KAVLI NEWSLETTER

Kavli Institute of Nanoscience Delft

No.13

June 2015

IN THIS ISSUE:

Kavli Colloquium Jack Szostak • Major funding for Qutech • NanoFront PhD projects awarded • Invitation Kavli Day 2015

Big news just before this newsletter went to press:

135 M€ for Qutech

A consortium of the Dutch government, TNO, NWO, HTSM, and TU Delft will support Qutech in their efforts to develop a quantum computer with an impressive amount M€ 135 in the upcoming 10 years. We congratulate Leo Kouwenhoven and colleagues!

21 new Nanofront PhD projects awarded

In the forthcoming years (until 2022), a staggering number of almost 100 PhD students will be appointed in the NanoFront program to work on the frontiers of bionanoscience, quantum nanoscience, and nanotechnology. The majority of these PhD positions are allotted over the various research groups within NanoFront via three so-called internal PhD calls. The first edition of these calls was organized in 2013, resulting in 22 new PhD projects. The second NanoFront internal PhD call was run this spring and resulted in 32 proposals, out of which the NanoFront Steering group now decided to grant 21 PhD positions. Collaborative projects between quantum and bio, Delft and Leiden, or theory and experiments were particularly encouraged. The research fields of the awarded projects varied widely, ranging from 'cell division by fluctuations' to 'nanoscale tomography with single-proton resolution using a single-spin quantum sensor'. For a full overview of all the PhD projects that were awarded in the 2015 NanoFront Internal PhD call, see the table at page 6. For those who do not know what NanoFront is: In November 2012, nanoscientists of TU Delft and Leiden University were granted the research programme 'NanoFront'. With an amount of 51 million euros, it was one of the largest Dutch investments in fundamental science ever.

"Agreed. We fund only those proposals we can understand."

IN THIS NEWSLETTER

Just as we were finishing this newsletter, breaking news came in: Leo Kouwenhoven and colleagues were awarded a stellar amount of 135 M€ for their efforts to develop a quantum computer with the Qutech consortium that prominently includes some of our Kavli faculty. We congratulate them with this great news!
Looking ahead, on Friday June 26 we will host Jack Szostak from Harvard University for a Kavli Colloquium on 'the origins of cellular life'. Jack won the 2009 Nobel Prize for his work on telomeres. His lab now focuses on understanding the origin of life on Earth, and the construction of artificial cellular life in the laboratory – truly major questions.
Furthermore in this newsletter: the Kavli Day on the beach with Uri Alon, 21 NanoFront PhDs, the last columns by Bojk Berghuis and Miriam Blaauboer, and much more.
Enjoy!

• **Cees Dekker**

COLUMN

Crowdfunding of research: valorisation at its best

It has become a new trend for setting up an art project or launching a start-up company: crowdfunding. To realize an idea, a project initiator or entrepreneur draws on small contributions from a large number of individuals, often using the internet and without standard financial intermediaries. In exchange for their financial support, investors ("project backers") are commonly offered a reward, such as shares, free tickets, special services etc.

The online crowdfunding platform Experiment.com is doing the same for scientific research. Anyone with a great idea for a scientific project can post it on their website, specify a target budget and ask for donations. If the funding target is reached within a given period of time Experiment transfers all donations received (minus an 8% fee) to the project initiator, thereby funding the project. If not, no one is charged. In order to help prospective donors to make informed decisions the platform encourages endorsements, with specialists commenting on proposed research and qualifications of researchers.

Backers of a successful project are rewarded by "seeing the science unfold in front of their eyes". How this is done depends on the project – initiators offer their donors rewards ranging from periodic updates on the progress of the project to 10 "Khan academy"-style videos summarizing important insights gained. In all cases the idea is that investigating a scientific question is like building a story, with many layers, characters, twists and turns, and that the most appealing reward for a project backer is to be part of that story.

Since its start in 2012, Experiment has funded over 4000 projects, raising close to 2M$ and forming partnerships with over 50 universities. The platform is currently only open for US-based projects. But it plans to be available internationally soon. Successful nanoscience-related projects include titles such as:

Using nanoparticles to activate immune cells to fight tumors (posted by a faculty member of the University of Iowa), *Targeted drug delivery by using magnetic nanoparticles* (initiated by two student researchers at the University of York), and *Can genetic diversity preserve friendships?* (proposed by a graduate student from California State University).

