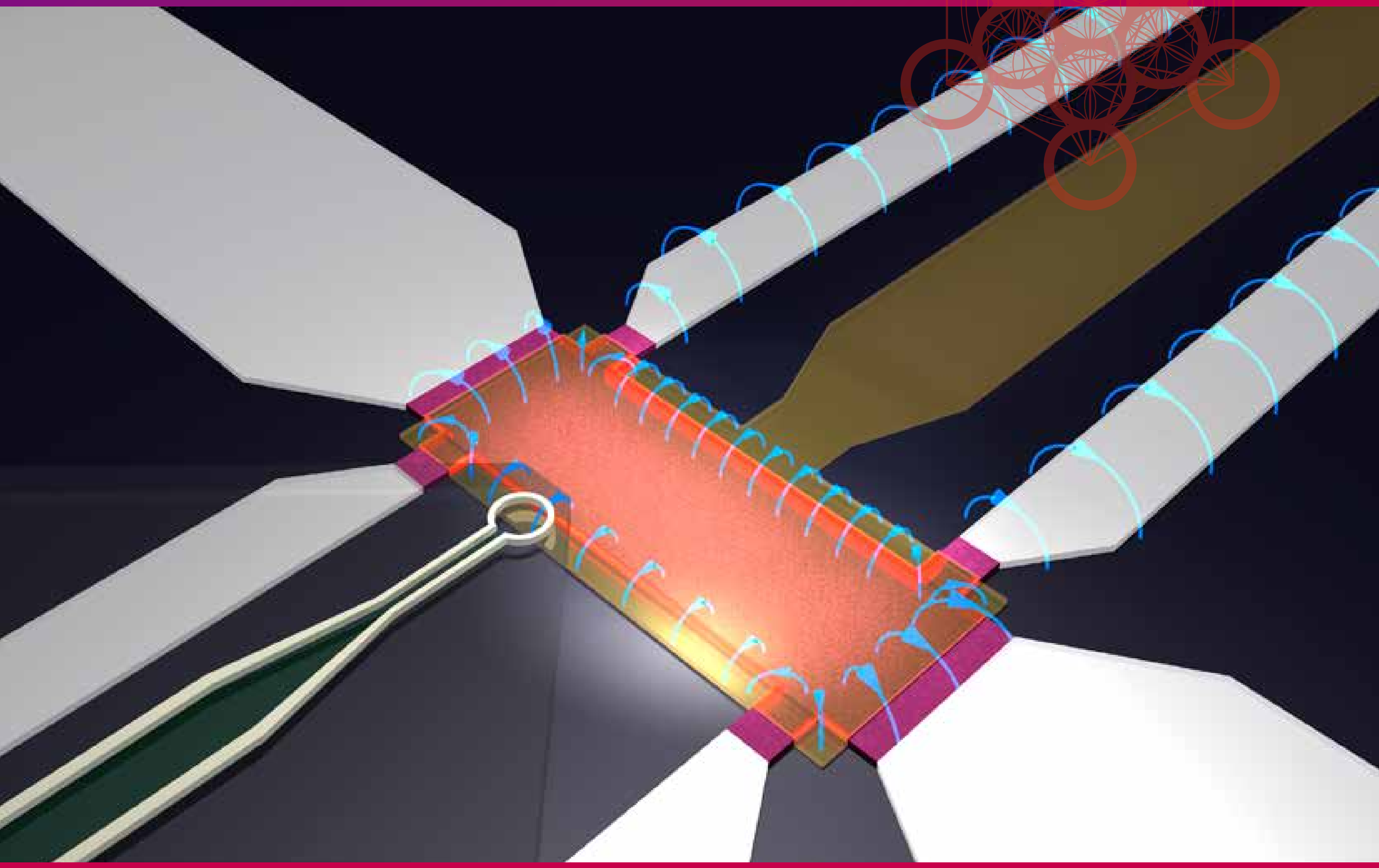
KAVLI NEWSLETTER
Kavli Institute of Nanoscience Delft

No. 15
February 2016



IN THIS ISSUE:

Kavli Colloquium Kathryn Moler • Self interview Kobus Kuipers • Overview five Nano-Institutes with Interview Paul McEuen

Five Kavli institutes in nanoscience worldwide, a student perspective

Working in frontier research areas in an internationally recognized university, is a stimulating environment in itself for a budding scientist. In fact, as a PhD student at our Kavli Institute at Delft, there is a palpable sense of mystery and discovery (or utter confusion?), as people talk of quantum computers and 'spooky action' on the same floor, as of synthetic cells, bacterial "arms races" and viral memory. You begin to feel that you ought to know your workplace inside out, especially if an apocalypse should ensue because of misguided experiments from over-enthusiastic scientists.

When you have that additional tag of "Kavli" for an institute within the university, it makes one wonder all the more what it is all about. Considering that there are other Kavli institutes elsewhere, it gets one asking if this is a holy brotherhood of some sort? Or is it just that people take pride (why would one do so, eh!, from the economic sense) in getting funded from just one primary source? Or is it some esoteric labelling for scientists, so that we are distinguished in some way?

