KAVLI NEWSLETTER
Kavli Institute of Nanoscience Delft
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NWO, Bram Saeys

IN THIS ISSUE:

Highest award in Dutch Science given to Marileen Dogterom

Professor Marileen Dogterom has been awarded with the NWO Spinoza Prize. The Spinoza Prize is the highest award in Dutch science and is also referred to as the 'Dutch Nobel Prize'.

Marileen does fundamental research focusing on the forces at work in living cells, in particular in the cytoskeleton. She carries out research into the dynamics in living cells and leads a consortium which is aiming to build an entirely artificial cell. This work helps scientists to understand how basic cell processes work, as well as what goes wrong in certain disorders.

She is one of the four researchers who have each been awarded 2.5 million euros for scientific research.

Cytoskeleton

Prof. dr. A.M. (Marileen) Dogterom (1967) is chair of the Bionanoscience Department of the Kavli Institute of Nanoscience at TU Delft. She became world famous for her experimental research on the forces generated by the cytoskeleton. The cytoskeleton is molecular 'frame' that gives the cells of yeast, plants, animals and humans their shape and sturdiness. It also plays a vital role in cell division. Marileen was the first to measure the forces generated by the microscopic tubules of that cytoskeleton during cell division. This knowledge helps us to understand how healthy cells function – and therefore also what goes wrong at the molecular level with afflictions such as cancer. That creates opportunities for treatments, but also for synthetic biology: building functional, artificial cells from molecular building blocks.

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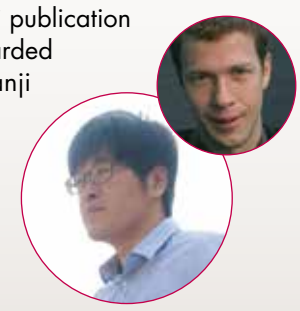
FROM THE DIRECTORS

This Newsletter covers a flood of exciting news in our institute. First of all, professors Marileen Dogterom and Cees Dekker from the BN department were given prestigious awards. Three group leaders from the quantum side of the institute became Antoni van Leeuwenhoek professors - Gary Steele and Sander Otte in QN and Leo Di Carlo in QN/QuTech. Furthermore, six major grants were awarded to KIND researchers: Nynke Dekker (ERC), Sonia Conesa Boj (ERC), Atilla Geresdi (ERC), Andrea Caviglia (Vidi), Anton Akhmerov (Vidi), and Toeno van der Sar (NWO Start-up). In addition, Stan Brouns (BN department) received funding from the Delft University Fund. Last but not least, the bi-annual Kavli publication prize was awarded to Mahipal Ganji (Cees Dekker group) during the Kavli Day.



Chirlmin Joo

COLUMN

In praise of curiosity

This spring, I had the pleasure to read Walter Isaacson's recent biography of Leonardo da Vinci. Following many fascinating chapters on Leonardo's life and work, at the end of the book Isaacson reflects on what he has learned from the great master artist-scientist. First and foremost, that is to "be curious, relentlessly curious". Throughout the book, Isaacson remarks many times that Leonardo, simply through close observation and by never stopping to wonder about anything, sees much more than most people do. Isaacson then explains how these observations are reflected in Leonardo's art and science.

It is often said that all children are born scientists, but that we (or our education system) teaches them to follow pre-set rules, killing their curiosity and the little scientist inside. Living with small children, I can certainly attest to the first part, in the sense that they exhibit Leonardo-like curiosity about everything. At the same time, I can only interpret their drawings because they usually enthusiastically tell me what they've just drawn. I'm no great artist myself, but if I draw a house, you'll recognize it as such – I even understand how to use perspective. That's not because I'm so clever, but because someone taught me. And like all great teachers, once my instructors explained the principles, they encouraged me to try on my own, and to draw what I could see.

It is easy to get bogged down in the grind of everyday life. That holds even if your life is that of a scientist, and thus should in principle be a life in which you can let your curiosity roam freely. It is not our education system that does that, we do it to ourselves. Perhaps here our new artist-in-residence program can help us, by making us wonder anew about the things we study, or perhaps simply talking to someone from another department can do the trick. Curiosity in itself is only the beginning though. It requires great skill to paint something life-like – which is what distinguishes Leonardo's paintings from my humble drawing of a house. It likewise takes great skill to study and manipulate the natural world, and there we have the advantage over Leonardo, as our collective toolset greatly exceeds his. Of course, it is in combining skill and curiosity that scientific progress can be made.

So this is how we should teach, and learn, and work. Develop your skills, and develop your curiosity, not just about your own topic, but about everything. Don't do it for the exam, the paper, or the grant, but just for "the pleasure of finding things out". And thus, combining the attitudes of Leonardo and Feynman, become an artist-scientist.

Timon Idema

TU Delft Best Professor Award 2018

Cees Dekker, Professor of Molecular Biophysics at the Faculty of Applied Sciences has been rewarded with the Best Professor Award 2018.

"It is a great honour to receive this award, especially because the students and PhD candidates have nominated me", says Cees Dekker.

"Cees Dekker's enthusiasm has led to initiatives for integrated research and education at the interface between physics, biology and nanotechnology at TU Delft. This is visible today in the success of the relatively young department of Bionanoscience and also in the new bachelor and master programmes Nanobiology", says Professor Lucas van Vliet, Dean of the Faculty of Applied Sciences.

Myrthe Smit, chairman of S.V.N.B. Hooke, the study association for Nanobiology, says: "Professor Dekker is not only a figurehead for our degree programme, he is also highly appreciated within our study association. We can always contact him for questions and advice and with his extensive knowledge and large network he helps us enormously with the realization of new plans."