Isn't this a great way to apply for funding of a project that you believe in but that may still be too unusual or too early for standard funding agencies to look at? Isn't it a great way to seed money for realizing a proof-of-principle experiment, exploring an early-stage hypothesis, or setting up a new technique, perhaps to be followed up with a "regular" grant proposal?

The items that money is typically raised for — production of samples, buying materials, lab testing — make a good fit with research in nanoscience. Defining a project does not require much writing and thinking about rewards (lab tours, adopting a fridge…) should be fun.

But above all of this, what I find particularly appealing about this funding system is that it combines doing research with making a direct connection to the public, allowing them to be part of a scientific discovery. By way of its nature, crowdfunding of research provides direct valorisation of science by connecting people.

• **Miriam Blaauboer**

INTERVIEW

Breathing life into chemistry: An interview with Nobel laurette Jack Szostak

Catered by an enthusiastic atmosphere regarding science and engineering at home, which led to frequent explosions in his chemistry lab in the basement, Jack Szostak fell in love with science at an early age. After completing a PhD at Cornell University, which involved chemical synthesis of oligonucleotides for gene detection, he dived into yeast genetics and recombination studies principally carried out at the Sidney Farber Cancer Institute, affiliated with Harvard Medical School, superbly pulling it off with Nobel prize-winning work on telomere maintenance and its relation to senescence and aging. Keen on exploring pristine, interesting and fundamental questions, prof. Szostak then shifted his focus towards ribozymes and de novo protein evolution. He currently works on the origin of life and is determined to build evolving and replicating chemical systems in his lab at the Massachusetts General Hospital and Harvard University. What follows is a short interview I was privileged to conduct with prof. Szostak:

To me, the term 'life' seems more like a conceptual line that we are still struggling to put somewhere in between the animate and the inanimate objects. What are your thoughts on this? At what point will you say that you have created life in your lab?

I am more interested in defining a continuous pathway from chemistry to biology than in pinpointing an exact dividing line between the two. The closer you get to the boundary between the two, the fuzzier that boundary appears. Complex chemical systems morph step-by-step into systems with more and more of the properties of life, as we know it in modern biology. Even Darwinian evolution, the hallmark of biology, emerges in stages from simple sequence biases in chemical RNA synthesis to the open-ended evolution of diverse metabolic ribozymes in the advanced RNA world. This latter stage is the ultimate goal of our laboratory experiments: we would like to see the spontaneous evolution of new ribozymes that increase the fitness of our replicating protocells. I would consider such cells to be a primitive form of life.

Following up on the previous question, would you rather view life in a more quantitative fashion, something like 'lifeness'?

That would be a totally subjective impression, since there is no metric of 'lifeness'. Our most advanced system to date exhibits limited chemical RNA copying inside membrane vesicles, where the vesicles are of a type that we have previously shown can grow and divide repeatedly. Our current goal is to make the RNA copying more efficient and general, so that we have fully integrated RNA and vesicle (i.e. protocell membrane) replicating system. Such a system would set the stage for the emergence of new selectively advantageous RNAs, i.e., for a laboratory 'origin of life'.

It is interesting that you are trying to resolve the past (the origin of life) by making synthetic cells, which will open up a whole new future. Just how revolutionary do you think that will be? Can you speculate on any exciting applications that you might have at the back of your mind?

My interest in this project is motivated more by the desire to understand how life got started on the early Earth, and whether it might also have started elsewhere in the universe. Personally I think the immediate practical applications will be limited – after all, such primitive systems will be much less sophisticated than even the simplest bacterium. However, in the longer term, the process of designing and building novel types of living systems will no doubt become easier, and it will become possible to design increasing complex living systems. Whether such systems will ever have practical applications is difficult for me to say.

What makes the bottom-up approach your personal favorite when compared with the top-down one? Do you see a complementary relation between these two?