So what is all that with those Kavli Institutes? Here is a short primer on Kavli Nanoscience Institutes that I would like to share with you. I write this article as I try to understand a bit of the true core of Kavli research. In doing so, we also get to appreciate of how we - at Kavli Delft - contribute to the "big picture" mission of Kavli foundation.

The Kavli institutes come under the umbrella of the Kavli foundation - which is named after its pioneer Fred Kavli. As an entrepreneur and philanthropist, he divested the shares of his business venture, the Kavlico corporation, to set up this scientific philantropy. Founded in December 2000 and based in Oxnard, California, the Kavli Foundation is dedicated towards advancing research in astrophysics, nanoscience, neuroscience and theoretical physics through its 20 institutes in the US, Europe and Asia.

Narrowing down our focus to the Kavli Nanoscience institutes exclusively, 4 out of 5 of these are in the US - located at Caltech, Cornell, Harvard and Berkeley. A glimpse of their research is presented below.

continue to read on page 4 >>

IN THIS NEWSLETTER

A relatively brief newsletter this time, as it follows up on our previous one pretty quickly. PhD student Sumit Deb Roy has taken a look at the five Kavli institutes in nanoscience worldwide and provides a brief overview. He also interviewed Paul McEuen, director of the Kavli Institute at Cornell, who has interesting things to say about beining a Kavli Institute. Read about it, starting here on this front page and continuing on page 4.

A highlight looking ahead will be on *Wednesday* February 3, when we will host Kathryn Moler from Stanford University for a Kavli Colloquium on 'Where the electrons flow: currents in quantum materials'. Kathryn Moler is the Director of the Center for Probing the Nanoscale, where Stanford and IBM scientists use and expand scanning probe methods for measuring, imaging, and controlling nanoscale phenomena. Her research ranges from imaging magnetotactic bacteria to vortex dynamics in mesoscopic superconductors. We this look forward to an exciting Kavli Colloquium.

Furthermore, Kobus Kuipers, the new chair of Quantum Nanoscience, introduces himself in this newsletter (see page 5), and you can enjoy the column by Martin Depken who proposes an arithmetic for fairness in funding. And there's more in this newsletter. Enjoy!

• Cees Dekker

COLUMN

In the cuckoo's nest

As a PI you have the dubious pleasure of constantly thinking about funding. Procrastinating in my duties, I recently found myself ruminating on the measures used to allocate grants. Lacking data, I tried to understand what would be best practices given the goals of funding bodies. If you bear with me, I will explain why this exercise left me feeling that something is definitely amiss!

A professor's (P) future performance is probably best predicted by past successes. There might be little surprise then, that funding bodies ask for the applicant's publication record and other appropriate indicators of past performance (O_P). Merely using a total output score ($S_{out} = O_P$) seems to introduce a dangerous and self-perpetuating bias though, as the large groups produce more, attract more funds, grow even larger, and so on ad infinitum.

Large groups might not be a problem, but to know this, we first have to establish the general goal of funding agencies. To get the most bang for the buck seems a reasonable aim when spending resources, so let us assume funding agencies operate according to this maxim. To achieve this goal, the strategy is simple: allocate resources, not to the professor that has the highest output, but to the professor who will produce the most additional output using those resources. Optimally then, if we were to measure resources in, say, PhD positions (N_P), the professor with the highest marginal output ($S_P^{opt} = \partial O_P / \partial N_p$) should be successful in each hiring round.

Unfortunately, we do not have all the information needed to implement this optimal scoring system. To do so, we would need to know how outputs depend on group size ($O_P(N_P)$) for all competing groups. Lacking this information, we should look for a scoring system that comes close to the optimal one, while still being implementable. An approach closer to the optimal selection criteria would be to approximate the marginal output with resource efficiency ($S_P^{opt} \approx S_P^{eff} = O_P / N_P$). Though still not perfect, this strategy should lead to a distribution of funds more in line with what is optimal. At the very least, the efficiency measure has the right units (!), and will score a small group running a tight ship as a better place to put funds than a larger less efficient group.

Of course, there are many criteria that contribute to any evaluation, but the first step toward a good decision is to focus on the relevant data. Focusing on irrelevant data instead, I suspect that we have bred cuckoos in our nest; letting the largest groups—not necessarily the most efficient ones—gobble up resources far beyond what is beneficial for the output of the field at large.

• **Martin Depken**

INTERVIEW

An interview with Kathryn Ann Moler

Professor Kathryn Ann Moler earned her Bachelor and PhD degrees at Stanford. After spending three years as a postdoc at Princeton she returned to Stanford in 1998 to start her own group focussing on superconductivity and quantum materials.

A tour of materials

In the upcoming Kavli Colloquim on the 3rd of February she will take us on a tour of quantum materials. She will explain how magnetic imaging can help us to understand materials better. In her lab, they develop magnetic imaging techniques to observe subtle effects on fundamental mesoscopic length scales and to distinguish unanticipated spatial variation from genuinely new functionalities.

From atoms to materials

While already successfull in atomic physics in of Steven Chu's group, a Nobel Prize winner in 2007, she decided to switch to condensed matter physics in her 3rd year. She was very attracted to the theories of quantum mechanics and felt that there was much more to figure out in condensed matter physics: 'intellectually it seemed like a big exciting challenge and there would be enough to explore for a lifetime of research.' She also thought that new materials could have a big social and environmental impact.

