bacterial gene was hijacked to detoxify cyanide from plants

Using the fully annotated spider mite genome, we compared gene expression patterns of the spider mite, *T. urticae*, adapted to cyanogenic and to the non-cyanogenic lima bean (*Phaseolus lunatus*). Surprisingly, one of the differentially expressed genes found in *T. urticae* could only be found in the genomes of plant-feeding spider mites, moths and butterflies. This remarkable gene encodes for an enzyme called *beta-cyano-alanine* synthase, which is able to detoxify gaseous cyanide by linking it onto the amino acid cysteine and producing *beta-cyano-alanine* molecules. We then searched for the presence of the *beta-cyano-alanine* synthase gene in other animals, plants and bacteria to reconstruct its evolutionary origin. To our surprise, the *beta-cyano-alanine* synthase gene in mites and butterflies had no homologues in the animal kingdom: the gene has a bacterial origin. Our results showed that the beta-cyano-alanine synthase gene had been integrated independently into the ancestral genomes of mites and butterflies by means of horizontal gene transfer from leaf-living bacteria (Methylobacterium species). Horizontal gene transfer is a relatively new concept in the evolutionary biology of animals. It defies how Darwin saw evolution, since genetic information is not transferred from parent to offspring but between non-related species. The mite *beta-cyano-alanine* synthase gene must have been acquired early in evolution because its DNA code has completely adjusted to that of the host.

Our study also suggests that the evolution of cyanogenic defences in highly specialized Burnet moths and longwing butterflies was likely to be mediated by the acquisition of the bacterial *beta-cyano-alanine* synthase gene. Over the course of time, some butterflies have developed their own tools to use cyanogenic glycosides as defence against predators. In fact, upon attack, these butterflies cleave the cyanogenic compounds to release cyanide gas using the same enzymatic steps as plants. It seems likely that the enzyme encoded by the transferred bacterial gene gave butterflies not only the necessary cyanide resistance but also helped them adopt their own cyanogenic defence mechanism.

Our results revealed how animals can adapt by incorporating novel genes from unrelated species, establishing horizontal gene transfer as an additional evolutionary force. Ω

The research article was published in *eLIFE journal*: http://elifesciences.org/content/3/e02365

"Over the course of time, some butterflies have developed their own tools to use cyanogenic glycosides as defence against predators"

→ Figure 1: An adult *Tetranychus urticae* female feeding on plant tissue
© J Van Arkel

© KAREN MAEX,

Dean of the Science Faculties of VU University and the University of Amsterdam

→ THE PERSON I LIKE TO INVITE TO ANSWER THESE QUESTIONS IN THE NEXT ISSUE IS ...

... THE CHAIR OF THE PHD COUNCIL: ROGIER VLIJM

1.

The first experiment I ever did was…

… in the second year of my Bachelor's in Engineering. We had to design a lens that would follow the sun. We used martensites - materials that undergo a phase transformation at around 30°C - such that their volume change could be used to move an optical structure. The idea was that this could be applied to solar cells. And it worked!

2.

My constant source of inspiration is…

… poetry (my favorite poet is M. Vasalis), classical music, a little bit of sun and a blue sky, and above all … happy people.

3.

One book that I recommend to all young scientists is…

… Hans Kung's *Der Anfang aller Dinge* (The beginning of all things). It explains the position of scientists in the world as well as the role of religions through the history of science. It should be obligatory reading for all students, regardless of their field of study.

4.

If I headed the Ministry of Science the first thing I would change is…

… to stop checking up on what researchers have done, start trusting the system and facilitate what researchers can do for the future. Time and money now spent on excessive administrative reporting tasks should be invested in enabling new research.

5.

If I had to change roles with a famous person for one day, I would choose to be…

… conductor of an orchestra like that of Het Concertgebouw. There aren't so many female conductors so it's the perfect place to bring in some women. As a student I used to play the violin in an orchestra. As a conductor you give guidance to many so as to make something creative and beautiful. Do I like to lead? Maybe!

6.

I am most creative when…

… I get bored! What I need to be creative is to 'switch off' my mind: when I'm not working towards a goal I can let my thoughts flow. For example, on vacation or when I am sick. That's when the best ideas come. During my research years I came up with ideas for most of my experiments during a week off, due to illness!

7.

If I could choose my field of study and university once again I would choose …

… Biomedical Engineering in Amsterdam or New York. I really like what I do, so given the option I would want to do something similar but applied to a different field. Amsterdam and New York are my favorite cities. People are liberal and vibrant. These are big cities but with a warm and local atmosphere.

8.

When I am not being a scientist I am mostly ….

… a mother and a friend. I couldn't have done it otherwise. Being a researcher and a mother are both full-time jobs and have their challenges. At any given time, there is always one job where things go well, either at work or at home, so it's good to have them both!