These approaches are complementary, and I do think that efforts to reconstitute simple bacterial cells from components are quite interesting. However the big gap between the top-down and bottom-up approaches is the translational system. Roughly 200 components are required to allow for ribosomal protein synthesis, and simplifying this system is a daunting task. In contrast, our approach is facing the hurdle of going from zero genes to one gene, and building up a system that could begin to allow for coded protein synthesis is far in the future. But understanding the origins of protein synthesis, i.e., the genetic code and the ribosome, may benefit from both approaches.

KAVLI COLLOQUIUM JUNE

KAVLI COLLOQUIUM

Date: June 26, 2015 at 15.00 hours Location: Joost van Grinten room, Faculty of Industrial Design

'Origins of Cellular Life'

Jack Szostak

Harvard University

On friday June 26, 2015 will feature a Kavli colloquium by Jack Szostak.

The abstract of this colloquium reads as follows: The complexity of modern biological life has long made it difficult to understand how life could emerge spontaneously from the chemistry of the early earth. We are attempting to synthesize simple artificial cells in order to discover plausible pathways for the transition from chemistry to biology. Very primitive cells may have consisted of a self-replicating nucleic acid genome, encapsulated by a self-replicating cell membrane. A chemically rich environment that provided the building blocks of membranes, nucleic acids and peptides, along with sources of chemical energy, could have led to the emergence of replicating, evolving cells.

Jack Szostak

15.00 h	Pre-programme:
	Eberhard Gill: 'Nano-satellites from TU Delft' Pascale Ehrenfreund: 'The challenge of searching for life on Mars' Akira Endo: 'Dawn of Superconducting Astrophotonics'
15.45 h	Break
16.00 h	Kavli colloquium by Jack Szostak: "Origins of Cellular Life "
17.15 h	Drinks & time to meet

HOTTOPICS

'Towards recreating a prebiotically plausible protocell'

Date: June 26, 2015 at 10.00
Location: Lectureroom G, F207

The tutorial is open for everyone to attend. The second part of the meeting is reserved as a discussion hour for the registered class of PhD students and postdocs with the lecturer.

Please register on casimir.researchschool.nl

What clear difference do you sense in your pre-Nobel and post-Nobel career? Did you ever run into a situation where getting a Nobel actually felt like a disadvantage?
I feel little difference, as I am just as focused on scientific research now as before the Nobel. Sometimes I feel that expectations are higher and reviews of papers are tougher, but this is not a serious problem. I have no complaints!

How satisfied are you with the way science works at the moment? What is one crucial change that you would love to see regarding the current scientific environment?
This is a fantastic time for science – we have so many new tools that are enabling amazing new discoveries in all aspects of science. Of course, things are never perfect, and there are never enough resources to do all of the things that one might like to do or see done. I would like to see more science funding directed in a manner that would maximize the creativity of individuals, for example by identifying people who have been productive in the past and allowing them to pursue their dreams without having to justify every new idea to inherently conservative review committees.

After a highly successful telomere-related work, you made a sudden transition towards RNA enzymes and then towards origin of life. Are we going to witness another transition: Is there something new sizzling in your mind that you would like to share?
Actually, those transitions were not so sudden, and both occurred over a period of several years. The field of Origin of Life studies is so broad that I anticipate staying in that arena indefinitely. We have recently transitioned from a focus on the biophysics of replicating membrane systems to a new focus on the chemistry of nonenzymatic RNA replication, and it is possible that future progress in understanding the Origin of Life will require additional shifts in focus.

- **Siddharth Deshpande**

KAVLI DAY 2015 @ THE BEACH

Save the date! September 10

Invited speaker: Uri Alon, 'Love and fear in the lab'

NEW EMPLOYEES

Name	Date of employment	Title	Lab
Jelmer Boter	24-11-2014	PhD	QT
Niels Bultink	1-12-2014	PhD	QT
Johannes Kattan	1-1-2015	PhD	Christophe Danelon lab
Juan Luis Aguilera Servin	01-01-2015	Postdoc	QT
Igor Marinkovic	01-01-2015	PhD	MED
Nikos Papadopoules	01-01-2015	PhD	MED
Thijs Cui	01-01-2015	PhD	Chirlmin Joo lab
John Watson	01-01-2015	PhD	QT
Aysen Norte	01-01-2015	Postdoc	Nynke Dekker lab

Nynke Dekker appointed as member of KNAW

Congratulations to Nynke Dekker, who has been elected as one of sixteen new members to the Royal Netherlands Academy of Arts and Sciences (KNAW). Members of KNAW, leading scientists and scholars from every discipline, are elected from nominations submitted by their peers within and outside of the Academy.
The KNAW has around 500 members, spread across the Humanities and Social Sciences Division and the Science Division. Members are elected for life. The new Academy members will be installed on Monday 28 September 2015 in the Trippenhuis, the official seat of the KNAW.