Carefully exploring

Now, as a full professor at Stanford, she does not regret this choice. She works together with theorists to construct ways to verify and explore theories. One of her strengths is to deduce experiments that have a clear answer to a theoretical question. In this way she has conducted many experiments, among others on D-wave superconductivity, anyons in superconductors and persistent currents in mesoscopic metallic rings.

Scientific dreams

She still has many scientific dreams to pursue. She wants to do a lot more work in materials and devices using magnetic imaging: 'I think the joint community effort in materials research would go faster if groups used magnetic imaging in the inspection and understanding of their devices.' This will be the message of her Kavli Colloquim.

Science on top

Kathryn Moler always wanted to become a scientist. Her parents, computer-scientists and mathematicians have had a career in academia. Ever since elementary school she enjoyed science classes. 'There have been times that I wanted to go to business school or to become a lawyer, but actually I always wanted to do science.' If she were to do graduate school all over again, she would probably choose the same topic, but she would consider atomic physics again, as well as earth sciences to research global warming.

Education

One of the things she loves about being a professor is to educate and work together with young, motivated people. 'It is a meaningful job, and I like to help them on their path.' Besides materials research, Kathryn Moler spends time on physics education research to improve the Stanford classes. She discussed this with Nobel Prize winner Carl Wieman, who switched to science education research. Her skills in deducing precise experiment to measure effects are also of great value here: 'we try to define what to measure and how to see if changes in how we teach actually work.'

Graduate school

She is very positive about the TU Delft Graduate school. It is good to organise courses in writing and other skills. In the US, this falls on to the advisors. 'In some places, the research groups can be too insular. It would be good if this was more organised like in Delft.' Kathryn Moler provides a one-day workshop in scientific writing with a science writing specialist.

The academic path

Kathryn Moler has taken the international academic path and sees that it might be a hard for those who have a strong connection to their homeland: 'the perception that it is necessary to do a postdoc in the U.S. might be one of the things that keeps women out of science in Europe.' She thinks that for example Swiss Federal Institute of Technology in Zurich and TU Delft could invest more in exchanging researchers. 'It used to be the case that the US was the best place for science, but now these places and others in Europe are equally good.'

One last tip

For the PhD students and postdocs standing before many choices in their scientific career, an experienced professor's advice can be very helpful. Kathryn Moler wants to encourage us all to make these choices based on what makes us happy to

• **Julia Cramer**

KAVLI COLLOQUIUM

Date: February 3, 2016 at 15.00 hours Location: Faculty of Industrial Design, Joos van der Grinten room

"Where the electrons flow: currents in quantum materials"

Kathryn Moler

Stanford University

February 3, 2016 will feature a Kavli colloquium by Kathryn Moler

Electrons that live in real materials exhibit many exotic phases and states. The theory of these electrons is complicated by the facts that they are quantum-mechanical, they may be strongly correlated, and they move through an environment determined by their material's composition, structure, and shape. Major international efforts in theory, computation, growth, fabrication, and experimentation seek to predict and control the resulting emergent phenomena. Electronic states create magnetic signatures. In my lab, we develop magnetic imaging to observe subtle effects on fundamental mesoscopic length scales and distinguish unanticipated spatial variation from genuinely new functionalities. By detecting current flow on mesoscopic length scales, we can verify the existence of persistent currents in normal metals; see how twin and grain boundaries enhance conductivity and superconductivity; observe edge currents flowing in both topological and trivial insulators; and measure current-phase relations in exotic Josephson junctions.

15.00 h	Pre-programme:
	Two new Kavli PIs present themselves: **• Simon Gröblacher: Quantum optomechanics with photonic and phononic crystals** **• Hyun Youk: From small to large: Building multicellular life**
15.45 h	Break
16.00 h	**Kavli colloquium by Kathryn Moler: "Where the electrons flow: currents in quantum materials"**
17.15 h	Drinks & time to meet

NEWS

STRATOSPHERIC TERAHERTZ OBSERVATORY

Ultra-sensitive terahertz radiation detectors based on a superconducting Niobium Nitride nano-bolometer, and also a nanostructured quantum cascade laser as a local oscillator, developed by Jian-Rong Gao from our Department of Quantum Nanoscience in close collaboration with SRON and MIT have been installed in the NASA long duration balloon borne Stratospheric Terahertz Observatory (STO2). STO2 is a pathfinder to study the life cycle of interstellar medium of our Milky Way. The observatory is now in McMurdo in Antarctica for the final integration and test. If all goes as planned, it will be launched late December 2015.

STO2 and the scientists after the successful hang test in the Columbia Scientific Balloon Facility in Palestine, Texas, in August, 2015

ERC CONSOLIDATOR GRANT FOR GARY STEELE

Quantum Optomechanics in 3D. In this project, we will take advantage of the exceptional coherence of microwave photons in 3D superconducting cavities to implement quantum optomechanics, enabling coherent control of mechanical motion. The long term aim is to build large quantum superpositions of massive objects in order to explore open problems in quantum mechanics, such as what happens to Schroedinger's cat and how gravity influences quantum evolution.

