KAVLI NEWSLETTER

Kavli Institute of Nanoscience Delft

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Kavli Colloquium Tim Mitchison • Self-interview Dimphna Meijer
Interview old and new Kavli co-directors

Change of directorship of our Institute

After 8 years Cees Dekker will complete his term as Co-director of our Kavli Institute on September 1, 2018. From this day, Chirlmin Joo will start as the new Co-director of the Kavli Institute. The Institute henceforth will be lead by Chirlmin and Lieven Vandersypen as Co-directors.

Timeline

2004 Hans Mooij first director of the Kavli Institute

2010 Cees Dekker new director of the Kavli Institute

2016 Lieven Vandersypen appointed as co-director

2018 Chirlmin Joo succeeds Cees Dekker as co-director

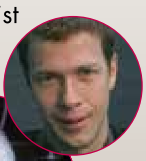
Read more on the views of Cees and Chirlmin in interviews with them on page 6 and 7.

FROM THE DIRECTORS

There is a slight hint of melancholy in writing this 'in this newsletter' overview, as this will the last time that I will write it. It has been a truly wonderful experience to head our great Kavli Institute as Director for 8 years, and I am thankful to have been part of this great adventure. I am very happy that we found an excellent successor, as Chirlmin Joo will succeed me starting on the Kavli Day. On our upcoming Kavli Day, we will travel to Zeeland for some fun activities and we will host a few pioneers that initiated nano-related startup companies which I expect will be very inspiring for generating similar activities at our Kavli Institute.

Looking ahead, we are thrilled to host Tim Mitchison from Harvard for a Kavli Colloquium. Tim is a systems biologist and a pioneer in the study of cell division. Out of many topics he can speak on, he will speak about the spatial organization of cells, and I expect an exciting Kavli Colloquium. The preprogram will highlight the recently announced 2018 Kavli Prizes. Don't miss out on this.

Furthermore in this newsletter: A self-interview with new PI Dimphna Meijer, a column by our new columnist Timon Idema, as well as one from Anton Akhmerov, and lots of other news. Enjoy!



Cees Dekker

COLUMN

Setting goals

Quantum computers and artificial cells don't have much in common. Perhaps the only thing they share is that people you know are trying to figure out how to build them. As it turns out, that's an excellent idea, a point driven home to me in a recent column by Ben Tiggelaar in NRC. His main conclusion: the best way to achieve something is if your goal is learning how to do it. In fact, while learning, you'll actually achieve more than if you merely aim for the achievement itself. The reason, as always in retrospect, is simple: when you're interested in the achievement, you're trying to show (or show off) what you can already do, and hide what you cannot do. When you're learning, admitting ignorance is part of the process.

On the one hand, this should be good news for us. When doing research, we're inherently trying to figure out something new, be it how to make something or how some natural phenomenon works. On the other hand, we're by no means immune to the desire to reach a certain goal, or the desire to show off. When I write a grant proposal, my goal is to get the money. Lofty as the next goal (actually investigating something and indeed learning something new) may be, for the proposal, the job application, or the paper, I have to confess that I too am often more motivated by the goal than by the learning process. Justifications are readily found. I can easily convince myself I need the money / job / publication list to finally be able to get to the interesting new research project.

How do we break this pattern? Again, it should be simple: let's do what we do when we do research! When we need a protocol or method, we look in the literature – so look for people who can do things well (perhaps so well it makes you a little jealous) and try to learn from them. When a new member joins the group, we show them how the equipment works – so share your insights and learn from the questions you can't answer (yet). And when we prepare for an important talk, we ask for feedback – so don't hesitate to do the same for other things.

Take this column, for example. I'm new at writing this, and there are many things I can learn. I've looked at how other people do it (thus coming across Tiggelaar's column). I'll try to use it to share some things about my life as a researcher. And perhaps most importantly, I'd like your feedback. You may have a brilliant idea on how to avoid the all too common achievement-oriented pitfall. Or perhaps you simply have some thoughts on this column. In either case, I look forward to interacting and would love to learn from you!

Timon Idema

INTERVIEW

Interview with Tim Mitchison

I'm talking with Tim Mitchison over skype, while he is at home accompanied by two dogs (one of which seems not particularly fond of the mailman in the background).
He started working on microtubules in 1981, a time when DNA and the central dogma (the two-step process of DNA transcription and translation to proteins) were the big things to study. Despite being tempted to work on this as well, Tim was looking for a path less travelled. Inspired by a lecture series of Marc Kirschner he decided to work on microtubules in his lab. On top of that, we both agree that microtubules are simply beautiful. Even back then, without digital cameras, when you could either develop a black-and-white picture yourself or wait a week to get a colour picture of your microtubule experiment. Not the fancy live movies we are used to these days, but still very beautiful.

In addition to admiring the beauty of microtubules and the self-organised networks they form, it is nice if you are "fairly successful". After 37 years in the field, he says that still his most successful experiment was during his PhD: the discovery of dynamic instability. Did this mean he back then already wanted to become a professor? No, not really. Even though he wanted to become a scientist as a five year old, during his PhD he was not really planning his career yet. Also, he thinks you have to be a bit typical in order to aspire becoming a professor.. But now that he is one himself, he luckily wouldn't want to do anything else. As cofounder of a small biotechnology company where he was a bit involved, he appreciates the focused and applied science and everybody working on the same team. But he feels it's too focused, while as a scientist/professor he had the freedom to study research topics ranging from single-microtubule reconstitutions to cell extract experiments, mitotic spindles and more recently microtubule-targeting drug responses of the human body.

When I ask if he misses things from when he was a PhD or postdoc (like fiddling around in the lab?) he replies that he misses more the general things from being young, "live as much as possible!". But apart from that, as a young researcher you are very obsessed with one thing, while further in your career you have more wisdom for a broader view. Also, it is fun to interact with younger students and help them doing science.
And indeed, when I hear him talking about his work, interests and job as a professor, I get the impression that students are something he cares about. Partly from his enthusiasm about PhD programs on "how to improve the life of students and get supervisors to behave better". But also he clearly likes to talk to students about other stuff than hard biology. Things like how to be confident on your research or results, figuring out what career would make them happy or even what the right moment is to get a baby. Although he says, "I think I'm more useful to other people's students than for my own students..", since it's easier to talk about other stuff than hard biological experiments with students from another lab. Indeed also I found myself answering questions on plans after my PhD, whether I consider moving to another country, the situation with biochemical companies in the Netherlands and advice on the importance of traveling (Tim: "I would love to do more travelling, but I work too hard, what can I say").