Vidi grant for Chirlmin Joo

Kavli scientist Chirlmin Joo will receive a Vidi grant of 800.000 euros from the Netherlands Organisation of Scientific Research (NWO). This grant enables his group to further understand and harness the genome editing ability of bacteria.

Inaugural speech

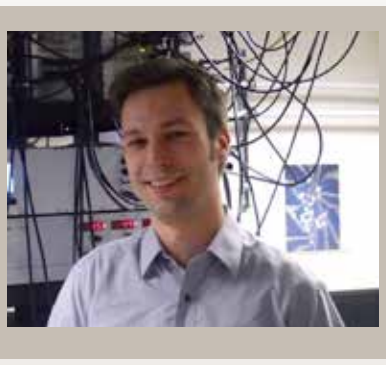
On Friday the June 12, Marileen Dogterom will present her Inaugural Speech in the Auditorium (Aula), at 15.00 hours. If you are interested in answers on questions such as "What is nanobiology?" and "What is a nanobiologist?" then you are cordially invited to attend her speech!

KNAW Royal Academy Professor Prize for Cees Dekker

The Royal Netherlands Academy of Arts and Sciences (KNAW) has awarded this year's Academy Professor Prize to Cees Dekker. Famed as the 'lifetime achievement award' of the academic field, two separate prizes are conferred each year: one to a scholar in the social sciences or humanities, and the other to a scientist in the natural, technical or life sciences. The award includes prize money of one million euros, to be used towards research at the recipient's discretion. The second prize has been awarded to professor Birgit Meyer from Utrecht.

The Academy commends Cees Dekker's impressive career, including his work on carbon nanotubes in the 1990s – work the Academy lauds as iconic within the field of nanotechnology. "As early as the nineties, he achieved international recognition for his pioneering research into the characteristics and applications of carbon nanotubes." Cees Dekker and his associates currently focus on the machinery of living cells: "His research demonstrated how individual DNA and protein molecules cooperate, for example to repair damage in the genetic code. He developed 'nanopores': holes so small that individual DNA molecules can be pulled through them in order to read the genetic code", reports the Academy.

Congratulations to Cees for this well-deserved prize!



Rubicon fellowship for Hannes Bernien

On 2 April, Hannes Bernien received the Rubicon fellowship. With this fellowship, NWO provides young scientist the possibility to get experience in international research as a stepping-stone to a scientific career.
For the upcoming two year, Hannes Bernien will conduct his research on quantum network nodes at Harvard University. In a quantum network, it is possible to send information that cannot be hacked. At Harvard, Hannes will work on developing a fundamental part of a quantum network: the node.

ERC advanced grant to Cees Dekker for artificial cell division

Cees Dekker received an ERC advanced grant (his second grant of this type) for research on synthetic cell division. With the aim to achieve this synthetic cell division, his lab will receive 2.5 million Euro for a five-year research programme. His lab will construct liposomes (soap bubble-like vesicles containing a watery solution of proteins and DNA), which will be engineered to spontaneously divide via a protein ring around the circumference of the liposome which can contract.

erc
European Research Council

Masters Nanobiology

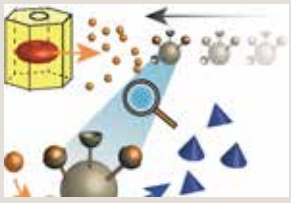
Smallest Challenges – Nanobiology – Greatest Solutions

In 2012, the new Nanobiology bachelor program started, initiated by the Department of Bionanoscience and Erasmus MC. So far, the bachelor program has been very successful. Every year, around 90 students enroll in this program. In the last two years, a curriculum has been developed for the master's program that will start in September 2015.
In the Nanobiology bachelor's program students have acquire fundamental knowledge and competences in mathematics, physics and molecular biology. The focus of the master's program is to deepen and extend this knowledge, to specialize in one or a few subfields, and to show competency in applying the knowledge in research. In the courses, physics and biology will be integrated as much as possible. This will be achieved by organizing regular faculty meetings for both TU Delft and Erasmus MC faculty, as has been successfully done in the bachelor's program.