TENURE AND PROMOTION FOR CHIRLMIN JOO

We would like to congratulate Chirlmin Joo, who received tenure in December 2015 and got promoted to associate professor. Chirlmin joined Bionanoscience as assistant professor in January 2011, as one of the first new faculty since the establishment of the Department in 2010.

Five Kavli institutes in nanoscience worldwide, a student perspective **(Continued from page 1) >>**

The Kavli Nanoscience institute at Caltech, Pasadena, is led by Profs. Oskar Painter and Nai-Chang Yeh. The three main thrust areas here are Nanobiotechnology, Nanophotonics and Large-scale integration of nanosystems. Recently, one of their research highlights was the invention of a new technique to produce graphene at room temperature (courtesy the Yeh group), which could potentially lead to the mass production of graphene-based solar cells and flexible electronics. Another recent feat accomplished was the development of tiny 3D camera by the Hajimiri lab, a silicon chip which measures less than a millimetre square that can provide "highest depth measurement accuracy" for better 3D printing.

The Kavli Institute at Cornell has Profs. Paul McEuen and David Muller at the helm. It is focussed on developing "next generation microscopies, physical and electronic measurement and manipulation, and optoelectronic nanocharacterization". Two of its groups (Muller and Estroff) recently discovered the process by which mollusks synthesize nacre - a material found inside seashells. Knowing the intricacies of this process will lead to the development of better building materials for the future, it is believed. And of late, the McEuen group published in Nature how the principles of "Kirigami" can be harnessed for fundamental research towards graphene based nanomachines of the future.

The Kavli Institute for Bionanoscience and Technology at Harvard University is headed by Profs. Joanna Aizenberg and George Whitesides. This institute focuses on the theory in soft condensed matter physics, reaching out to disciplines like crystal engineering and self-assembly, plant and animal morphogenesis, continuum mechanics, micro-electronics, artificial intelligence and robotics. Recently the members of Mahadevan's team provided an understanding of how bees cluster or 'swarm' for collective temperature maintenance at the core of the cluster formation, when the scout bees are out searching for new home locations. And using computer simulations, the Brenner group deciphered the principles of self-replicating colloidal clusters which could further our understanding of biological replication.

The Kavli Energy Nanosciences Institute, headed by Profs. Paul Alivisatos, Omar Yaghi and Peidong Yang, is situated at the University of California Berkeley and Lawrence Berkeley National Laboratory. Amongst the frontline news on research here, is the exciting development of 2D lasers by the Zhang lab and breakthrough studies on Metal Organic Frameworks (MOFs): 3D crystals of extraordinarily large internal surface areas that can be used to store immense volumes of gas.

Ours is the only nanoscience institute outside of US, and thus occupies a place of pride. The institute which was founded in 2004 is structured around two broad themes - quantum nanoscience and bionanoscience. Prof. Cees Dekker is the present director. I will refrain from talking about our accomplishments, as we are too humble to blow our own trumpet (at least I am periodically :)) despite being ambitious all the way.

All in all, from a student's point of view on the research conducted in Kavli nanoscience institutes, two conclusions stand out. The first is that we work on cutting-edge scientific disciplines and we do so by combining interdisciplinary skills of natural philosophy and natural history. The second is the vision of Mr. Kavli dedicate to this research to advancing science for the benefit of humanity, promoting public understanding of scientific research, and supporting scientists and their work. Indeed, all this knowledge should be made useful to mankind – a thought that makes me pause in life to question myself at every occasion possible, and not restrict oneself to mere dry intellectualism sitting in an armchair.

- **Sumit Deb Roy**

INTERVIEW PAUL MCEUEN

To gain an in-depth understanding of what it entails to be in a Kavli institute, we asked Prof. Paul McEuen, Director of the Kavli Institute at Cornell University for his insights and some general questions.

What is the long term research vision of the Kavli Institute at Cornell for Nanoscale science, under your stewardship?

The main goal of the Kavli Institute at Cornell (KIC) is to develop new tools—call it eyes and hands—for imaging and manipulating the nanoscale world. We accomplish this in three ways. First, we fund seed grants to develop new kinds of instrumentation. Second, we help support the acquisition and development of cutting-edge facilities. Third, and probably most important, we fund KIC Postdoctoral Fellows. This program brings many of the best and brightest young scientists in the world to Cornell to attack key problems in nanoscience.

What is the most exciting science going on at Cornell now?

That is a question of taste! I'll mention two. The first is a project called CONQUEST that is pushing the frontiers of quantum materials. Led by Darrell Schlom, Seamus Davis, and Kyle Shen, CONQUEST marries three technologies: molecular beam epitaxy, scanning tunneling microscopy, and angle-resolved photoemission (ARPES) to provide both the real-space and momentum space electronic structure of quantum materials layer-by-layer.

I'm also very excited about work at Cornell on 2D van der Waals materials such as graphene and MoS_2 a compound similar to graphite. This includes everything from in-plane heterostructures and topological edge states to the world's thinnest pane of glass and origami with an atom-thick sheet of paper.

How do you perceive the research conducted at Kavli Institute of Nanosciences at Delft?

