KAVLI NEWSLETTER
Kavli Institute of Nanoscience Delft
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IN THIS ISSUE:

Image:
High-fidelity projective read-out of a solid-state spin quantum register'.

Credit: Lucio Robledo, Lilian Childress, Hannes Bernien, Bas Hensen, Paul F. A. Alkemade & Ronald Hanson

FRED KAVLI, OUR UPCOMING COLLOQUIUM, AND MUCH MORE

We continue to get very positive feedback on our newsletters. Various people suggested that its content may be of interest not only to us, the members of our Kavli Institute of Nanoscience Delft, but also to outsiders who may be interested in reading about the activities of our Institute. For that reason, we are now distributing this third newsletter to a wider circle of people. Feedback is quite welcome! (Feel free to send an email to Amanda van der Vlist, A.vanderVlist@tudelft.nl, or me.)

A main item in this issue of the newsletter is the article about Fred Kavli himself. Student Ammeret Rossouw and I spoke to him about his dreams, his career, and his remarkable initiative to start the Kavli Foundation, which has initiated institutes, a big science prize, and much more. It is quite interesting to hear about that from the man who started this all. Read about it on page 6!

This issue furthermore highlights the upcoming Kavli Colloquium by Petra Schwille on December 8. Petra Schwille is a great scientist who currently is a professor in biophysics at Dresden but soon will move to Munich to take up a directorship at the Max-Planck-Institute. She has done pioneering work in fluorescence correlation spectroscopy and now leads an exciting research program in biophysics and synthetic biology, aiming to understand biological life from the bottom up. On December 8, she will tell us about the 'Bottom-up synthetic biology of pattern formation' in what promises to be a very interesting Kavli Colloquium. As a teaser, PhD student Zohreh Nourian interviewed her. Read all about it on page 2.

Finally, you can enjoy in this newsletter self-introductions by new faculty members Chirlmin Joo and Leonardo DiCarlo, read columns by Jan Lipfert and Yuli Nazarov and learn about a variety of other news. Enjoy!

• **Cees Dekker**

Column

TOPOLOGICAL QUANTUM NANOSCIENCE

When I was a student, we were all fascinated by the first steps that the topological approach made into physics. It took a while to understand that the winding of phase around a vortex is always 2π whatever you do; and that had a sweet taste of intellectual victory. It was so enlightening to learn that π in topology has a different, much more profound meaning.

Topology has progressed in years past, and has been overwhelming in recent years. There are no more insulators, we now have topological insulators, they insulate as much as wet towels, yet are much more profound. The field of superconductivity seemed so stable; yet now the advent of topological superconductors makes it truly revolting. And no quantum computing scheme would ever work if topology would not give its protective blessing.

In a kind of conservative rebellion, I have recently suggested in public that perhaps there are some exciting things left in physics that are *not* directly based on topology of coordinate space. O boy, how wrong I was. My only consolation is that my wrongness let the truth prevail.

Charles Marcus, a Harvard professor and the most modest experimentalist I know, has responded to my public blunder with a seminal conjecture that I have a great honour to reveal:

Marcus's conjecture
Any result involving integers, including 1 + 1 = 2, can be represented geometrically as a statement of topology, since 1 + 1 = 2 cannot be continuously deformed into any other relation between integers.

Breathtaking. I could have suspected so, why was I so blind?

A note for non-specialist: physics originates from, and is based on counting fingers. For all practical purposes, the result of such counting can be approximated by an integer non-negative number. The conjecture therefore puts physics into its true context: it appears to be a practical exercise in homotopy theory, and is to be supported as far as it advances valorization of the latter.

A technical note: Charles insisted on presenting his conribution as a conjecture, while the proposition clearly has the status of a theorem. He said he would not present the proof yet. I wonder how he has actually done the proof yet concealed. Being a physicist, he could use the traditional medium of this profession, the backside of an envelope. Having understood the importance of topology, he could turn to a margin of a Greek manuscript, the only proper medium for seminal mathematical discoveries since Fermat. Being a conservative rebel, I'm just exploring the consequences of occasional and absolutely unintended disappearance of this envelop/manuscript. What a wonderful loss for science that would be!
At least, we would not have to rename the department to match the title of my contribution...

• **Yuli Nazarov** - QN Department

Interview

INTERVIEW WITH PETRA SCHWILLE

Our upcoming Kavli Colloquium speaker Petra Schwille is a professor at the TU Dresden. Petra started her physics study at Stuttgart and did a PhD in the lab of the Nobel laureate Manfred Eigen at the Max-Planck-Institute (MPI) in Gottingen, developing Fluorescence Correlation Spectroscopy (FCS). She pursued two postdoctoral fellowships in the MPI and at Cornell University. In 2002 she became a full professor in the biophysics department at the TU Dresden. Let's hear how her journey towards the success started. An interview by PhD student Zohreh Nourian.

A JOURNEY TOWARDS THE ORIGIN OF LIFE!

Like many physicists, Petra Schwille thought she should do quantum physics to satisfy her interests for theoretical physics but she soon got frustrated by it. She then decided to go to Manfred Eigen, famous for his origin-of-life research, to theoretically study evolution and answer fundamental questions about the origin of life. 'I had no idea of biology though. I learnt it in Gottingen, by diffusion probably', Petra says.

You also studied philosophy besides physics. Did it help you shape your research plan and decide what you would like to do in your life?
No, that was not helpful at all. I was really unhappy with physics and just wanted to do something else. Some people go running, I studied philosophy.

How did you get introduced to fluorescence-based single molecule techniques?
When I met Prof. Eigen he said the only thesis he was giving out was an experimental single molecule project. He then showed me the lab and I really can say I fell in love with microscopes and optical instruments. I did most of my PhD and a substantial part of my postdoc developing methods just because I liked it.

It seems that you are increasingly attracted by the field of synthetic biology*. Why?
For me, merely staying a methods person is annoying. I like to raise questions. I felt that model systems are very attractive because you can understand them in a cleaner way compared to the real cell. I think it would be so nice to make a cell where you can understand every single part of.