HIGHLIGHT PAPERS

A Collective path toward regeneration

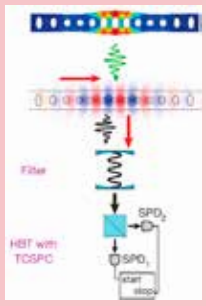
In this invited perspective / brief review paper, we highlighted a recent work in which the researchers discovered that hair follicles collectively regenerate plucked hairs by "counting" together the density of plucked hairs, a form of "quorum sensing". We then provide some insights and guesses into as yet unknown design principles of multicellular systems that use cell-to-cell communication and genetic circuits as "Lego blocks" for realizing various multicellular behaviours.



T. Maire, H. Youk.
Cell 161, 195-196; April 2015

Phonon counting and intensity interferometry of a nanomechanical resonator

In the publication we perform a Hanbury Brown and Twiss type experiment with phonons (mechanical excitations). We demonstrate how the phonons have different statistical properties depending on how strongly the mechanical oscillator is driven with a laser. The mechanical motion changes from a thermal state to a displaced thermal state, which is very similar to the state of a laser (coherent state). The read-out is done by mapping the mechanical oscillations onto a laser and measure the statistics of the photons a novel method that paves the way to observe non-classical mechanical behavior in the near future.



J. D. Cohen*, S. M. Meenehan*, G. S. MacCabe, S. Gröblacher, A. H. Safavi-Naeini, F. Marsili, M. D. Shaw, and O. Painter, Nature 520, 522-525 (2015)

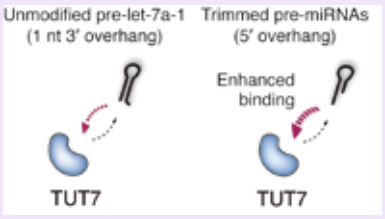
Detecting bit-flip errors in a logical qubit using stabilizer measurements

Our researchers demonstrate basic quantum error correction with a five-qubit superconducting processor.
By encoding one qubit's worth of information in an entangled state of three qubits, and using the other two qubits to perform quantum parity checks, bit flip errors are detected without compromising the encoded information.

D. Ristè, S. Poletto, M.-Z. Huang, A. Bruno, V. Vesterinen, O.-P. Saira & L. DiCarlo
Nature Communications 6, 6983 (2015)

TUT7 controls the fate of precursor microRNAs by using three different uridylation mechanisms

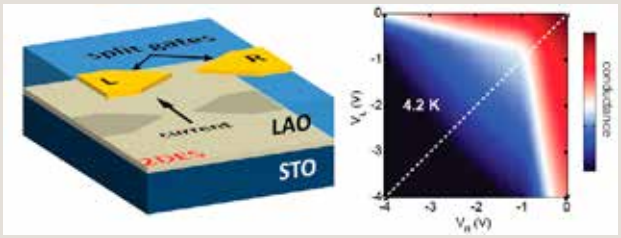
MicroRNAs (miRNAs) are a class of short non-coding RNAs that play a key role in the regulation of gene expression in eukaryotes. We have previously reported that terminal uridylyl transferases (TUTs) function as integral regulators of miRNA biogenesis. Using biochemistry, single-molecule and deep sequencing techniques we uncover the molecular mechanism by which human TUT7 recognizes and uridylates precursor miRNAs. We find that the overhang length of the precursor miRNA is the key factor that modulates the binding frequency and uridylation pattern of TUT7.