The Kavli Institute at Delft is clearly one of the top research institutions in the world for nanoscience. What makes it especially remarkable is that it has great strength in two distinct areas: biological nanoscience and quantum nanoscience. Very few places in the world can match Delft in either of these areas. The two together make for something really special.

What are the advantages of being a researcher at a Kavli Institute particularly, when compared to any another well reputed university?

There are two major benefits. The first is financial flexibility. The resources of the Institute can be used in creative ways to foster the long-term success of nanoscience. The second great benefit is being a member of the Kavli family. The Kavli Foundation sponsors workshops and conferences (such as the Nano-Bio Kavli Futures Symposium put together by the Delft and Cornell a few years back) as well as major new programs like the BRAIN Initiative in the US.

According to you, how much of a scientific camaraderie exists between the different Kavli institutes with respect to nano sciences research?

There are certainly linkages, such as the Kavli Nexus nano meeting in Puerto Rico a couple of years back, but I think

To start at the beginning: Kobus Kuipers the nanoscientist doesn't really exist. My official name first name is actually Laurens, but I am known as Kobus and I prefer it that way. Clearly, the abovementioned could also be construed as a trigger for a discussion about what a nanoscientist is. I'll put that off until we meet at a coffee table somewhere (see below). So far my path through science has meandered along a myriad of topics: time-resolved investigations of ensembles of molecules, dynamics of atomic steps, phase transitions, diffusing mass-selected nanoclusters, the photophysics and force interactions of single molecules and nanophotonics. Compared to that the corresponding path on the globe seems rather prosaic: AMOLF-Cambridge-Birmingham-Enschede-AMOLF and now Kavli (Delft).

Observing new, unexpected phenomena is what makes science interesting for me. Perhaps, it's therefore not surprising that I ended up investigating light at the nanoscale. In this seemingly impossible realm of nanophotonics which aims to control and manipulate light at length scales (much) smaller than its wavelength, optical behavior is often surprising and counter-intuitive. So far, my fascination has allowed me to observe slow light, materials that seem more than transparent, rogue waves, light's magnetic component and soliton fission. Currently, optical singularities, optical entities that put nanophotonics to shame as they have size zero, hold my attention both from basic curiosity but also to explore how we can exploit them, and the field topology around them, to mold light and control emission. At QN I hope to infuse my nano-optical research with topics of which QN holds great expertise: electron tunneling, superconduction and topological materials.

'Als de koffie maar goed is'

Being an active physicist in The Netherlands it is very difficult to recall my first impression of thé Kavli institute in Delft. Over the years I have been inundated with beautiful science coming from this institute. After taking in the umptieth groundbreaking result, with a healthy degree of envy setting in, you start to wonder what it is that makes the Kavli institute so special. Well, it isn't the shiny corridors… But following the adagium of AMOLF's founder, Jaap Kistemaker, "als de koffie maar goed is", plus your nose you quickly discover Kavli's secret. Tracking the smell of coffee you will find bright-eyed, young, enthusiastic scientists discussing a variety of topics, including science, at speed and depth. No magic. What is an institute but its people? A great institute, great people. The reverse is not always true. That these great people will continue to form a great institute, even when distributed over different buildings, is therefore something that I -together with others- will endeavor to ensure.

- **Kobus Kuipers**

there can be more. Programs to encourage scientific collaboration between the institutes would be a great idea. I also think we could work together to help set the larger scientific agenda through opinion pieces, meetings, etc.

Which areas of Kavli nano sciences research today, do you think, would most likely be groundbreaking for societal impact tomorrow?

Personally, I'm excited about small machines combining nanoscale components to create functional micron-scale systems. These components can be chemical, biological or inorganic. We've miniaturized electronics, now it's time to do the same for things that move more than just electrons. From a technological perspective, this will allow us to push the Internet of Things to the cellular scale. But I'm even more excited about what this will teach us about self-organizing systems and maybe even the origin(s) of life.

- **Sumit Deb Roy**

3 NEW KAVLI INSTITUTES IN NEUROSCIENCE

The Kavli Foundation announced the establishment of Kavli neuroscience institutes at the Johns Hopkins University, The Rockefeller University and the University of California, San Francisco. They are part of a commitment by the Foundation and its partnering universities of more than $100 million in new funds to enable research aimed at deepening our understanding of the brain and brain-related disorders.

HIGHLIGHT PAPERS

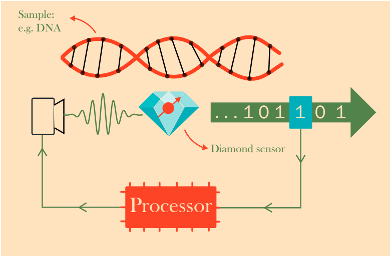
Evolutionary recovery after crippling cell polarization reveals reproducible trajectories

Like man-made machines, cells are organized by functional modules, which typically contain physical components whose removal severely compromises the module's function. We studied how cellular modules rewire during evolution by evolving budding yeast without an important component. We found that organisms can be evolutionarily robust to physiologically destructive perturbations and suggest that the recovery can lead to rapid divergence in the parts list for cell biologically important functions.