"Hans Kung's *Der Anfang aller Dinge* should be obligatory reading for all students"

Life after graduation

➔ That very special moment of graduating: it may be years ahead or feel like ages ago.
Either way, it does not have to mean the end of your involvement in what happens at your Faculty. As an alumnus, there are so many ways to stay connected. Alumni can join the Amsterdam University Association of UvA or the VU Alumni Association, attend activities specific to their own degree programme, or share their valuable experience with the next generation of students.
Activities for science alumni are organized at various times throughout the year and include lectures, networking meetings and additional training. These activities provide an opportunity to reconnect with former fellow students, make interesting new contacts and stay abreast of scientific developments in your field. Check the alumni websites to find out about upcoming events.

Finished together. The first graduates of Amsterdam's joint (VU+UvA) Bachelor's degree programme in Chemistry.

Alumni in numbers

Alumni 17254

countries of residence 63

73% **27%**

Source: UvA alumni office
(UvA Faculty of Science alumni)

Want to read more?
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www.vu.nl/en/alumni

Reactions?
science-alumni@uva.nl

alumni@work

Where do the alumni of the Faculty of Science end up in the worldwide job market? This edition zooms in on two alumni who have taken the short step into science communication.

Edda Heinsman

➔ Member of the editorial staff at De Kennis van Nu, a Dutch platform for online, radio and TV items about science

"My Astronomy curriculum included practical training and small-scale projects at a large number of institutes including Nikhef, AMC-UvA and AMOLF. This diversity really appealed to me and I discovered that I enjoy talking and writing about science in the broadest sense. I got the opportunity to do a work placement at Het Klokhuis, a Dutch educational children's TV programme, where I was basically able to get started right away, alongside my courses. Because I had to read a large number of papers during my studies, I learned how to scan through articles and identify the main points quickly. Moreover, I knew how to critically assess research results. It helped that I wasn't intimidated by mathematical equations. Developing new items is the best part of my job. I love contacting people, getting out in the world, consulting with researchers and finding interesting topics to explain and illustrate."

➔ Insider's advice
Don't reveal your scientific background when you're meeting a researcher for the first time. Otherwise, they tend to start using jargon and stop explaining things in real detail.

Tim van Opijnen

➔ Founder of Sciencepalooza.nl (blog) and the Discovery Festival
I first started mobilising people on issues I cared about as a Biology student.

"While the courses I took laid a strong foundation to write knowledgeably about science, serving as a board member at CONGO and organising several symposia taught me important organisational skills. As a PhD student at the AMC-UvA, I got the sense that young scientists weren't getting the media attention they deserve. So I started a writing club with a few friends to figure out how to write about scientific subjects in an accessible way. I managed to attract a publisher and we wrote a book titled In de toekomst is alles fantastisch (Life will be fantastic in the future). It even made the shortlist for the 2007 NWO Eureka Prize celebrating the best popular scientific book in the Netherlands.
I now run my own lab at Boston College, where I'm studying infectious diseases. As a researcher I still contribute to popularising science, for example through Sciencepalooza.nl. Doing so makes my work even more diverse and allows me to meet an even wider range of people - something that I consider to be the best thing about my job. Boston is really the place to be. The possibilities are endless, and you run into leading academics on an almost daily basis."

➔ Insider's advice
There are lots of people trying to break into science journalism, with few positions available. But if this is what gives you energy and drives you, you just have to go for it!

"Green gold": how to use sunlight smartly

© MICHEL HARING

"The Photanol-concept directly transforms CO2 into predetermined products when exposed to light"

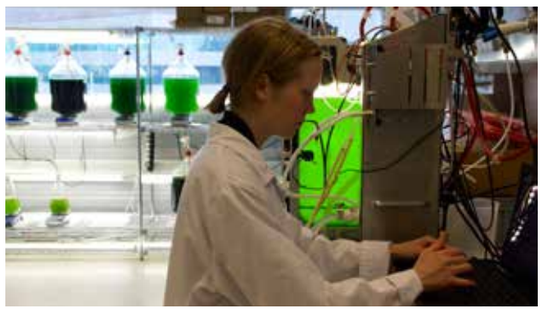
➔ Sometimes the valorisation of scientific results can look incredibly simple. Take the example of the UvA start-up Photanol. In 2008, two experts in the physiology of bacteria and algae, the UvA professors Klaas Hellingwerf and Joost Teixeira de Mattos decided to found a company to put their theory into practice. They reasoned that algae (in this case cyanobacteria) could use their photosynthetic machinery to produce building blocks for more complex chemical compounds. These compounds could be generated inside the cyanobacterium by introducing a gene into the algae from another organism. In their patent application they described how this approach could be used to produce lactic acid. Introduction of the ldhB gene from a bacterium (Lactococcus lactis) would result in the production of the enzyme NAD(P)H-dependent L-lactate dehydrogenase, which is its turn would transform the algae into little lactic acid factories. This small organic compound can then diffuse out of the cell and can be harvested from the culture medium. The lactic acid can then be used as a feedstock in numerous other chemical processes so as to produce the building blocks for plastics or biofuels.
The Photanol-concept thus transforms CO_2 into predetermined products when the cyanobacteria are exposed to light.