To what extent do you believe that bottom-up synthetic biology has something to say about the origin of life?
I assume that there must be a simpler way of making a cell than how nature does it. To understand how life started we need to know the essencwe of life. I think it must have started in a much lower degree of connectivity and organization. That motivates me to go into synthetic biology. The information part of life we understand quite well. But what we do not understand is the compartmentalization part. By a bottom-up approach we could learn a lot about that.

What are your dreams in your research?
I would just love to build something that looks like it is living. It would be cool if we could make a vesicle that divides while information can be sustained.

Have you found it difficult being a woman in science?
No, on the contrary. I think science is a very nice and equal environment. The only big problem for women in science is that they often are more ready to sacrifice their career to keep their relationship happy. Young scientists should know that they are responsible for their own talents. But the real path to change is that parents educate their girls differently.

Which part of being a successful scientist do you like the most?
Being free.

'Scientists do not have a life'. Does this comment sounds familiar to you?
I don't think that's true. I think scientists are in a way like artists. You are responsible for your own creativity with enormous freedom. Definitely success in science requires devotion of a large part of your life like any other career. I was working 80 hrs a week during my postdoc in Cornell without seeing any daylight. But once you establish your own group you don't have to do everything by yourself. I think being a scientist is a great job.

Is there anything that you would like to say to the community in Delft?
In a way you have to be born a scientist. If you feel inside you are a scientist you should go for it. No matter how insecure you are or being a women not knowing how to combine it with family...
Forget about these things and just go for it!

• **Zohreh Nourian**

* Synthetic biology is an emerging area of biological research that combines science and engineering to design and construct of new biological entities such as enzymes, genetic circuits and cells or to redesign existing biological systems.

Kavli Colloquium


Petra Schwille

BOTTOM-UP SYNTHETIC BIOLOGY OF PATTERN FORMATION

PETRA SCHWILLE, DRESDEN

December 8, 2011 will feature a Kavli colloquium by Petra Schwille. The abstract of this colloquium reads as follows:
The driving force behind our involvement with synthetic biology is the aim to quantitatively understand fundamental mechanisms of self-organization and emergence, such as pattern formation and polarization, in biological systems, particularly protein-protein and protein-membrane interaction networks. Our concept is to identify minimal systems required to capture a specific biological phenomenon, and reconstitute them to a controllable in vitro system. We are primarily interested in protein systems that are able to transform membranes, with the ultimate goal of identifying minimal protein machinery able to controllably divide a membrane compartment. We have successfully reconstituted the self-organization of Min proteins, being part of the bacterial cell division machinery, resulting in dynamic pattern formation and travelling waves on model membranes. We could recently demonstrate that and how this system reacts to spatial cues, e.g., the exact geometry of the membrane compartment. Strikingly, the Min waves are able to recognize the longest axis of a membrane patch, and can be directed along complex pathways. •

15.00 hr	Pre-program: "Science and background of the Nobel prizes"
	Henk Hoekstra (Leiden), The 2011 Nobel prize in physics Aviva Joseph (Delft), The 2011 Nobel prize in medicine Bernard Dam (Delft), The 2011 Nobel prize in chemistry
15.45 hr	Break
16.00 hr	Kavli colloquium by Petra Schwille (Dresden): Bottom-up synthetic biology of pattern formation
17.15 hr	Drinks & time to meet

Extra seminar

FLUORESCENCE CORRELATION SPECTROSCOPY: AN ANALYTICAL TOOL FOR SYSTEMS BIOLOGY

On December 7, Petra Schwille will additionally present a lecture: "Fluorescence Correlation Spectroscopy: an analytical tool for systems biology". The abstract for this lecture reads as follows:
Cell and developmental biology are immensely complex and rapidly growing fields that are particularly in need of quantitative methods to determine their key processes. With all the data known about protein interactions and interaction networks from biochemical analysis, there still remains the important task of in situ biochemistry, i.e. determining the thermodynamic and kinetic parameters of certain reactions in the cellular environment. E.g., to understand how cells polarize and develop into organisms, we need quantitative methods to determine concentration gradients and diffusion coefficients of key factors such as morphogens. In conjunction with two-photon excitation and spectrally resolved detection, Fluorescence Correlation Spectroscopy (FCS) is a powerful means for the study of concentrations, translocation processes, molecular association or enzymatic turnovers. It is fair to state that this technique raises strong hopes for quantitative systems biology. During the past years, we applied FCS to a variety of cell-associated phenomena, among them protein-protein binding, protein-membrane interactions enzymatic reactions, endocytosis, and gene silencing. Recently, we established the possibility of determining how morphogen gradients form and maintain in living embryos, thus opening up a manifold of attractive applications in developmental biology. •

Kavli Colloquium

"BOTTOM-UP SYNTHETIC BIOLOGY OF PATTERN FORMATION"

Date : December 8, 2011 at 15.00 hours
Location : Aula Congress center, Mekelweg 5, Lecture room B

Extra seminar

"FLUORESCENCE CORRELATION SPECTROSCOPY: AN ANALYTICAL TOOL FOR SYSTEMS BIOLOGY"

Date : December 7, 2011 at 16.30 hours
Location : TN building, Lorentzweg 1, Lecture room F

ME IN A NUTSHELL

Introduction new faculty

Leonardo DiCarlo

A SELF-INTERVIEW BY LEONARDO DICARLO

I was born in Buenos Aires, Argentina, and grew up in Venezuela, Mexico and France. (My family moved often due to my father's job with Olivetti.) Attending American schools made all these moves easier, so I naturally pursued university studies in the USA. I did my undergraduate and Master's work at Stanford, a PhD at Harvard, and a post-doc in Yale.