Boseon Kim*, Minju Ha*, Luuk Loeff*, Hyeshik Chang, Dhirendra K. Simanshu, Sisi Li, Mohamed Fareh, Dinshaw J. Patel, Chirlmin Joo, & V. Narry Kim
* Equal contribution
EMBO Journal embj.201590931 (2015)

Nanoscale Electrostatic Control of Oxide Interfaces

The interface between two insulating complex oxides (Lanathanum Aluminate and Strontium Titanate) hosts a two-dimensional sheet of conducting electrons, that turns superconducting at low temperatures. In this work we show that using appropriately designed metallic top gates it is possible to control the conducting (and superconducting) properties of this interface at the nanoscale. This in-situ control of the potential landscape provides a flexible and versatile route towards building tailor-made nanostructures to study and exploit the rich electronic phase space inherent to oxide interfaces.



Srijit Goswami, Emre Mulazimoglu, Lieven M. K. Vandersypen, Andrea D. Caviglia
Nano Letters 15, 2627 (2015)

Granted proposals in the NanoFront Internal PhD call 2015 (In alphabetic order)

Synergy Proposals

Applicants	Title of the proposal
Anton Akhmerov and Vincenzo Vitelli	Anderson localization in Topological Mechanical systems
Bertus Beaumont and Marie Eve Aubin-Tam	Reprogramming of anti-bacterial nanomachines
Christophe Danelon and Thomas Schmidt	Cell Division by Fluctuations
Martin Depken and Chirlmin Joo	The nano-mechanics of fast, specific, and efficient microRNA target search
Luca Giomi and Daniela Kraft	Curvature driven localization of lipid nano-domains: from the plasma membrane to artificial cells
Simon Gröblacher and Milan Allan	Novel microfabricated devices for combined scanning optical near-field and tunnelling microscopy
Liedewij Laan and Andreas Engel	Reconstitution of Cdc42-based polarity establishment in vitro
Anne Meyer and Herre van der Zant	Biologically patterned graphene
Jan van Ruitenbeek and Henny Zandbergen	Atomically thin Bi films as 2D topological insulators
Stefan Semrau, Timon Idema, and Sander Tans	Cell adhesion molecules and cell sorting: towards the spatial control of artificial tissues
Gary Steele and Andrea Caviglia	Coherent control of quantum matter

RECENT PHD THESES

O disordered superconductors

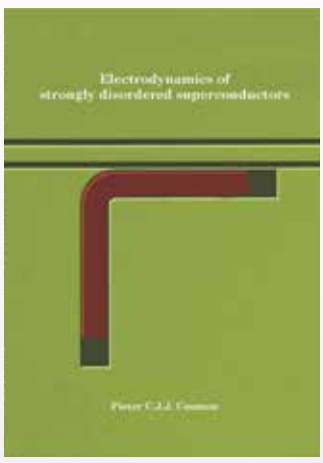
Electrons can be fixed by anarchy
In nanowire as thermometer
To monitor by an astronomer
Each photon flying through the galaxy.

It is a quantum thing – so much is true
Creating super sensitivity
By means of endless resistivity
But how it really worked, we had no clue.

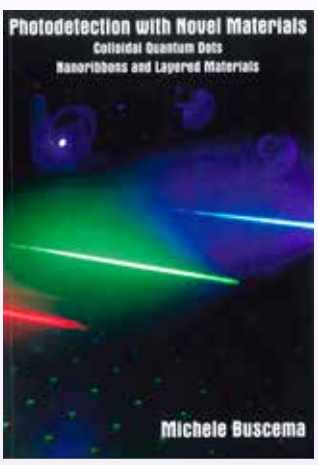
Therefore we started our experiment
With quasiparticles in excitation
Modelling some α element

To find the right phase fluctuation
In a zero K environment.
Coming soon as homespun application!

Poetic impression by Bauke Steenhuisen of the dissertation 'Electrodynamics of strongly disordered superconductors' by P.C.J.J. Coumou, defended on February the 6th 2015 in Delft.