L, Laan, J.H. Koschwanez, A.W. Murray
eLife, 10.7554/eLife.09638, (2015)

Optimized quantum sensing with a single electron spin using real-time adaptive measurements

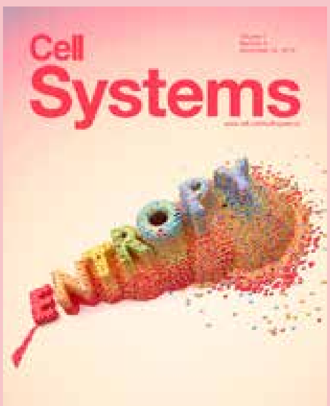
Magnetic field sensors based on single spins can measure signals with very high (few nm) spatial resolution, allowing them to image for instance individual molecules or nanoelectronic devices. In research published in Nature Nanotechnology, researchers from Delft University and the Foundation for Fundamental Research on Matter (FOM), in collaboration with colleagues at Macquarie University (Sydney, Australia) have been able to increase the sensitivity of a magnetic sensor one hundred times, by creating an 'intelligent' sensor based on only a single electron trapped in a diamond. In the experiment a feedback loop is implemented to analyse a sequence of measurements of the magnetic field 'on the fly' and adjust the subsequent measurement settings for optimal performance.



C. Bonato, M. S. Blok, H. T. Dinani, D. W. Berry, M. L. Markham, D. J. Twitchen and R. Hanson
Nature Nanotechnology, doi:10.1038/nnano.2015.261 (2015)

Molecular-level tuning of cellular autonomy controls the collective behaviors of cell populations

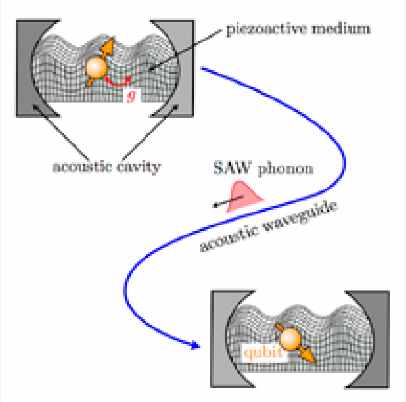
We know that biological processes are constrained by physical laws and probability; these constraints are captured in molecular-level models. However, biological processes may also be constrained by the cell's context, particularly the behavior of other cells and their arrangements in space. Our work presents a formal treatment of these larger-scale dependencies. We show that tuning the amount of autonomy cells have when they make decisions can produce rich cellular- and population-level phenotypes.



T. Maire, H. Youk
Cell Systems, 2015, Volume 1

Universal Quantum Transducers based on Surface Acoustic Waves

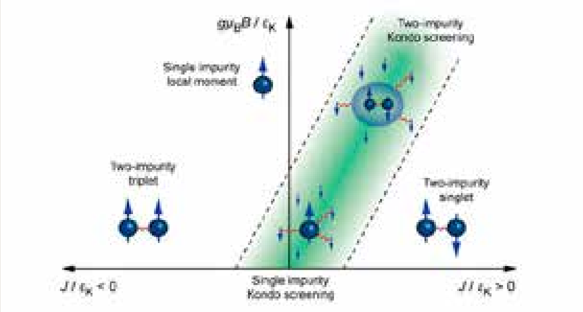
On-chip transducers can mediate coupling between distant qubits and offer flexible coupling networks. The authors propose to use quantized modes of surface acoustic waves as a universal quantum bus for coupling a broad arrays of qubits, including quantum dots, nitrogen-vacancy centers, trapped ions and superconducting qubits.



M.J.A. Schuetz, E.M. Kessler, G. Giedke, L.M.K. Vandersypen, M.D. Lukin, J. Ignacio Cirac
Phys. Rev. X 5, 031031 (2015)

Exploring the phase diagram of the two-impurity Kondo problem

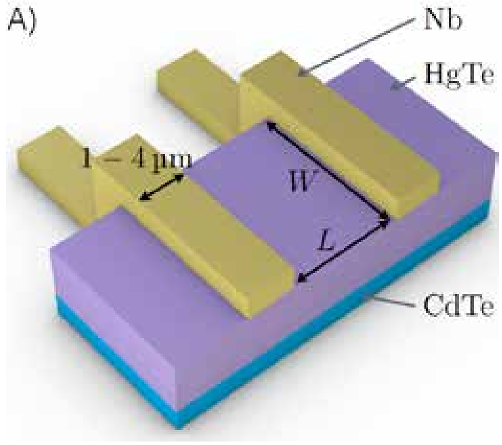
The Kondo effect – an intricate quantum phenomenon involving many electrons surrounding a magnetic atom – becomes even more fascinating when two coupled atoms are together Kondo-screened. Depending on the competition between the inter-atomic coupling and the screening strength, a variety of different correlated phases can be realised. In this paper we show that the complete phase diagram of the two-impurity Kondo problem in a magnetic field can be covered experimentally by building pairs of atoms using a scanning tunneling microscope.