Since October, I am a tenure tracker in the Quantum Transport section of the Quantum Nanoscience Department within Kavli. I have begun a line of research here that stems from my post-doctoral work in superconducting quantum circuits with Rob Schoelkopf. At Yale, I realized (together with great colleagues) integrated circuits that you can program to solve simple problems using quantum mechanics. My new group is developing technologies based on quantum measurement and feedback control that will make these working mini quantum computers more robust and more powerful.

So I've been here for almost a year! This is hardly an introductory self-interview!
Indeed. I've had the pleasure of meeting most of you by now. If not, you might recognize me as the guy who walks funny lately after losing an epic tennis match to the QN chairman! I think Herre loves to spread the news of his sporting conquests. So just in case Herre hasn't told YOU yet, he beats me in tennis [lately ;)]! Alternatively, you might recognize me as the oldest among The QT Boyz! I love playing in this local rock band, even if our repertoire is limited to Johnny Cash tunes for the time being.

How did I end up coming to the Netherlands?
I learned early in my scientific career of the cutting-edge research performed in Delft, and especially in the areas of semi- and superconducting nanotechnology where my interests lie. My PhD thesis advisor, Charlie Marcus, has been a regular in TUD PhD committees for years. Charlie would bring back the beautifully printed theses and I would read them from cover to cover. I especially remember Wilfred van der Wiel's. Every chapter is a Nature, Science or PRL publication! Talk about a role model. Many students from TUD did their Master's project or internship in Charlie's group as well, and I learned about the Dutch joy for life by having a gezellig time with them.

I visited TUD in 2003 following the quantum information conference in Amsterdam. Hans Mooij gave us a tour of Delft, and I felt then that someday I would be coming here. I decided during my post-doc that it was time to settle down in Europe. I had really enjoyed living in Paris both during high school and in between Stanford and Harvard. So, when Leo Kouwenhoven informed me of open positions, I did not hesitate! To my eyes, Delft offers the possibility of perfect work-life balance. The quality of life in the Netherlands is excellent, and the research facilities in Delft are second to none.

Rumor has it I have not explored that possibility much during this first year!
I do spend many hours at the university. It is thrilling to build a new lab and start a new team, one great student at a time. The extra momentum we gain each day gets me even more excited about the next! There is also a lot to adapt to in evolving from post-doc to assistant professor. I went from turning knobs in the lab 90% of the time to experiencing several new dimensions... mentoring, teaching, recruiting, grant writing, meetings, committees….some of these in a new language. It's all very exciting.

Spreek je al Nederlands?
Learning Dutch is a must. I enjoy evening classes with the Delftse Methode and het groene boek. Private lessons with Annelies Mooij also helped a lot at the start. It's all adding up, and I begin to understand the techs' jokes at the coffee table! My Master's students Josephine and Joost are also excellent tutors.

So, will I be teaching in Dutch any time soon?
I hope to do so within a couple of years. Right now I co-teach Advanced Quantum with Jos Thijssen, and next semester Quantum Computing with Lieven Vandersypen. These are Master's courses taught in English. I will upgrade to Bachelor's courses in due time!

I describe myself as a quantum engineer.
I like building superconducting circuits that behave as near-perfect quantum objects. That is, objects that we can drive and couple according to a Schrodinger equation, and measure according to Born's counter-intuitive rule. It amazes me to this day that we can do textbook quantum mechanics with purely man-made objects! Most approaches to quantum computing involve some element that is given by Nature: an atom, a spin, etc. Not here. Improving these circuits, and putting many of them inside an electronic chip that behaves quantum-mechanically as a whole requires increasingly complex engineering. I think "quantum engineering" captures the interplay between physics and engineering that is essential for progress in this discipline.

How is Kavli a good match for my line of work?
My group benefits greatly from startup funds provided by the Kavli Institute, in addition to infrastructure developed by the Flux Qubit group led by Hans Mooij and Kees Harmans. We also benefit from excellent colleagues to collaborate and discuss with across the institute. Teun Klapwijk's group supplies excellent superconducting thin films needed for our devices, and Ronald Hanson's and my groups hold regular joint meetings to discuss quantum computing, to name just a few examples.

Do I think we'll ever have a useful quantum computer?
Absolutely. I am not sure what form it will take exactly, or what its first application will be, but I am certain that we will have a useful quantum-enabled computing device in my academic lifetime. Of course, my own hunch is that it will consist of a superconducting chip, with only wires coming in and out. No lasers, no big magnets. But who knows, the various approaches taken by my colleagues in the Kavli Institute (NV centers, spin qubits, Majorana's, nanomechanics, plasmons) are really opening my eyes to the exciting possibilities! And that's the best part.

• **Leonardo DiCarlo**

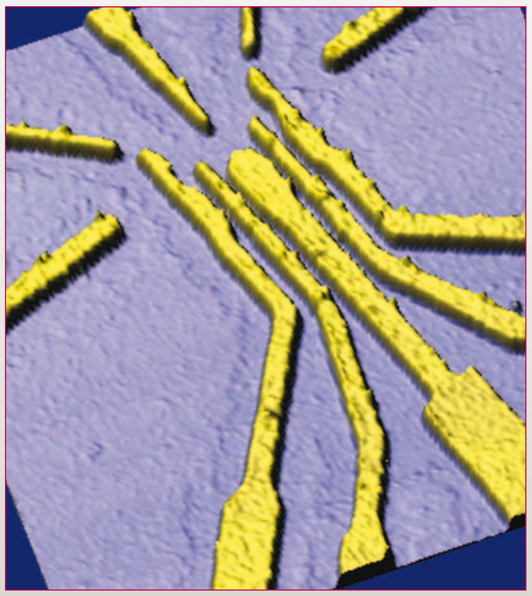
KAVLI THESIS PRIZE

Kavli Delft Thesis Prize 2011

Katja Nowack receives the Kavli Delft Thesis Award 2011

The first-ever Kavli Delft thesis prize was awarded to Katja Nowack at the annual Kavli Day on September 22, 2011. The biannual award (a statue and 3,000 euros) is introduced to highlight the best thesis produced within the institute. Katja joined the group of Lieven Vandersypen in 2005 and defended her thesis 'The manipulation of electron spins in quantum dots' cum laude in December 2009. Her publications in leading journals were widely referenced. Katja Nowack, now a postdoc at Stanford, was flown in for the event. •