Pieter Coumou
6-2-2015



Michele Buscema
11-5-2015

Ronald van Leeuwen
18-5-2015

Zohreh Nourian
8-6-2015

Single Applicant Proposals

Applicants	Title of proposal
Carlo Beenakker	Topological optomechanics
Greg Bokinsky	Visualizing high-speed homeostasis in single cells: How bacteria use their growth rate speedometer
Christophe Danelon	Assembly of a Minimal Cell: Bringing Parts Together
Cees Dekker	DNA structure in live cells shaped with nanofabrication
Nynke Dekker	Dynamics of the fully reconstituted yeast replication fork studied at the single-molecule level
Ronald Hanson	Nano-scale tomography with single-proton resolution using a single-spin quantum sensor
Leo Kouwenhoven	4π interferometry using Majorana bound states
Yuli Nazarov	Quantum mixtures of topological and non-topological states realized with superconducting junctions
Michel Orrit	Vapor Nanobubble as a Nano-sonar
Hyun Youk	Phase Transitions in Stem Cells: Programming Cells with Nano-devices and Statistical Mechanics

COLUMN

SUPPORTING CONVERSATIONS

During a recent conversation with a technician, let's call him 'Cherry Maker' (CM, not to be confused with cherry picker), I wanted to know what being support staff meant to him. "Assimilation." he answered, and after seeing my puzzled face, he added: "It's becoming what you always dreaded as a researcher." "Well", I said, "isn't that a bit dramatic?" CM: "No! I find it quite funny. When I was a young grad student a long time ago, I found the sight of a technician going home at 5, irrespective of the status of the experiment, horrifying. Same when a technician's interest in a paper did not go beyond his/her own contribution."

"Now" he said with an ironic smile, "I can just feel those looks from grad students as soon as I leave for home at around 5! Look Bojk," CM said in his usual tongue-in-cheek manner, "you PhDs like to think it's all about you and your research, but as a technician you have come to realize that hierarchy and continuity come first, then comes a whole lot of nothing and other stuff, and then come the PhDs…" Me: "So where's the assimilation part in this and why is this funny?" CM: "Because I realize now that every researcher-turned-support unavoidably assimilates towards this other way of thinking, irrespective of the initial world view. It's nurture pur sang!"

Interesting sense of humor, that Cherry Maker, I guess that also comes with the years. What I also wondered was: what makes someone really good at their support job? In my eyes, many of the most talented scientists amongst us would fail miserably at the jobs of the support staff.

Many times during the past couple of years I have witnessed the craftsmanship of the supporting staff at its best: Of course most of us grad students would be totally lost without being able to rely on the vast pool of knowledge and skill of the many Kavli technicians. And the organization of the myriad of Kavli events: is there anyone who honestly believes this would be in safe hands with us scientists? Take for example the seemingly insignificant detail concerning the division of hotel rooms during the recent Nanofront retreat: where many of us would have simply met the basic requirement of splitting up the sexes and making a division in alphabetical order, some support staff member actually went through the effort of placing us in rooms based on existing friendships or matching characters. A sense of social tact I found quite remarkable.

After pausing for a moment CM said: "Doesn't that also have to do with the fact that we all know each other?" Me: "Good point, I guess our organization is still smaller than Dunbar's number." CM: "Say what?" Me: "Well, a certain Dr. Dunbar allegedly found that the social coherence you are referring to starts to fall apart above group sizes of 150." Besides the fact that we might need to start worrying about further department growth, we both agreed that it is the individuals in an organization who deserve credit for actually giving it their own personal touch. In that sense I think us non-self-supporting scientists are in good hands here.

•**Bojk Berghuis**

SCIENCE ART

Artist's impression of unpaired quasiparticles represent an intrinsic source of decoherence in superconducting quantum circuits. A small island of niobium titanium nitride (NbTiN) alloy attached to aluminum leads acts as a filter of quasi-particles without impeding Cooper-pair transport.
Image by TU Delft/Tremani

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

UPCOMING KAVLI COLLOQUIUM

Uri Alon

September 10, 2015

Weizmann Institute of Science

KAVLI DAY

SEPTEMBER 10, 2015
@ THE BEACH
NOORDWIJK

UPCOMING KAVLI COLLOQUIUM

Charles Kane

June 30, 2016

University of Pennsylvania

COLOFON

The Kavli Newsletter is published three times a year and is intended for members of the Kavli Institute of Nanoscience Delft and those interested. PDF versions of all Kavli Newsletters can be found at www.kavli.tudelft.nl

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