A. Spinelli, M. Gerrits, R. Toskovic, B. Bryant, M. Ternes and S. Otte
Nature Communications 6, 10046 (2015)

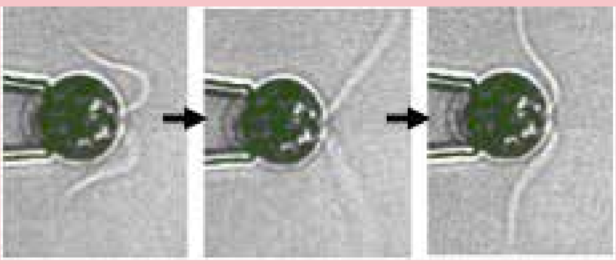
4π-periodic Josephson supercurrent in HgTe-based topological Josephson junctions

An international team, including Kavli-researcher Teun Klapwijk, demonstrated that the semiconductor HgTe, when used in a Josephson-junction provides signs of a 4π periodic Josephson-current, reminiscent of gapless Andreev bound states



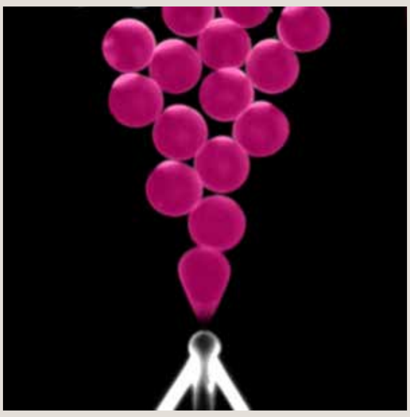
Wiedenmann, J. et al
Nature Communications, 6:10303, doi:10-1038/ncomms10303(2015)

Hydrodynamics Versus Intracellular Coupling in the Synchronization of Eukaryotic Flagella
Collective motion is crucial in many cell processes. The organized dynamics of micron sized hairlike cell projections called eukaryotic flagella or cilia has attracted high levels of interest. Our study of the breaststroke motion in swimming algae shows that hydrodynamic forces cannot explain the synchronization between the microorganism's flagella, but that synchronization is due instead to coupling through cell internal fibers connecting the flagella.



G.Quaranta, M.E Aubin-Tam, and D.Tam
Phys. Rev. Lett. 115, 238101

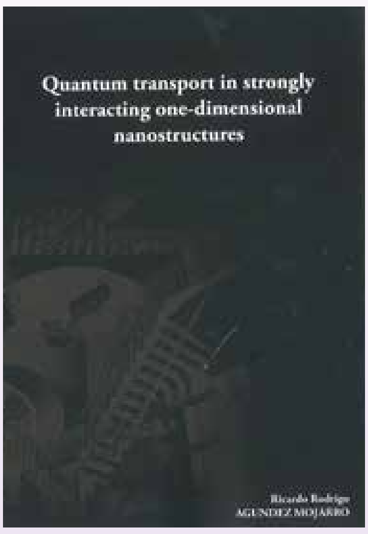
Octanol-assisted liposome assembly: A robust method to produce liposomes on chip
This paper presents a novel microfluidics-based method, octanol-assisted liposome assembly, to form monodisperse, cell-sized (5–20 μm), unilamellar liposomes with excellent encapsulation efficiency, which offers a versatile platform for future analytical tools, delivery systems, nanoreactors, and synthetic cells.



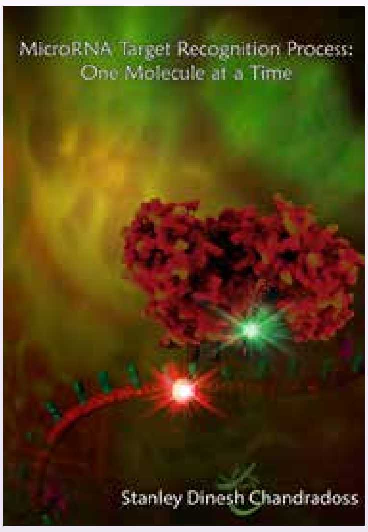
S. Deshpande, Y. Caspi, A. Meijering, C. Dekker
Nature Communications, 22 Jan.2016