TWO-QUANTUM BIT DETECTION REALIZED



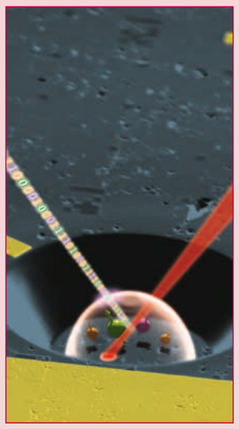
A team of researchers, led by Lieven Vandersypen have succeeded in reliably reading out two spins, the elementary building blocks of such a computer. This research is another step forward towards a future, superfast quantum computer. The scientists have reported on their results in Science Express on August 4th 2011. •

PRESTIGIOUS DUTCH PHYSICS AWARD FOR FRANK KOPPENS

Dr. Frank Koppens received the Christiaan Huygens science prize for Physics. He was nominated for the award because of his ground-breaking research that made it possible to control the spin of a single electron in a nano structure. Koppens finished his PhD with honours at the Kavli Institute of Nanotechnology at TU Delft on 'Coherence and control of a single electron spin in a quantum dot'. •

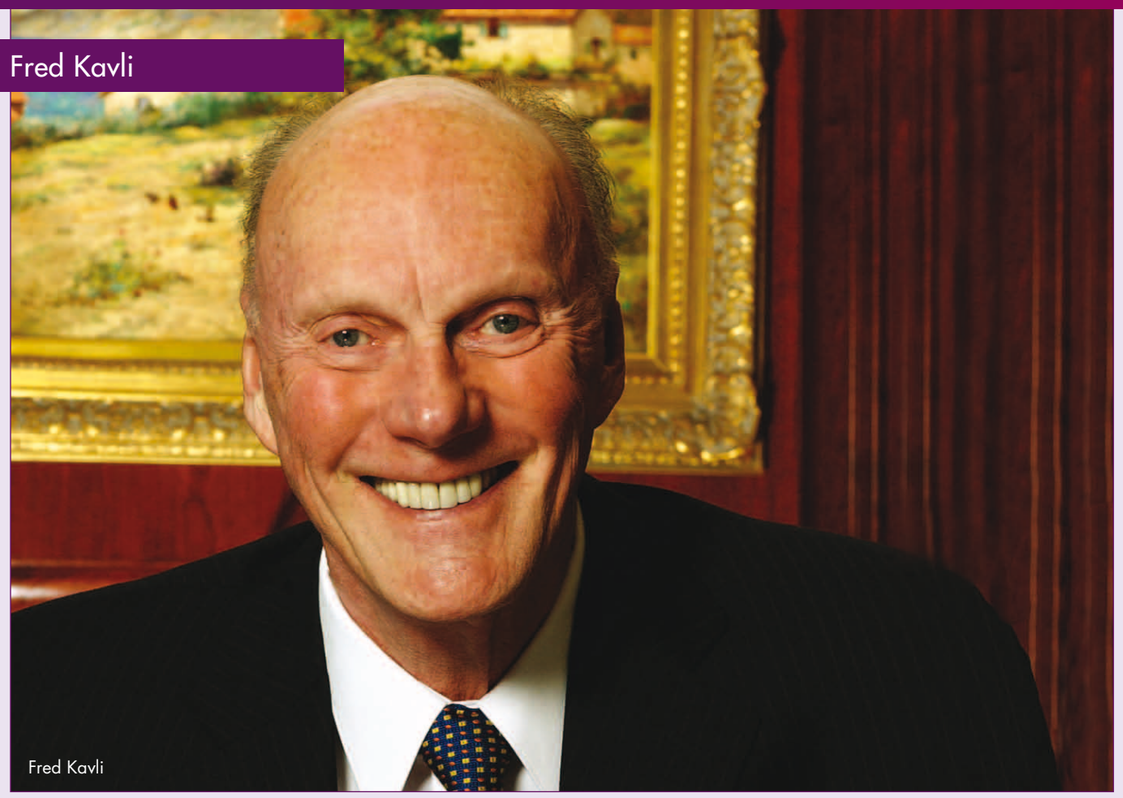
READING OUT A MINIQUANTUM COMPUTER

A team of scientists led by Ronald Hanson has succeeded in very accurately initializing and reading out a mini-quantum computer comprising four quantum bits on a chip of diamond. This breakthrough marks an important step towards a quantum computer and makes it possible to test advanced quantum protocols, such as teleportation, on a chip. The researchers have published their results in Nature *477, 574* (2011). •



ONCE UPON A TIME IN THE WEST

Fred Kavli



Fred Kavli

THE MAN AND THE DREAM BEHIND THE KAVLI FOUNDATION

Once upon a time in the west (of rural Norway), a young boy named Fred Kavli dreamed of "doing something of long range benefit for humankind". Today, a good seventy years later, we are benefiting from the realization of this dream with our Kavli Institute of Nanoscience in Delft, together with 14 other Kavli Institutes at leading universities worldwide. Who is this man whose name our institute bears and what is the story behind The Kavli Foundation and the Kavli Institutes? From his office in Santa Barbara the 84-year old Mr. Kavli, who is still actively involved in his foundation as the chairman, shared with us some highlights from his life's journey. It started with a dream, a fascination for science, and a small business he was running with his older brother.

Northern Lights and Niels Bohr

Fred Kavli grew up in a village in western Norway where nature was close and powerful. He vividly remembers enjoying the stars and the spectacle of the northern lights during the long winter nights, and wondering how it all worked and where it all came from. His curiosity for astrophysics was born here, and this later became one of the three main fields of basic science that his foundation supports, together with nanoscience and neuroscience. Apart from personal interest, Kavli choose these three fields because he believes they are the most exciting and promising ones of our time. While astrophysics searches for basic answers to questions on the origin of our universe, neuroscience endeavors to understand the most complex entity around, the brain, while (Bio-)nanoscience holds the potential of revolutionizing technology.