So when he is in Delft, don't hesitate to talk to him about microtubules, drug research or any aspects of life in academia (or outside).

Kim Vendel

KAVLI COLLOQUIUM

"Spatial Organization of a Very Large Cell by Microtubules"

Tim Mitchison

Harvard Univeristy

June 14, 2018 will feature a Kavli colloquium by Tim Mitchison:

I am interested in how molecular processes that occur on nanometer and millisecond scales physically organize cells on micron and minute scales. During my PhD with Marc Kirschner I discovered that individual microtubules grow and shrink using GTP hydrolysis. Since then, I have been interested in how dynamic microtubules, together with microtubule binding and motor proteins, self-organize into complex arrays that specify the internal geometry of cells. Cleaving frog eggs epitomize these problems. The frog egg is a mm-scale cell, which severely challenges molecule-scale organizing mechanisms. After fertilization, the egg rapidly executes a precise pattern of cleavage divisions, where each cleavage plane bisects the long axis of the cell, and successive planes exhibit orthogonal orientation. Cleavage geometry is specified by microtubule asters, large radial arrays that grow out from a central nucleating sites to span the cell. We have used microscopy and biochemistry to investigate the mechanisms by which microtubule asters grow to fill the huge egg cell, and how pairs of asters interact to generate length asymmetries and position cleavage furrows. Our work provides steps forward in the classic questions of how cell ensure that cleavage furrows cut between sister nuclei to accurately partition genomes at cell division, and how the cleavage pattern of early embryos is established.

15.00 hr	Pre-programme: Kavli Prizes 2018
	Astrophysics Kavli Prize 2018 - Chirlmin Joo Nanoscience Kavli Prize 2018 - Marcel van der Heijden Neuroscience Kavli Prize 2018
15.45 hr	Break
16.00 hr	Kavli colloquium by Tim Mitchison: "Spatial Organization of a Very Large Cell by Microtubules"
17.15 hr	Drinks & time to meet

KAVLI COLLOQUIUM

Date: June 14, 2018
Location: Faculty of Industrial Design, Van der Grinten lectureroom

Dr. Tim Mitchison is the Hasib Sabbagh Professor of Systems Biology, co-Director of the Initiative in Systems Pharmacology, and Deputy Chair for the Department of Systems Biology at Harvard Medical School. He is interested in all aspects relating to microtubules, the cytoskeleton, and cell division.

Dr. Mitchison received his Ph.D. in Biochemistry and Biophysics from the University of California, San Francisco. During his postdoctoral work at the University of California, San Francisco with Dr. Marc Kirschner, he discovered dynamic Instability of microtubules, a fundamental aspect of cytoskeleton biology and since then has studied the biochemistry, dynamics and spatial organization of microtubules and actin filaments with a focus on cell division mechanisms. Much of his lab's work in this area is based on live fluorescence imaging and has been at the forefront of the application of novel optical methodologies to living cells.

In 1997 he moved to Harvard Medical School to Co-direct the Institute of Chemistry and Cell Biology, a collaboration between chemists and cell biologists, to develop and apply small molecule screening capabilities in academia. As part of this effort, Dr. Mitchison's developed a strong interest in cancer chemotherapy and in more rational approaches to drug development in general. In 2004 he co-founded a new department, Systems Biology, that aims to bring systematic and quantitative methods to bear on problems in basic cell biology and medicine and in 2011 he helped found the Systems Pharmacology initiative at Harvard Medical School, a major interest area within the department, co-Directed by Peter Sorger and himself.

HOT TOPICS SESSION

Topics: Microtubules and cell organization

Date: June 15, 2018
Time: 10.00h
Location: Applied Sciences, Building 58, room A1.100

Kavli Nanolab 1st annual cleanroom user meeting

Nanotechnology by and for the cleanroom users

3 July 2018 – in VLL Atrium

12:00 - 13:00	Registration and lunch
13:00 - 13:15	Welcome – Cees Dekker
13:15 - 13:30	Developments at KN – Frank Dirne
13:30 - 14:15	Atomic Layer Etching and Area Selective Deposition – Adrie Mackus (TU/e)
14:15 - 14:30	NEMS for quantum mechanical devices – Richard Norte
14:30 - 14:45	Interconnects for quantum devices – Alessandro Bruno
14:45 - 15:00	Developments in graphene processing – Sabina Caneva
15:00	Poster session (with drinks)
16:30	Best poster award and best micrograph award
17:00	End

Registration by email to f.g.vanverseveld@tudelft.nl

NWO Valorisation Award to Jetty van Ginkel

Jetty van Ginkel has won the 2017 NWO Physics Valorisation Chapter Prize. She won the prize for the valorisation chapter in her PhD thesis entitled 'Peptide Fingerprinting Using Single-Molecule Fluorescence'.

NEW EMPLOYEES

Name	Date of employment	Title	Lab
Thijs van Gogh	01-03-18	PhD	Kuipers Lab
Nils Klughammer	01-04-18	PhD	Cees Dekker Lab
George Dadunashvilli	01-04-18	PhD	Timon Idema Lab
Christian Dickel	15-04-18	PD	Steele Lab
Florian Huber	15-04-18	PostDoc	Marileen Dogterom Lab
Arian Stolk	01-05-18	PhD	Hanson Lab
Tanja Kuhm	01-05-18	PhD	Arjen Jakobi
Gerd Kiene	01-05-18	PhD	Charbon Lab
Elena Fernandez	01-06-18	PostDoc	Greg Bokinsky Lab
Lin Han	01-06-18	PhD	Kouwenhoven Lab
Ajay Kumar Mahalka	15-06-018	PostDoc	Marileen Dogterom Lab
Ahmed Abid Moueddene	15-06-18	PhD	Bertels Lab
Patrick Harvey-Collard	16-06-18	PD	Vandersypen Lab
Tobias Krähenmann	16-07-18	PD	Vandersypen Lab
Hamza Balci	01-07-18	Researcher	Chirlmin Joo Lab
Filip Malinowski	01-07-18	PhD	DiCarlo Lab
Martin Caldarola	01-07-18	PD	Kuipers Lab
Mario Lodari	01-07-18	PD	Scappucci Lab
Mitascha Bharadwaj	01-08-18	Postdoc	Cees Dekker Lab
Zhanar Abil	01-09-18	PostDoc	Christophe Danelon Lab

My playground

I chose to share pictures me walking the streets of the St. Botolph district on my way to work. Coincidentally, St. Botolph not only gave his name to the original city of Boston in the UK, but he is also the patron saint of the pedestrians, blessing my every morning walk to the Longwood Medical Campus. The contrast between the neo-Greek façade of the Harvard Medical School building and the shiny glass windows of the freshly built New Research Building would remind me of how, to me, reinventing the past is so much less exciting than building the unknown.