RECENT PHD THESIS

Machiel Blok
29-10-2015



Agundez Mojarro
25-11-2015

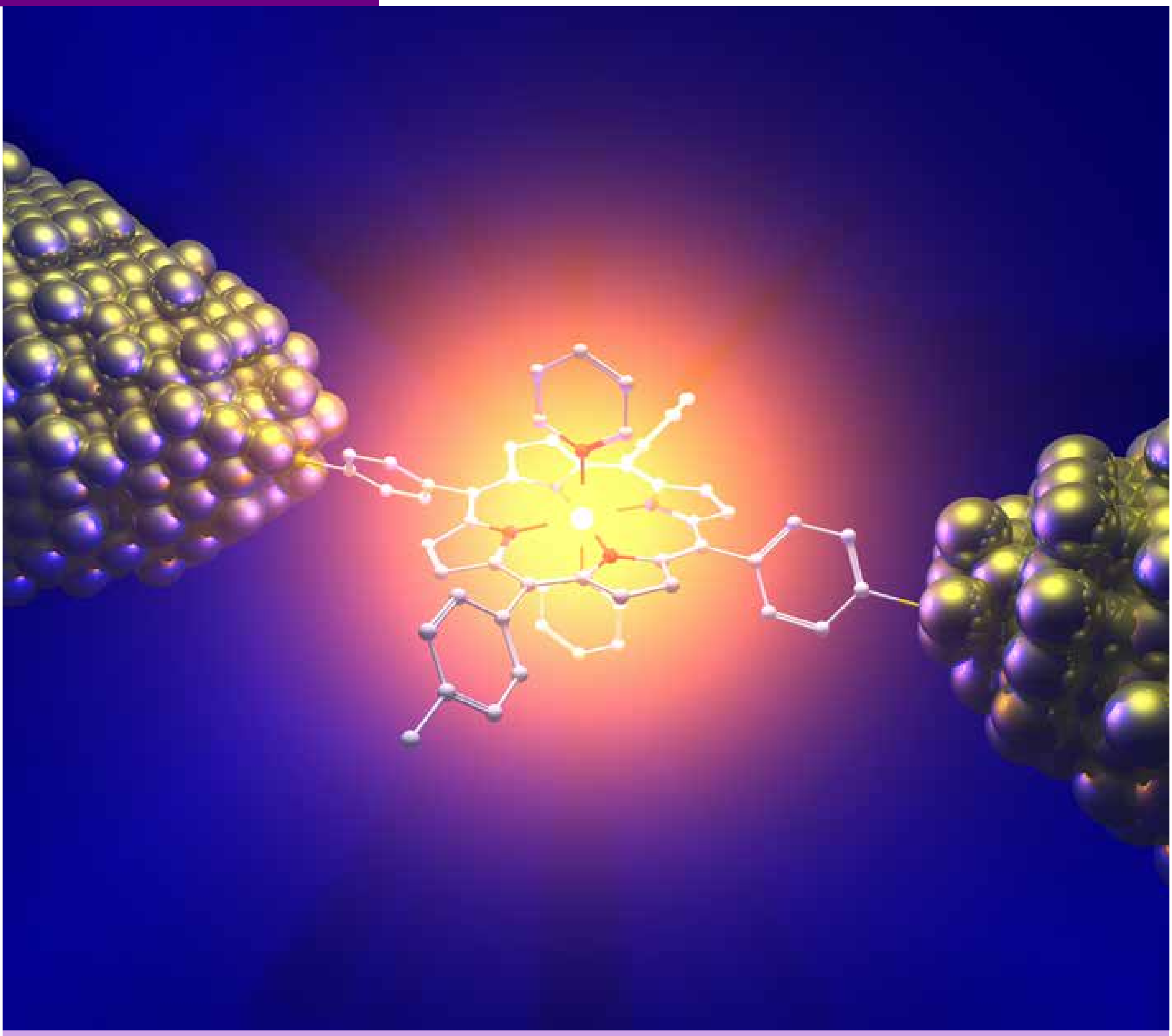


Stanley Dinesh Chandradoss
29-1-2016

NEW EMPLOYEES

Name	Date of employment	Title	Lab
Ronald Bode	01/12/15	technicus	QN/MED
Andreas Wallucks	01/01/16	PhD	QN/MED
Mark Jenkins Sanchez	01/01/16	Postdoc	QN/MED
Maarten van Leeuwenhoek	01/01/16	PhD	QN/MED
Je-Kyung Ryu	01/01/16	Postdoc	BN/Cees Dekker lab
Umberto Sanchez	01/01/16	Postdoc	BN/Nynke Dekker lab
Lisa Dreesens	01/01/16	PhD	BN/Beaumont/Aubin lab
Wayne Yang	01/01/16	PhD	BN/Cees Dekker lab
Sungchul Kim	18/01/16	Postdoc	BN/Chirlmin Joo lab
Kim Vendel	18/01/16	PhD	BN/Marileen Dogterom lab
Bas Nijholt	25/01/16	PhD	Akhmerov Lab
Pablo Perez Piskunow	01/02/16	Postdoc	Akhmerov Lab
Vladimir Volkov	01/02/16	Postdoc	BN/Marileen Dogterom lab
Fayezeh Shamsi	01/02/16	Phd	BN/Laan/Engel lab
Michel Bengtson	01/02/16	Phd	BN/Cees Dekker lab
Simon Streib	01/02/16	Postdoc	Bauer Lab
Benjamin Lehner	01/03/16	Phd	BN/Anne Meyer

SCIENCE ART



Artist impression of a single molecule connected to two gold electrodes (Dr. Mickael Perrin)

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

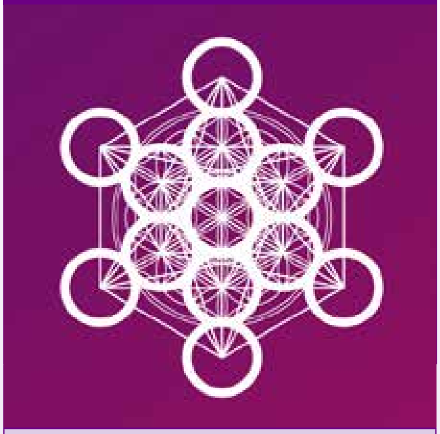
UPCOMING KAVLI COLLOQUIUM

Charles Kane

June 30, 2016

University of Pennsylvania

KAVLI DAY



September 8, 2016

Save the date

CONTRIBUTE TO THIS NEWSLETTER

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

COLOFON

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