Kavli's love for science was furthered during his studies at the Norwegian Institute of Technology, where he got his masters degree in physics. Kavli recalls: "We had a very good professor in theoretical physics who was also a friend of Niels Bohr. He used to go down to Denmark during his summer holidays to visit Bohr and brought back all these stories of what they had discussed. He would go over them on the blackboard with us. That was very exciting and a lot of fun!"

Benefiting humankind

Kavli started dreaming of benefiting humankind much earlier though. In high school he was already discussing his ideas with his peers. "I was fortunate to go to a wonderful school in Norway and I had a great group of fellow students. We were very idealistic and discussed life, philosophy and what we wanted to do and accomplish. One of my thoughts was that I wanted to do something of long range benefit to humanity. And as my education later on was in science, I started thinking in the direction of funding basic scientific research. It was something that matured over time."

Kavli Institutes of Nanoscience

There are four Kavli Institutes in the field of nanoscience. Three of them are based in the United States, at Cornell, Caltech and Harvard University, while one is based in Europe, at Delft University of Technology. Each Institute approaches nanoscience with a slightly different emphasis. The Kavli Nanoscience Institute at Caltech focusses on biotechnology and photonics, with the goal of integrating individual nanoscale structures and devices into nanosystems. The Kavli Institute at Cornell is devoted to the development and utilization of next-generation tools for exploring the nanoscale world. The Kavli Institute for Bionano Science and Technology at Harvard aims to deepen our understanding of life and biology at the nanoscale level. The Kavli Institute of Nanoscience in Delft (KIND) explores the frontiers of nanoscience, orginally starting out with an emphasis on quantum electronic transport phenomena and more recently expanding towards the interface between nanoscience and biology. Our Kavli Institute at Delft is organized in two academic departments, the Department of Quantum Nanoscience and the Department of Bionanoscience. •

KIC Kavli Institute at Cornell

Kavli Institute for Bionano Science & Technology at Harvard University

KAVLI INSTITUTE of Nanoscience Delft

kni CALTECH The Kavli Nanoscience Institute

Ammeret Rossouw

Photo: Jacqueline de Haas

While being delayed from education due to the Second World War, Kavli spent his time decisively. Venturing with his older brother, he took his first steps into the world of business. "We started when I was about 12 years old by making planks that were used in manufacturing furniture. The farm where I grew up had a lot of timber so we cut down the wood and made the planks using a little sawmill. Then as the Second World War broke out, we started making what we called "generator knott": small briquettes of wood that were used instead of gasoline. The briquettes were heated in a cylinder mounted on the back of cars and provided the syngas to drive the engine. My brother devised and patented a special machine to fabricate the wooden briquettes, which we produced and sold. My brother was 7 years older, but he was very generous and gave me half the business which enabled me to pay for my academic studies later on."

From Kavlico ...

Despite his love for science, Kavli never considered a career in science itself. "I really wanted to make a success in business; I was quite business oriented as I started with it so early in life. This gave me the confidence that I could do it, but still I was fortunate to be succesful as it is not easy." Right after finishing his studies at the Norwegian Institute of Technology, Kavli moved to Canada where he worked for one year as an engineer. He then got the chance to move on to California and soon started his own business "Kavlico", developing and producing position and pressure sensors. "I moved to the U.S. for two big reasons: one was the climate, and the other was that at the time it was absolutely the place to be for a business in engineering. We just had the space race with Russia and there were tremendous opportunities for engineers and physicists! As a matter of fact, a lot of the rocket engineers came from Europe as there was a lack of them in the U.S."

Kavlico became very succesful, providing high-end sensors for the aeronautic and automobile market and patenting numerous inventions and new technologies. In 2000, Kavli sold his business, of which he was the sole share holder, for 345 million dollars. It was then that he started the Kavli Foundation. "During the years I was very busy with business, but I never forgot about my boyhood dream! In the end success in business enabled me to do something about that dream, which had been maturing over time. I'm not the only business man ending up in philanthropy. Many successful business people think about how to use the fruits of their life-time of work for some bigger purpose, as just being succesful in business and making a lot of money isn't really fulfillment of their life."

...to The Kavli Foundation

Kavli had planned and worked on starting The Kavli Foundation long before he sold the company, but in 2000 he really got started. He believes that basic scientific research and discoveries will eventually lead to a better quality of life for humankind. This is summarized in the mission statement of the Foundation: "The Kavli Foundation is dedicated to advancing science for the benefit of humanity, promoting public understanding of scientific research, and supporting scientists and their work". The Foundation implements its mission through a network of international activities that support each other in a synergistic way. Apart from fifteen research institutes, seven professorships, various symposia and other initiatives, the Foundation is also a founding father of The Kavli Prizes which are awarded biannually to recognize scientists for their seminal advances in astrophysics, nanoscience and neuroscience. The institutes however, of which there are ten in the U.S., two in China and three in Europe, make up the heart of the Foundations activities.

Having been out of academia most of his life, Kavli realized that he couldn't run the organization by himself. "We had to acquire the expertise and knowledge of the academic community. I started by getting advice from a friend David Gross, a Nobel laureate and professor at UC Santa Barbara. He encouraged us to set up endowments for institutes rather than professorships. Shortly thereafter, David Auston became president of the Foundation and did a great job finding the very best science teams, backed up by the strongest institutions. In starting the Kavli Institutes, we gained a lot of friends in the academic community who helped us to further develop the Foundation."

Kavli now runs his Foundation with the guidance of a board of directors that includes six extraordinarily accomplished people in science, business and academia. The board includes Robert Conn, who has been president of the Foundation since 2009.