Current playing field

During my PhD work, I realized that molecular biology and biochemistry are not foundational enough to unravel the detailed biological signaling processes underlying intricate brain functions. In pursuit of this granularity, I moved back to the Netherlands and started my postdoctoral work in the Department of Crystal and Structural Chemistry at Utrecht University to understand brain development on the atomic level. I now aim to combine my research interest of the development of the central nervous system with my research experience in protein structural biology (including single particle cryo-electron microscopy):

Without angry neighbors like our Truus, we can together adapt the rules of the game to accelerate our science.

How do brain stem cells differentiate into neurons, astrocytes and oligodendrocytes that together accommodate learning and memory formation?

As kids, our playground was the parking lot of the Dutch Chamber of Commerce (KvK) in The Hague, where my brother and I played endless games of soccer and 'puthockey'. Puthockey was an adaptation of our regular field hockey practice that came to life after our neighbor, Truus, complained about using the shared brick wall to her living room as a goal. Instead of using Truus' brick wall, we would open up several street gutters from the sewer system on the parking lot - risking being scolded by the car owners – to create field goals. Some rules of the game had to be changed: scoring not only entailed pushing the ball inside the drainage system but also grubbing the ball back up. Our game was well designed and many of the neighborhood kids would join our practice. Years later, folding steel parking barriers were unfortunately installed that prevented us from playing on KvK's parking lot, and which also sadly put an end to my puthockey games.

During my final year in high school, I made another adaptation that turned out favorably - this time to my life's path. Initially I had decided to start a Bachelor program for Greek and Latin Language and Culture. I enjoyed studying the ancient texts and discovering word by word what had been written thousands of years ago. However, leafing through the Student's Guide to College and Career planning, I learned that instead of studying the past, I could research the future by unraveling biological mechanisms. The prospect of discovery at the level of a single molecule rather than a single word captured my imagination. Without a glance to the past and happily forgetting all the Greek inflections, six years later I finished my B.Sc. in Biomedical Sciences and M.Sc. in Neuroscience & Cognition at Utrecht University. From there, I quickly moved on to a PhD project in a neurodevelopmental biology / oncology lab at Harvard Medical School in Boston. In fact, the photograph that

Creating a win-win situation

The biggest breakthrough in the next few years? High spatial and temporal resolution that allow us (as a science community) to watch the interplay between neurons, oligodendrocytes and astrocytes during development of the brain on the atomic level. We are close to defining the individual building blocks of, for instance, a neuronal cell but the dynamics of these building blocks (How *long* do proteins interact? How *fast* is a conformational change?) are not well understood. I look forward to joining an institute with such a communicative, integrative and entrepreneurial atmosphere as the Kavli Institute of Nanoscience where we can start to address these questions. I still get excited by changing the rules of the - nowadays - scientific game and I hope that without angry neighbors like our Truus, we can together adapt the rules of the game to accelerate our science.

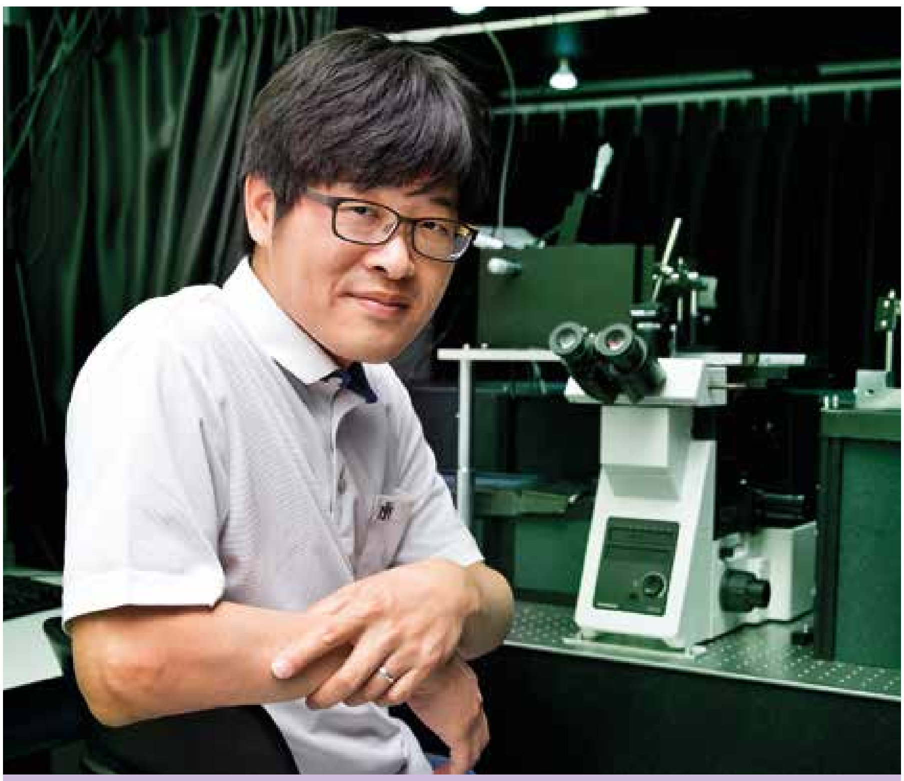
Dimphna Meijer

Interview Chirlmin Joo, new Kavli director

Transition from the pioneers to the younger generation

Could you tell us who Chirlmin Joo is?
I am a biophysicist with an education background in physics and research experience in biology. My expertise is in single-molecule fluorescence. I am from Korea (South Korea if you are curious). I did my PhD in the U.S., and started as aa group leader at the Kavli Institute of Nanoscience Delft in the Department of Bionanoscience (BN) in 2011. My group carries out fundamental research that requires curiosity and creativity, like all other groups in Kavli. On a personal note, riding a bicycle makes me happy.