General formula Photanol concept: light+CO2 building blocks +extra enzyme product+ oxygen

Specific formula light+CO2 pyruvate+ lactate dehydrogenase lactic acid+oxygen

After first providing proof of concept in their research laboratories, Photanol's founders started a pilot factory in 2012, which was housed in the greenhouse at Science Park and funded by UvA Holding. This facility attracted much attention and resulted in investment from a venture capital source (ICOS capital) in 2013.
Although the original idea of Photanol focussed on the production of biofuel by cyanobacteria, changes in the global fossil energy market and the negative image that the word 'biofuel' had come to possess, because of the competition with arable land for food production, forced the company to re-think their strategy. Now the inherent strength of the concept became apparent: the modular structure of the production process inside the cyanobacteria means that not just lactic acid, but virtually anything carbon-based can be produced! Given the fact that these cyanobacteria themselves are simple plants, generation of plant-based compounds is the most promising approach. This time insertion of a plant gene would suffice to make cell factories that produce flavour or fragrance compounds, based on CO_2 capture and the energy of sunlight only. After proving the production of fragrances via cyanobacteria was possible, Photanol attracted the attention of AkzoNobel Speciality Chemicals, which resulted in a strategic collaboration for the production of organic acids from September 2014.
Now, in March 2015, Photanol employs fifteen scientists, both chemists and microbiologists. The pilot factory has now outgrown both the UvA-greenhouse and the Science Park. Chief Scientific Officer of Photanol, Michiel Lensink, explains:
"The Photanol-concept directly transforms CO_2 into predetermined products when exposed to light. These advantages can truly disrupt the world's production of chemicals and fuels. We believe that our technology will become the new standard in agriculture with a very positive impact on the environment. Due to the small amount of water needed, and the use of non-arable land, there is no negative impact on food production or deforestation. On the short term Photanol will start the production of high value chemicals like fragrances and low calorie sweeteners. Our solution delivers products with constant quality and supply, in a market that is prone to supply issues due to variability of feedstock. The efficiency of the Photanol technology will enable lower production costs compared to current fermentation-based technologies. In a later stage, Photanol's business model will be geared towards the licensing of technology. As our key competence is in developing new strains to produce different chemicals, a licensing model enables us to grow faster without needing a large amount of cash to build manufacturing sites. In the long term, Photanol also envisions providing a cost effective alternative production technology for bulk chemicals and fuels. This will enable substantial capacity for CO_2 capture and will truly change the way we source our commodity chemicals and fuels".
Photanol is a real success story and an excellent illustration very close to home of how science and business can successfully interact in an academic environment. Ω

➔ Figure 1:
Photanol Laboratory at Science Park Amsterdam (source: Photanol bv)



Puzzle

Can you find one unique digit for each letter in the summation below to make it work?

Please note that the digits 6 and 2 are already taken.

```
  SIX6
  SIX6
  SIX6
  SIX6
  SIX6
  SIX6
+ SIX6
---------
 FORTY2
```

before April 30th

mail the answer to
magazine-science@uva.nl

win
the first ten correct answers will win an Amsterdam Science T-shirt

cartoon

BART GROENEVELD

share

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Mark Golden, Hamideh Afsarmanesh, Harry Buhrman, Michel Haring, Jeroen Zuiddam

Front row:
Dorota Kawa, Eline van Dillen, Anne van de Poel, Heleen Verlinde, Héctor Serna Chavez

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"Be inspired: my perspective on Amsterdam Science"

→ Three years ago my space mission PromISSe took off from the launch pad in Baikonur, Kazachstan. In reality, I started my mission years before that particular day, while preparing and being trained for my work in space.

I am still invited to speak about the unique perspective I had as an astronaut. This often refers to the view I had from space on planet Earth, while orbiting our planet as a living satellite. Indeed: this perspective is unique. Flying along a wall of water, while crossing the Pacific Ocean, witnessing the moon rise from a very thin atmosphere, set against the deep black backdrop of the cosmos, and the ever-changing pattern of clouds and landscapes changed my view on life forever. I will continue to share my experiences and my respect for our planet that makes all life possible.

Yet, there is another perspective I had as an astronaut: the perspective on technology, science and people. During my two space missions I was privileged to work with the most passionate people imaginable: the smartest engineers, the brightest scientists, gifted inventors, people who link out-of-the-box thinking to discipline and perseverance.

I recognize these qualities in many people who work in science. Whether they face technological challenges, tackle tough scientific problems or work on economically or socially relevant applications; they are always passionate about their work. Exactly this is the prerequisite to get one step further in your own field, time and time again. Yet, to be able to achieve a common goal, one that is possibly incredibly complex, like spaceflight, it is important to speak each other's language, both literally and figuratively, and to transcend different cultures and reach out to different disciplines. Why? Because of what the view from space makes plainly clear: everything is related.

Therefore I support this new magazine Amsterdam Science. It is a fantastic way to share your findings with your colleagues and fellow students, here and abroad, but also with the general public and the rest of the world. Let yourself be inspired and help make our planet a better place. Ω