Unexpected

A good ten years down the road, Kavli feels very happy and satisfied about the progress of the Foundation and the functioning of the Institues. "It's been more succesful than I had hoped for, quite frankly. I'm very satisfied and happy." When I asked him for a final word of encouragement to the members of our Institute, Kavli remarks: "Scientific research takes a lot of patience, effort and time. I think the discoveries sometimes come when you don't expect them, so you have to have the perseverance to dig in, and I think you do have that. I'm impressed with what you are doing!"

For further information, see:
www.kavlifoundation.org and www.kavli.nl

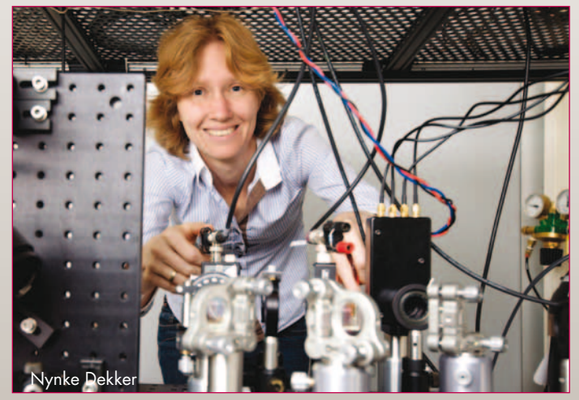
• **Ammeret Rossouw**

News

LNVH ANNIVERSARY PRIZE FOR NYNKE DEKKER

Nynke Dekker was awarded the LNVH anniversary prize, a sum of 500 euros and a certificate, on 5 September 2011. Four young excellent female scientists, each a winner in one of the four categories from social to natural sciences, did receive the prize from the Dutch Network of Women Professors (LNHV) on the occasion of its 10th anniversary.

Nynke has received this prize because she has built up a formidable reputation at a young age. Within and beyond her own university, Nynke Dekker fulfils an exemplary role as an organiser and figurehead of science. For example, she has previously received a Vidi and a Vici grant from NWO. And on 1 January 2012 ,she will become the first female member of the Executive Board of the FOM Foundation. We congratulate Nynke warmly. •



Nynke Dekker

Introduction new faculty


Chirlmin Joo

CHIRLMIN JOO, A SELF-INTERVIEW

LIFE AT 10:30 AM	
5:45 am	Walked out of home. Went to college. Started studying physics.
6:15 am	Took a brief break for military training.
6:45 am	Back to study. Mastered undergraduate physics.
7:15 am	Started a PhD. Joined a biophysics group.
9:00 am	Completed a PhD thesis. Jumped into biology.
10:00 am	Visited the Kavli Institute of Nanoscience in Delft.
10:15 am	Moved to Delft. Hired the first crew.
10:30 am	Still in the morning.

"You are a butterfly," he said. Dr. Johnathan Milton, my lifetime mentor, was pointing that I was too quickly switching from one topic to another when talking with him. Puzzled, I argued back. But I soon realized that he was right (as he had always been!) I had a habit of jumping between seemingly unrelated matters.

My last five hours are marked with drastic changes in academic subjects and geographic locations. After entering an undergraduate program at 5:45am in Seoul, South Korea, I was constantly bouncing back and forth between physics and astronomy. When I encountered with ethology and molecular biology at 7am, I learned that the universe was too complex (or too interesting) to be explained only by physics. This changed my future.

At 7:15am I flew over the Pacific Ocean to pursue a PhD in biophysics and joined Taekjip Ha's group in University of Illinois at Urbana-Champaign, USA. The Ha group was by then small (only 10 people) but grew exponentially afterward (to more than 30 when I left). That flourishing environment gave me an opportunity for tasting various new single molecule techniques. At 9am, I headed for the Narry Kim group in Seoul to taste the essence of biology. In the new place, I learned how to speak new languages and think in a biologically relevant manner.

After appreciating biology and biophysics, I decided to grow my own flower and make nectar of my own flavor. As far away as in Korea, I could smell the enthusiasm of the new Department of Bionanoscience in the Kavli Institute of Nanoscience. My visit to Delft at 10am convinced me that this place was where I could integrate my knowledge in biology and biophysics. With the historically strong nanoscience and the rapidly growing biophysics at the Kavli Institute in Delft, I felt confident to develop novel biophysical tools.

At 10:15am, I moved to Delft with 10 boxes of my belongings. Being an expert in the butterfly business, it took me only three seconds to start the new position and only a few minutes to hire my first members. The nectar that I am going to make with my crew will have a unique taste with the main ingredients of single molecule fluorescence and mammalian cell biology.

Single molecule biology has celebrated its successful first decade. But, because of its short history, it cannot yet help scientists explore novel biological systems. My group has recently developed a single molecule technique to use a soup of cell extracts and has applied it in studying human protein complexes. This new technique will enable scientists to investigate many other novel protein systems at the molecular level.

We are developing another new technique to address one of the challenges in biology. In human cells there are >20,000 protein species. To analyze a protein population, researchers read protein sequences. Current sequencing techniques have such limitations that they cannot cover a full spectrum of cellular proteins. By reading protein sequences at the single molecule level, my group aims to change the paradigm of proteomics.

Just like bringing up seemingly unrelated topics all at the same time, I have been jumping between apparently different scientific disciplines—physics, biology and biophysics. I believe this is how we can be creative—relating the unrelated. But we sometime need to stop jumping and delve into important subjects. Whenever I become too excited with a new idea, I look at my biological clock—which is passing 10:30am at the moment of this writing—and look ahead at the long afternoon waiting. After all, we come up with great ideas when we are alert but relaxed.

* To calculate your current biological time, assume that your clock started running from the midnight when you were born and it will reach the next midnight when you reach an expected lifespan (e.g. 80 years). Many of you will find that you went to a college early in the morning and obtained a PhD around at 9am. Now your clock may be indicating some time in the morning or early afternoon and there must be long hours waiting for you in the afternoon and/or in the evening.