Are there are new challenges for you as Kavli director?
When I was asked to succeed Cees Dekker as the next Kavli director, I was honoured and also felt a big responsibility. Challenges, for example, are connecting QN, BN and QuTech. A "quantum person" from QN and QuTech tends to talk only with another quantum people, and a "bio person" from BN only with another bio people. There is much interest in bioscience from QN and QuTech and there are many physicists in BN. Under the umbrella of Kavli, we should be able to create synergy in new innovative fields such as nanomedicines and quantum biology. Our new activities will inspire other Kavli institutes as we are the only Kavli institute that connects the research of quantum and bio science. not many PhD students and postdocs know what Kavli Institute is. They are up to date with Kavli events such as Kavli Colloquia and Kavli Day, but are not aware of what context the Kavli Institute represents and why we get support from the Kavli Foundation. With a better understanding of what Kavli is about, we will take advantage of the prestige of being one of the very few Kavli institutes in the world.



Career
Department of BioNanoScience, Delft University of Technology (TU Delft)
Associate Professor (2016-present)
Assistant Professor (2011-2015)

School of Biological Sciences, Seoul National University
Research Professor (2009-2010)
Post-doctoral Fellow (2007-2009)

Education
Ph. D. (2007)
Physics, University of Illinois at Urbana-Champaign
B. S. (2002) summa cum laude
Physics, Seoul National University

Research
Using cutting-edge single-molecule fluorescence tools, we investigate how small RNA mediates gene silencing (RNA interference) and anti-viral defence (CRISPR immunity and DNA interference). We apply the mechanistic understanding to genome editing. We develop single-molecule protein sequencing techniques for advanced proteomics analysis.

What do you think of the achievements made so far by the Kavli Institute?
The strategic decision to set up the Bionanoscience department worked out very well. There was some concern that biology was not a topic for TU Delft, but Kavli Directors have shown that the scepticism was unjustified. Thru the last eight years and counting, BN has become a sustainable department with a vision of leading biophysical research in the world. The third "sibling" QuTech has also established its own position. The next step is to connect these three siblings more closely by finding common ground of doing new nanoscience together.

And how are you going to take this further?
We should flip the "top-down" feeling. We have talented students and staff members in Kavli. We should provide everyone in Kavli (including PhD students and postdocs) with opportunities to come up with new research ideas and realize them using KAVLI funding. We may promote joint master's, PhD's, postdoc's (continuing the current Kavli fellowship) and even group leader positions with support by Kavli. Recently we were given another generous endowment from the Kavli Foundation and may use this for more academic events (poster sessions, competitions for seed funding, etc) that promote these "bottom-up" activities. In the beginning as a director, I will be collecting ideas. I will talk to individual PI's to find out what they want from Kavli. I see that my role is coordinating actions.

What is your first priority as Kavli Director?
Cees Dekker has been inspiring in running this institute. For the moment, my challenge will be to maintain the high level of prestige and eventually lift it up one level higher. For that, I will need to tour around and get to know the people in the Kavli community better. I am already receiving a lot of new initiatives which I very much appreciate. For instance, new ideas about the Kavli Newsletter, the Kavli Chair and the Fellowship programme.

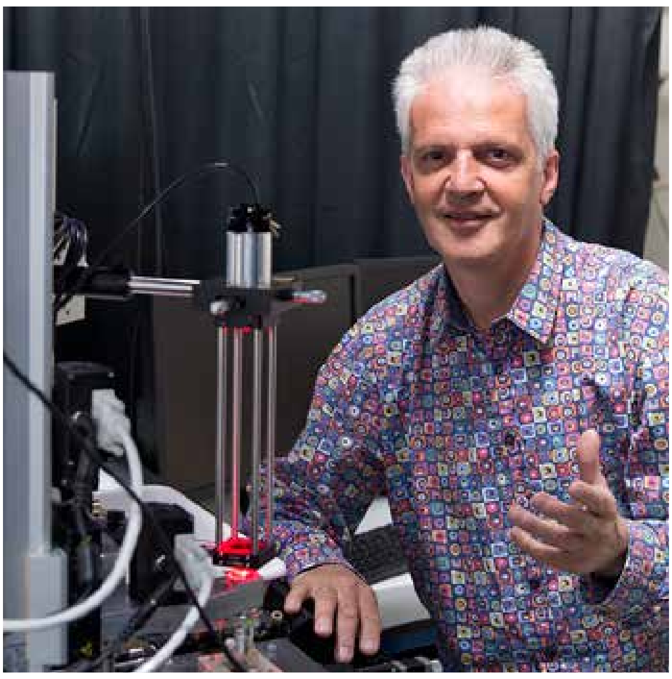
Finally, I would like to express my great appreciation for Cees Dekker. His contribution and proactive ideas have made our institute known all over the world by promoting the high-quality research in quantum science and seeding the ground for biophysics in TU Delft.

Chantal Brokerhof

Interview with Cees Dekker
- Handing over the Kavli directorship

Mission accomplished

Eight years ago, Cees Dekker took over from Hans Mooij as director of the Kavli Institute and now it is his turn to pass on the baton. In the very first Kavli Newsletter, which he himself started in 2010, Cees talked about wanting to follow in the footsteps of Hans by having one central goal: As he said by then: "The main challenge ahead of us is to consolidate the recent choice to expand the institute into the exciting direction of the interface of nanoscience to biology, while at the same time renewing and enforcing the existing strength in quantum transport."



Have you succeeded in your mission?

Yes, I think it's been a great success! In particular, the two aspects named above. The first was related to setting up the Bionanoscience department in 2010. That has turned out to be an amazing success. We are here with a group of 16 PIs and a thriving community who examine biological issues with all the tools of nanotechnology. And the second element was the development and enhancement of our efforts in quantum nanoscience. And that has succeeded as well. There is now an entire quantum-science landscape, which includes QuTech and related activities, and as a result the Kavli Institute has itself grown. How we had to incorporate QuTech, with its different set-up from a regular university department, was certainly a challenge, perhaps even the most complex one facing us when I think back over the past eight years. But that has taken shape and now we have been joined by a number of inspirational new Kavli colleagues.

How have you been able to bridge differences and generate cohesion between quantum nanoscience and biology?