• Chirlmin Joo

September 22, 2011

News

VENI FOR RUTGER HERMSEN

Evolution in heterogeneous environments:
Wherever they may be, organisms always adapt to their surroundings, and have spread to all corners of the world. It is therefore likely that spatial aspects are important to biological evolution. Nonetheless, most mathematical models of evolution fail to address this perspective. With his Veni research, Rutger Hermsen (1978) wants to understand how a heterogeneous environment can influence or accelerate evolutionary processes. •

VENI FOR VLAD PRIBIAG

In his VENI research study, Vlad Pribiag (1980) is trying to use a type of qubit to show and control the phenomenon of quantum entanglement, an unexplored territory within semiconducting nanostructures. Dr Vlad Pribiag gained a BSc at the University of Toronto and an MSc in Physics at Cornell University (2006), where he was also awarded his PhD (2010). Since then he has worked as a post-doctoral researcher at TU Delft. •

New employees

NEW EMPLOYEES DEPARTMENT BIONANOSCIENCE

Name	Date of employment	Title	Lab
Allard Katan	01/05/2011	Post doc	Cees Dekker Lab
Hugo Snippert	01/06/2011	Post doc	Cees Dekker Lab
Erwin van Rijn	01/07/2011	Technician	Department
Michela Martino	01/07/2011	PhD	Anne Meyer Lab
Magnus Jonsson	01/07/2011	Post doc	Cees Dekker Lab
Stanley Chandradoss	01/07/2011	PhD	Chirlmin Joo Lab
Daniel Burnham	18/07/2011	Post doc	Cees Dekker Lab
Anna Haagsma	18/07/2011	Technician	Department
Inge Geuzebroek	15/08/2011	Logistic support	Department
Amanda van der Vlist	01/09/2011	Management assistant	Department
Bronwen Cross	01/09/2011	Technician	Department
Mina Lee	01/09/2011	Post doc	Nynke Dekker Lab
Bojk Berghuis	01/09/2011	PhD	Nynke Dekker Lab
Andrew Scott	15/09/2011	PhD	Christophe Danelon Lab
Yaron Caspi	01/11/2011	Post doc	Cees Dekker Lab
Martin Depken	01/12/2011	Assistant Professor	Department

NEW EMPLOYEES DEPARTMENT QUANTUM NANOSCIENCE

Name	Date of employment	Title	Section
Andres Castellanos Gomez	01/05/2011	Post doc	MED
Reinier Janssen	01/06/2011	PhD	NF
Anna Spinelli	01/07/2011	PhD	MED
Dominique Meijer	01/08/2011	Management assistant	QT/Kavli Nanolab
Shibabrata Basak	01/09/2011	PhD	HREM
Tatiana Kozlova	01/09/2011	PhD	HREM
Anil Yalcin	01/09/2011	PhD	HREM

News items

KAVLI LOGO & AFFILIATION

Our Kavli Institute has a new logo. You can find this logo on www.kavli.tudelft.nl or request for the logo in various formats by sending an e-mail to A.vanderVlist@tudelft. Please use this logo and the affiliation below on your posters, publications, presentations and thesis.

Our affiliation is:
Department of Quantum/Bionanoscience
Kavli Institute of Nanoscience Delft
Delft University of Technology
Lorentzweg 1
2628 CJ Delft
the Netherlands. •

KAVLI INSTITUTE
of Nanoscience Delft

RONALD HANSON AWARDED FOR QIPC YOUNG INVESTIGATOR AWARD

The 2011 European Quantum Information Young Investigator Award has been awarded to Dr. Ronald Hanson and Dr. Stefano Pironio, by decision of the QUIE2T Advisory Board of Experts and upon approval by the QUIE2T Coordination Steering committee. Hanson receives this award for his experimental work on the coherent control and measurements of single spins in solids, and his proven leadership and independence through the successful establishment of his own research group. •

CONTRIBUTE TO THIS NEWSLETTER

Input to forthcoming newsletters is very welcome.
Please send any relevant material to
Amanda van de Vlist (A.vanderVlist@tudelft.nl).
If you like to contribute to this newsletter as an editor, please contact Cees Dekker. •

Jan Lipfert

Column

WILL THE TOP SECTORS GO TO MARS?

The current Dutch government is pursuing a new agenda of research and development (R&D), called "top sectors", to focus efforts in selected areas of science, technology, and business. The program aims to boost Dutch R&D efforts in prioritized fields, from food and agriculture to life science and high tech. As a nanoscience institute, we might rejoice in the fact that we are amongst the selected few sub-fields areas that are explicitly mentioned. However, upon closer inspection, I am unsure whether we should be enthusiastic about the program. The announcement of the program and its media coverage remind me of an episode from the Bush era in the United States. In January 2004, George W. Bush, then US president, announced a new space flight agenda, proposing to return to the moon and to eventually explore Mars. It called for robotic moon missions by 2008 and a new manned spacecraft by 2014. In the media, the announcement was rather well received and Bush junior scored points as a president who cares for science and technology. It was heralded as potentially being "the most far-reaching and ambitious space agenda since President Kennedy launched the Apollo program in 1961."
I was initially surprised by the announcement, which ended up teaching me a lesson in how political "spin" and science budgets can entangle. The template for politicians looks roughly as follows: 1) Announce a bold science and technology program (like going to Mars or boosting Dutch R&D in key sectors). 2) Receive positive media coverage for being a politician who cares about science. 3) Cut science funding in areas unrelated to your program and allocate a (small) fraction of the cut funding to the new initiative. As the end results, you will have made positive headlines and have saved money (that can be spend on something else). Without wanting to discuss the feasibility of Bush's Mars program or the merits of manned space travel, the simple facts are: the NASA budget as percentage of GDP dropped during the Bush years (Fig. 1), in particular right after 2004, and we witnessed the last US space shuttle flight for the foreseeable future in July.
Obviously, it is too early to judge the only recently announced top sectors with the benefit of hindsight, but I am quite worried that some of the same mechanisms are at work. The young academy of the Dutch Royal Society (KNAW) has already pointed out one important problem with the top teams in an open letter: The program will take money away from fundamental research in favor of more applied projects, to, in the words of minister Verhagen, go more directly "van kennis naar kassa" ("from knowledge to cash"). Not only do I agree with the KNAW about the importance of fundamental research and the intrinsic unpredictability of which avenues of research will be most fruitful in the future, I am worried for another reason: The net result of the top sector program might very well turn out to be a simple cut in science funding, leaving almost all sectors of Dutch R&D worse off.