It's a real and continuous challenge, because biology is quite a different field from quantum physics. I do believe, however, that we have succeeded, at least partially, in that. People feel part of the Kavli Institute and are proud of the fact that together we are the Kavli Institute. Being Kavli comes along with a degree of prestige as there are no more than five such institutes in the world and Delft is the only one outside the United States. People are proud to be part of this unique community and this contributes to the cohesion. We come together during such events as Kavli Colloquia, workshops, and Kavli Days, even though the content of our fields varies significantly. Despite this, we do have a joint culture, aimed at exploratory, new concepts. We follow new lines of research that are not necessarily determined by which grants are offered by the outside world, but we are determining our own direction in the field, thinking ahead and being innovative. And quality is a key aspect of this.

How were you able to leave your mark on that culture as director of the Kavli Institute?

Primarily by making it more visible I think. The Kavli Newsletter, for example, which I started at the time, promotes a community spirit. By keeping each other informed with news from the departments, recent publications, awards and 'self-interviews', etc. I tried to encourage everyone to show more of ourselves, not only as researchers but also the type of people we are, creating a culture that, collectively, we are driven by both science and empathy.

What have you achieved in the past eight years as director of the Kavli Institute, which you can now pass on as a legacy to your successor?

I think that quite a lot of new things have started. In 2010, there was a Kavli Colloquium and a Kavli Day, and these were actually the main activities at that time. It was still very small-scale. We then started the website, the Kavli Newsletter, further expanded the facilities and launched really major projects. We organised a number of workshops, on our own and together with other Kavli Institutes. We established a number of awards for the outstanding work of our young researchers. But if I were to choose one thing, I would

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COLUMN

SciPost: the future of journal publications

Within our community the main way to communicate the result of your work is to publish a scientific article. A talk or a blog post is easily more engaging at a cost of being informal, while software or data repositories are better for enabling reuse of your results. Still, journal articles are the most established way to formally communicate research results, and when thinking about research output, we mostly think about articles in the first place.

Journals are frequently ranked using their impact factor: the average number of citations their articles attract within two years. The impact factor is the main metric of a journal's performance, and therefore selecting papers based on the possible two years impact part of the editor's job. The impact factor is then used as an important metric for evaluating researchers: for example the Kavli Institute of Nanoscience tenure track policy expects publications in high impact journals. Because an impact factor is a noisy and opaque metric, researchers initiated DORA (Declaration On Research Assessment): a proposal for excluding journal impact factor from assessing researchers. While many researchers, including myself, and organizations find the DORA arguments convincing, coming up with better policies is a hard task that will take a lot of thinking and discussion.

Turning back to the publications, it is the review process ensures that several people read the article, potentially found and fixed errors, and then considered that the article is good. Still, both the editor and the reviewers are error-prone, and easily overlook even basic errors. For example, I would not notice lack of filtering in a circuit, and many experimentalists have a good chance of not spotting a gauge invariance breaking within a lengthy calculation (honestly I am unsure if I would notice it neither). The reader then only learns that a paper has passed review, a single bit of information.

The recently founded SciPost journal improves the transparency of the publication process. It is run by researchers as a nonprofit that does not charge neither for the publication, nor for article access. However the most important change that SciPost implements is the open review process, where the anonymous referee reports are publicly visible as soon as they arrive. I find this approach beneficial to everyone:

- The editors provide an additional perspective on the articles at no extra work.
- The reviewers' work has additional visibility, instead of being buried in the editor's desk.
- This is especially important if the editor and the reviewer disagree.
- The readers learn more about a paper than just that it was published. For example, the paper reviews may then also be used when evaluating the researcher.
- Finally, the authors are less at the mercy of the editor and the referees because a reasonable reader would still disagree with an unreasonable reviewer.

In under two years SciPost published more than a hundred articles (including one of my own) and has about two hundred more under review, so it is already embraced by the community.

I wish SciPost future success because I believe this is how publishing must be done. And by "success" I certainly do not mean just the impact factor.

Anton Akhmerov

Interview with Cees Dekker - Handing over the Kavli directorship

Mission accomplished!

› **Continued from page 7**

say the most important has been building the community over the years. Recently, we again received new funding from the Kavli Foundation, which we can use to initiate a lot of new things. We are therefore in the next phase of expansion with, among other things, the Kavli Chair, the KIND fellowships, and an artist-in-residence programme.

It appears that after a period of sowing the seed, you can now also start reaping the rewards. In which phase will the new director of the Kavli Institute, Chirlmin Joo, be taking over the reigns?

We are now in a phase with new funding and new possibilities and we hope that this will continue. The extra money will help the institute do additional things and we are free to invest it without having to consult first with the university. My advice to Chirlmin would be to continue to develop the connections between quantum science and biology. An important practical connection is our joint Kavli Nanolab, but it would also be nice to see more connections realised that are related to scientific content. Of course, Chirlmin is completely free to develop policy as he sees fit.

What are your long-term dreams?

This Newsletter contains a nice column by Timon Idema about goals that one may like to achieve. Our institute has a number of big scientific dreams, such as building a cell or a quantum computer. And what this column rightly says is that the process leading to this is a learning curve, which is great fun and insightful and is in itself of tremendous value. The intrinsic nature of our institute is already a dream: to be able to conduct leading scientific research, driven by our curiosity, to study the natural world and to build new devices that open up completely new possibilities once again. I feel it's a great privilege to be able to spend time trying to make this happen; it's fantastic.

I also hope that we will stay forming a very collegial community. Science is all about people working together. We spend a lot of time and energy in the lab with each other. That's why I think good human interactions and communication are essential, so we can enjoy working together in a pleasant atmosphere. It's not only the scientific result that counts, but also how we interact with each other.

Was your directorship merely focused on Delft?

As Kavli director, you are also active on various other fronts that are less visible. One of which is that we provide constructive input to the Stichting Nanoscience on our endowment and on how this is best maintained. And, as a director, you're in contact with the other Kavli directors from places such as Cambridge, Harvard and Berkeley, for example, and there's also a whole international network with joint meetings, during which we discuss the Kavli Foundation's strategy and policy. It was interesting to be part of the conversation - an enjoyable experience. I also enjoyd the big event surrounding the Kavli awards in Oslo, with huge symposia and a banquet with 1,000 people that's held in the City Hall: you meet lots of interesting people there.

It was also good to get a better insight into how the Kavli Foundation operates. They provide fantastic support to our institute. This takes place primarily behind the scenes, by helping us, for example, to position ourselves within our own university. They listen very seriously to our advice: which new institutes should be added, new future symposia, and about which new fields of research are emerging internationally.

What advice would you give to your successor?

My advice for Chirlmin would be not to try to imitate me, but, above all, to do your own thing and to be yourself!

Chantal Brokerhof

Save the date
August 30 2018
Zeeland, Neeltje Jans



Kavli Day 2018: The excitement of starting a company

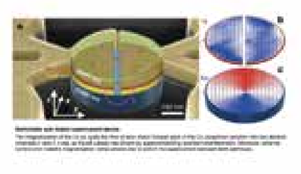
Exciting and ground breaking nanoscience is in the DNA of our Kavli Institute. Starting a company offers much of the same excitement, dynamic approach, high ambitions and pioneering spirit. In a forum discussion at the Kavli Day, you will hear from three pioneers about the early days of their company, about the excitement but also about the many tough challenges, and their advice. This is your opportunity to listen, ask questions and get inspired!




Speakers:
Marco Wieland - CTO and cofounder of Mapper Lithography
Jeremy Butcher - CTO of Fox-IT and graduate of TUD Applied Physics
Sadik Hafizovic - Founder and CEO of Zurich Instruments

HIGHLIGHT PAPERS

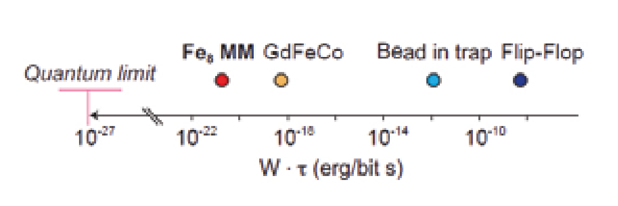
Controlling supercurrents and their spatial distribution in ferromagnets



It is known that magnetic texture helps the generation of spin-triplet Cooper pairs, which can be used for superconducting spintronics. Recently, Kaveh Lahabi, PhD student with Jan Aarts from Leiden University and Paul Alkemade from Quantum Nanoscience, has shown that magnetic texture also permits control over the spatial distribution of the spin-triplet supercurrent. By superconducting quantum interferometry, Lahabi demonstrated first the existence of two distinct supercurrent pathways in the ferromagnetic barrier of a Josephson junction; then he showed how this supercurrent can be controlled by moving the magnetic vortex with a magnetic field. His approach allows the use of switchable supercurrent pathways in future hybrid devices for superconducting electronics.

Kaveh Lahabi, Morten Amundsen, Jabir Ali Ouassou, Ewout Beukers, Menno Pleijster, Jacob Linder, P. Alkemade and J. Aarts
Nature Communications: 10.1038/s41467-017-02236-2

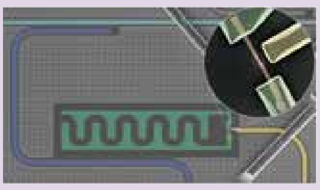
Quantum Landauer erasure with a molecular nanomagnet



The ultimate physical limits of a computation:
Why do our computers and electronic devices heat our laps and drain our batteries? After all, we might think, they shuffle and manipulate only bits of *information*, and information seems to be a virtual entity. In reality, there is a small caveat: when information is erased, an amount of energy gets unavoidably dissipated in the form of heat. How much is that amount?

Nature Physics (2018). R. Gaudenzi, E. Burzurí, S. Maegawa, H. S. J. van der Zant and F. Luis,; 10.1038/s41567-018-0070-7.

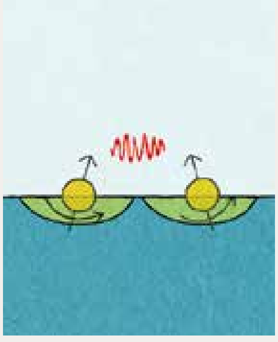
Evolution of Nanowire Transmon Qubits and Their Coherence in a Magnetic Field



We extend the coherence of transmon qubits based on nanowire Josephson junctions and investigate the mechanisms limiting this coherence. We also test the resilience of these qubits to magnetic field, taking a promising step towards new applications of circuit QED at field.

F. Luthi, T. Stavenga, O.W. Enzing, A. Bruno, C. Dickel, N.K. Langford, M.A. Rol, T.S. Jespersen, J. Nygård, P. Krogstrup, and L. DiCarlo
Physical Review Letters 120, 100502 (2018)

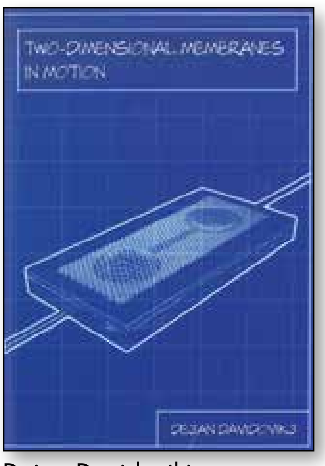
A programmable two-qubit quantum processor in silicon



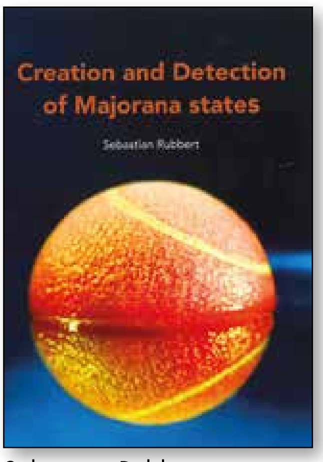
In this paper we demonstrate a programmable two-qubit quantum processor is silicon which can run simple quantum algorithms. The quantum bits (qubits) are made from single electron spins confined in quantum dots in silicon and are controlled using electrical signals. These qubits are an attractive platform for large-scale quantum computers due to their excellent coherence properties, small size, and compatibility with industrial fabrication processes.