• Jan Lipfert

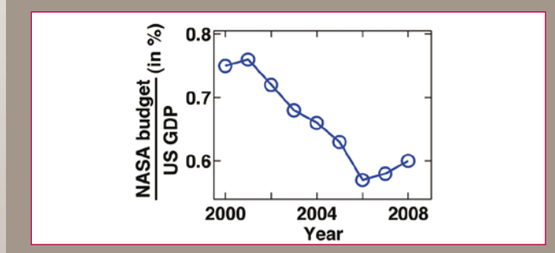
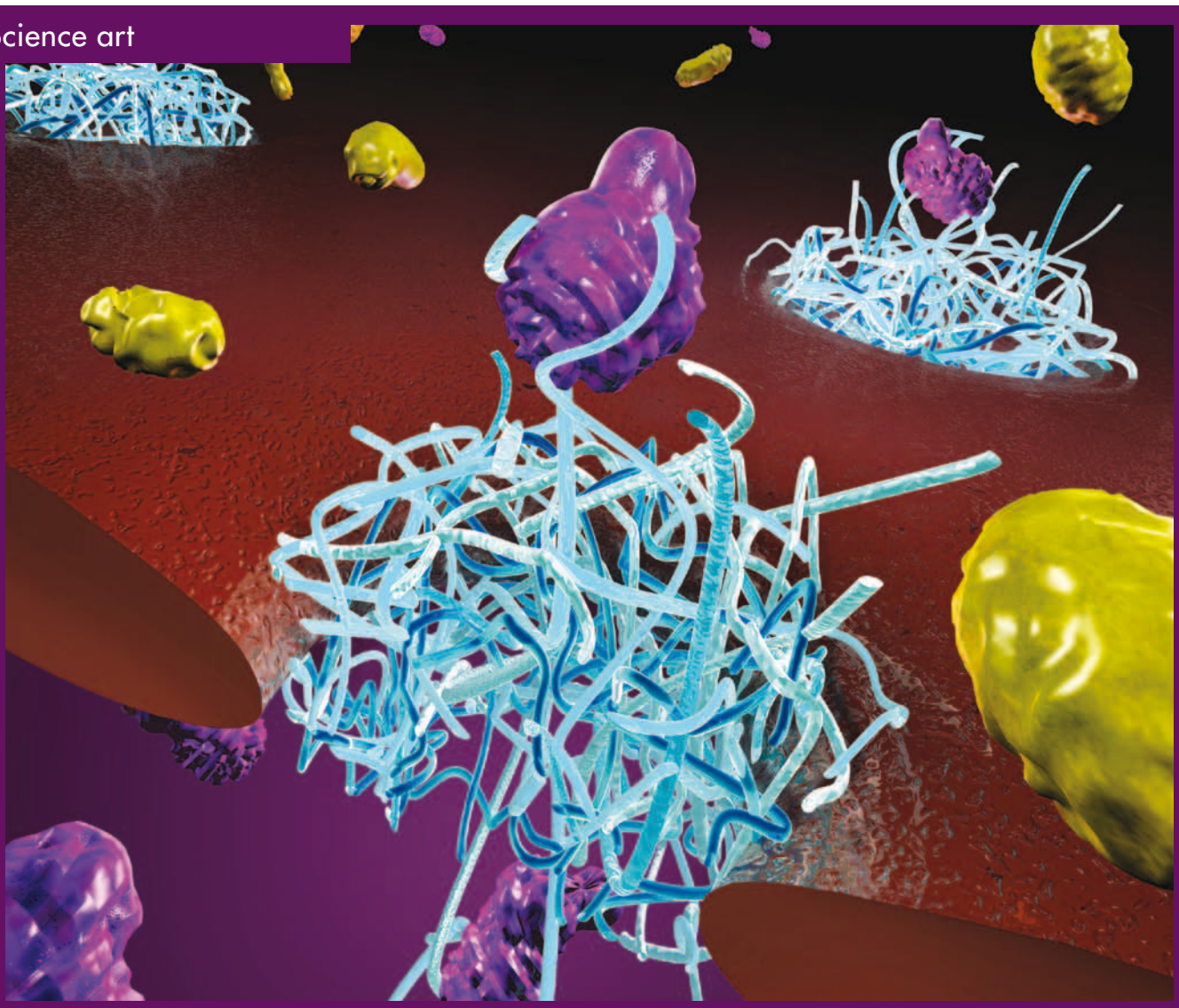


Figure 1.
NASA budget as percentage of US gross domestic product during the presidency of George W. Bush (2000-2008).

Science art



Artistic rendering of a biomimetic nuclear pore complex. Stefan Kowalczyk, graduate student in Cees Dekker's lab and collaborators at the University of Basel established a biomimetic nanopore that provides a unique test and measurement platform for the way that proteins move into a cell's nucleus. The biomimetic pore (blue) acts as a selective filter that lets certain transporter proteins pass (purple) while blocking transport of others (yellow). Further details in Nature Nanotechnology (June 19, 2011 – online). Image credit Cees Dekker lab / Tremani.

Please send suggestions for 'Science Art' to Amanda van der Vlist, A.vanderVlist@tudelft.nl

Upcoming Kavli Colloquia

KOSTYA NOVOSELOV

April 12, 2012

University of Manchester

Kavli Day

ANGELA BELCHER

September 13, 2012

MIT

Upcoming Kavli Colloquia

BONNIE BASSLER

November 22, 2012

Princeton University

Colofon

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