T. F. Watson, S. G. J. Philips, E. Kawakami, D. R. Ward, P. Scarlino, M. Veldhorst1, D. E. Savage, M. G. Lagally, Mark Friesen, S. N. Coppersmith, M. A. Eriksson and L. M. K. Vandersypen
Nature 555 633–637 (2018)

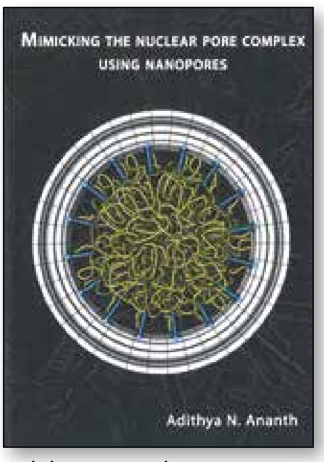
RECENT PHD THESES



Dejan Davidovikj
23 February 2018

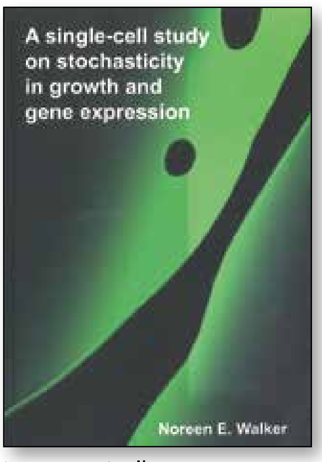


Sebastian Rubbert
18 March 2018



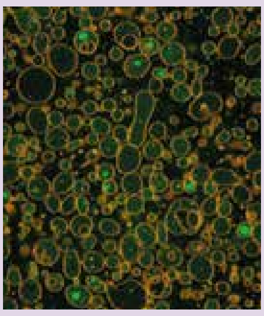
Adithya Ananth
10 April 2018

Norbert Kalb
5 April 2018



Noreen Walker
22 April 2018

Self-replication of DNA by its encoded proteins in liposome-based synthetic cells



The central dogma of biology was formulated in the 1950's and describes the flow of genetic information as a universal property of living cells. In this report, we reconstructed DNA replication, transcription and translation, the three pillars of the central dogma, inside synthetic liposome compartments.

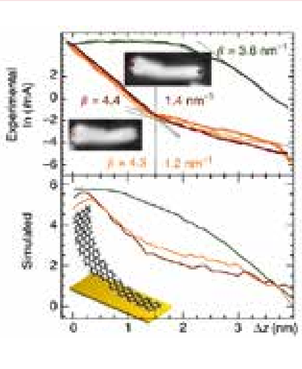
P. van Nies, I. Westerlaken, D. Blanken, M. Salas, M. Mencia and C. Danelon
Nature Communications 2018, 10.1038/s41467-018-03926-1

Remote quantum entanglement between two micromechanical oscillators

Next step towards quantum network based on micromechanical beams. In recent years nanofabricated mechanical oscillators have emerged as a promising platform for quantum information applications. Quantum entanglement of engineered optomechanical resonators would offer a compelling route towards scalable quantum networks.

R. Riedinger, A. Wallucks, I. Marinkovi´c, C. Löschnauer, M. Aspelmeyer, S. Hong, and S. Gröblacher ,
Nature 556, 473–477 (2018).
10.1038/s41586-018-0036-z

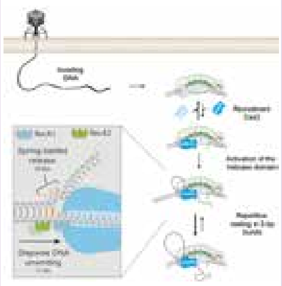
Electronic components embedded in a single graphene nanoribbon



Chemically synthesised nanoribbons with alternating segments were studied using scanning tunnelling microscopy (STM). By lifting the STM tip, different lengths could be measured. The experiments showed remarkable agreement with theoretical calculations, carried out in Delft, Thijssen group.

Peter H Jacobse, A Kimouche, T Gebraad, MM Ervasti, JM Thijssen, P Liljeroth, I Swart
Nature Communications volume 8, Article number: 119 (2017)
10.1038/s41467-017-00195-2

Repetitive DNA reeling by the Cascade-Cas3 complex in nucleotide unwinding steps



A single-molecule fluorescence analysis of an E. coli CRISPR protein. The Cas3 protein uses a spring-loaded unwinding mechanism, reeling the target DNA 3 base-pairs at a time. Facilitated by slipping, Cas3 repeatedly presents its intrinsically inefficient nuclease domain with DNA substrate, which may contribute to promoting a robust immune response"

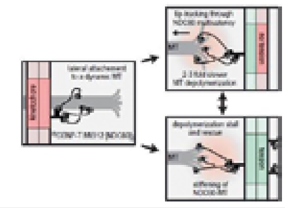
L. Loeff, S. J. J. Brouns, C. Joo, Loeff et al
Molecular Cell molcel.2018.03.031

Single-molecule peptide fingerprinting" *Proceedings of the National Academy of Sciences*

A sensitive protein sequencing technology will create the opportunity for on-site medical diagnostics. The Joo group developed single-molecule fluorescence technology to read signals from labeled amino acids in an ordered manner. This proof of concept will pave the road toward the development of a new, fast, and reliable protein diagnostic tool."

J. van Ginkel, M. Filius, M. Szczepaniak , P. Tulinski , A. S. Meyer*, C. Joo* " - "
PNAS: vol. 115, 13, 3338-3343

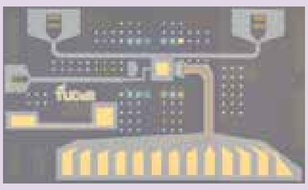
Multivalency of NDC80 in the outer kinetochore is essential to track shortening microtubules and generate forces.



Separation of chromosome pairs in a dividing cell relies on forces produced by catastrophic shortening of microtubules, but how these forces are transmitted to chromosomes is poorly understood.
In this work we show that joining a few copies of Ndc80 complex at its chromosome-binding site creates an efficient coupler that follows microtubule shortening and can reverse it under force, unlike individual monomeric Ndc80 complexes which lack these properties.

Vladimir Volkov, Pim Huis In 't Veld, Marileen Dogterom, Andrea Musacchio
eLife 2018; 7:e36764.

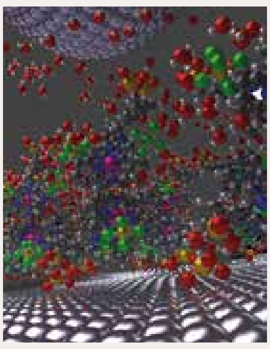
Strong spin-photon coupling in silicon



In this paper we demonstrate strong spin-photon coupling, where a quantum of energy can be exchanged between a single electron spin and a single microwave photon faster than it is lost to the environment. The electron spin is hosted in a silicon double quantum dot, and the photon is trapped on an on-chip superconducting resonator. This result opens the way to cavity-mediated quantum gates between distant spin qubits, removing a major roadblock for the scalability of spin-based quantum processors.

N. Samkharadze*, G. Zheng*, N. Kalhor, D. Brousse, A. Sammak, U. C. Mendes, A. Blais, G. Scappucci, L. M. K. Vandersypen
Science 359, 1123-1127 (2018)

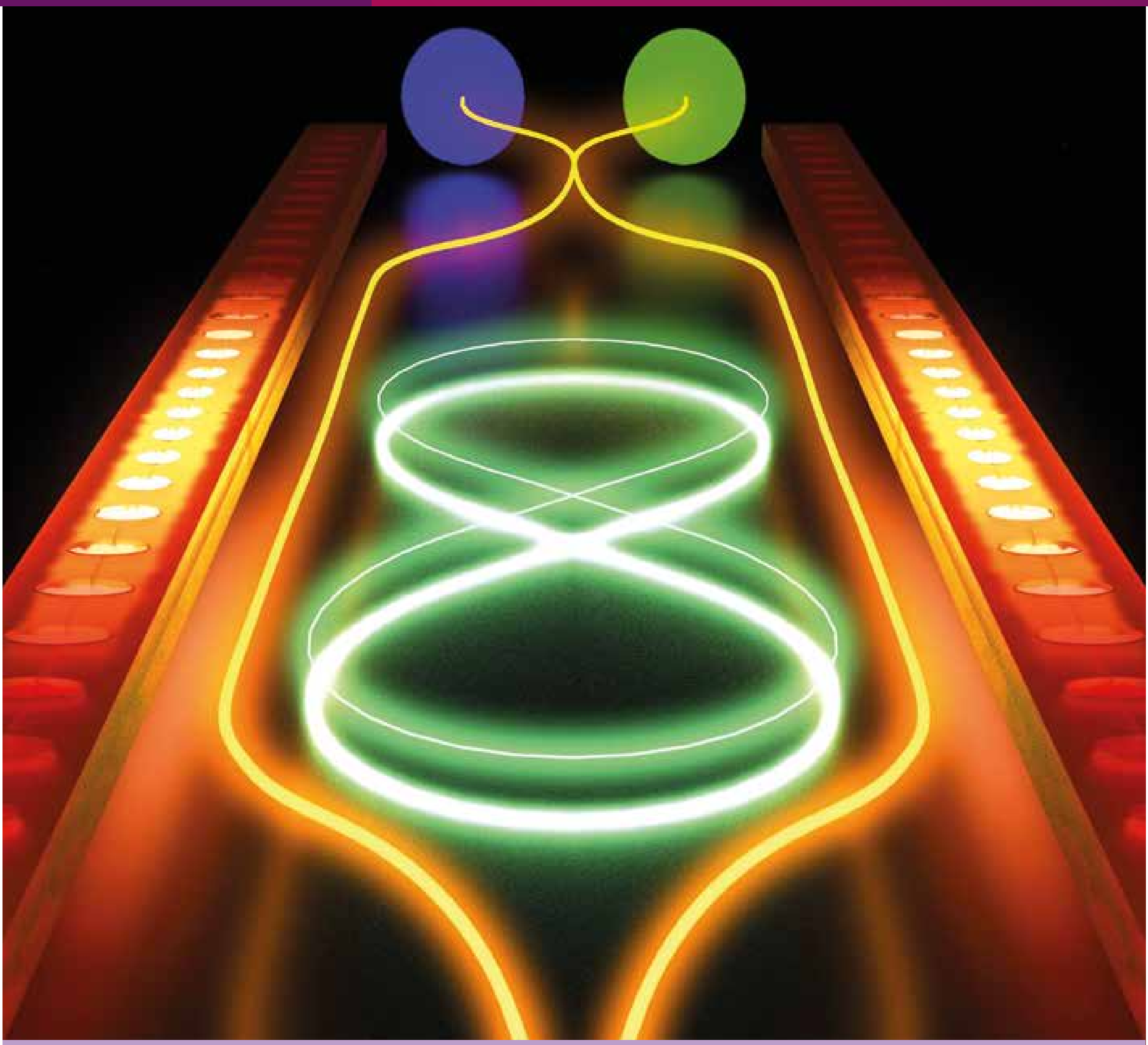
Humidity-controlled rectification switching in ruthenium-complex molecular junctions



An international group of scientists, led by Leiden physicist Sense Jan van der Molen, has developed the first switchable molecular diode. You can turn this on and off through humidity. Vice versa, it is a humidity sensor at the nanoscale. The experiments were backed by elaborate numerical quantum calculations, performed in the Thijssen group (Kavli Instituut of Nanoscience Delft).

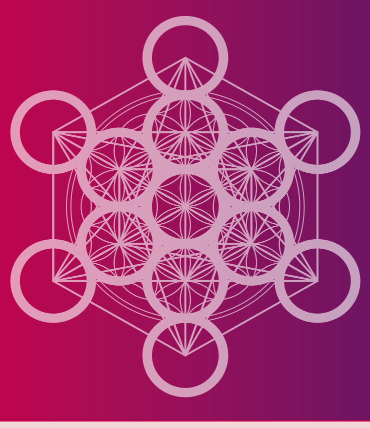
H. Atesci, V. Kaliginedi, J.A Celis Gil, Hiroaki Ozawa, Joseph M Thijssen, Peter Broekmann, Masa-aki Haga, Sense Jan van der Molen.
Nature Nanotechnology vol.13, pages117–121 (2018) 10.1038/s41565-017-0016-8

SCIENCE ART



Artists impression of two mechanical oscillators that are brought into a quantum entangled state through a light field inside an optical interferometer. The two systems exhibit stronger than classically possible correlations, often referred to as *spooky action at a distance*. This demonstration of entanglement between engineered systems could help to directly realize a quantum network. See Riedinger et al, *Nature* 556, 473–477 (2018)
Credits: Moritz Forsch. Kavli Institute of Nanoscience, Delft University of Technology

KAVLI DAY 2018



August 30, 2018

Zeeland, Neeltje Jans

UPCOMING KAVLI COLLOQUIUM

David Awschalom

October 18, 2018

University of Chicago

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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Lay out
Haagsblauw

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