2 Vidi grants

NWO has awarded Anton Akhmerov and Andrea Caviglia a Vidi grant worth 800,000 euros. The grant enables them to develop their own innovative line of research.

Anton Akhmerov will work on artifical intelligence for nano-device design. His group will develop automated algorithms to create optimally functioning and robust quantum electronic devices. In that development they will need to overcome the imprecision of the device creation, and the natural variation occurring at the microscopic scale.

The research of Andrea Caviglia investigates a new family of exotic two-dimensional quantum materials created by an innovative transfer technique. This method will allow to surpass the limitations imposed by the conventional growth methods.

KAVLI COLLOQUIUM

"Quantum spintronics: controlling and connecting spins in semiconductors"

David Awschalom

University of Chicago

October 18, 2018 will feature a Kavli colloquium by David Awschalom:

Our technological preference for perfection can only lead us so far. As traditional transistor-based electronics rapidly approach the atomic-scale, small amounts of disorder begin to have outsized negative effects. Surprisingly, a promising pathway out of this conundrum may emerge from recent efforts to embrace defects and construct quantum systems to enable new information technologies based on the quantum nature of the electron. Individual defects in materials possess an electronic spin state for manipulating, communicating, and storing quantum information at the level of single electrons and nuclei. We describe recent developments in manipulating and linking spins in both diamond and silicon carbide. These include opportunities to implement geometrically protected quantum gates, pathways towards high-fidelity processing within wafer-scale materials, and schemes to 'wire' spins using magnons and phonons.

15.45 hr	Reception coffee/tea and cakes
16.00 hr	Kavli colloquium by David Awschalom: "Quantum spintronics: controlling and connecting spins in semiconductors"
17.00 hr	Drinks & time to meet

KAVLI COLLOQUIUM

Date: Oktober 18, 2018
Location: Aula, lectureroom D

David Awschalom is the Liew Family Professor and Deputy Director of the Institute for Molecular Engineering at the University of Chicago, and a Senior Scientist at Argonne National Laboratory. Before arriving in Chicago, he was the Director of the California NanoSystems Institute and Professor of Physics, Electrical and Computer Engineering at the University of California – Santa Barbara. He works in the emerging fields of spintronics and quantum information engineering, where his students develop new methods to explore and control the quantum states of individual electrons, nuclei, and photons in the solid state.
His research includes implementations of quantum information processing with potential applications in computing, imaging, and encryption. Professor Awschalom received the American Physical Society Oliver E. Buckley Prize and Julius Edgar Lilienfeld Prize, the European Physical Society Europhysics Prize, the Materials Research Society David Turnbull Award and Outstanding Investigator Prize, the AAAS Newcomb Cleveland Prize, the International Magnetism Prize and the Néel Medal from the International Union of Pure and Applied Physics, and an IBM Outstanding Innovation Award. He is a member of the American Academy of Arts & Sciences, the National Academy of Sciences, the National Academy of Engineering, and the European Academy of Sciences.

HOT TOPICS SESSION

Topics: Microtubules and cell organization

Date: 19 October 2018
11:00-12:30 hrs
F104 (building 22)

For more information and registration:
https://casimir.researchschool.nl/

Highest award in Dutch Science given to Marileen Dogterom

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'Optical tweezers'
Early on in her career, Marileen was already publishing ground-breaking studies in major scientific journals – and she continues to do so. She has taken her field to new heights, both in the Netherlands and internationally. She initially achieved this at the FOM institute AMOLF and later at the universities of Leiden and Delft. She also made important contributions to the development of biophysical techniques. One example is a laser technique called 'optical tweezers', which enables its user to measure the forces generated by individual molecules.

Artificial cell
Marileen is one of the most important faces of biophysics in the Netherlands. She is the driving force behind the national consortium BaSyC (Building a Synthetic Cell). BaSyC seeks to improve our understanding of the basic physical-chemical processes of life by building an artificial cell bottom-up. BaSyC consists of six research institutes and is supported by a Gravitation grant worth 19 million euros.

What goes into the PMD bin?

Wolfgang Tittel, a self-interview

Two years ago I was firmly established in Canada. I had a good job at the University of Calgary with lots of possibilities to develop. I had a young family with two small children that kept me busy. And I had the Canadian Rockies with their pristine wilderness and offering lots of possibilities for my favourite sports—climbing, skiing, mountain biking—only one hour away. Life was enjoyable, well organized, and predictable.

And then there was this possibility to join the TU Delft. A place that I had not been to before. A place known for its lack of mountains, its rainy weather, and its difficult language. But also a place known for its quality of life, its European culture, and its strong road bikers (who needs hills to climb if the wind is always blowing in your face?). What should we do? Choose security and stay in Calgary, or go for another adventure and move back to Europe (where we came from 12 years ago)? My wife and I were on the fence, changing opinion about what to do at least once per day.

But then came this email. "Everything that is happening around here tells me that there is a unique chance for us to make a big impact in the next half decade in which the future of quantum networks will certainly be defined - and I strongly believe you would be a great partner in this." "That's for you", said my wife. "Let's go!" And so we did.

I am an experimental physicist, and I am fascinated about the interplay between fundamental discoveries in quantum and nano-physics, and the possibilities they offer for creating quantum technology, in particular quantum networks. These are networks that allow provably secure communication—a requirement whose importance for our ICT-dependent society cannot be overestimated—as well as the connection to and between future quantum computers. I started my journey into these topics 24 years ago as a young MSc student when key ideas such as quantum teleportation—proposed only one year earlier— were still considered science fiction. Delft, with its strong focus on quantum communications, quantum computing (within QuTech) and nanotechnology (within the Kavli Institute), supplemented by the very dynamic nature of the European research in these fields, was obviously a huge attraction.

Our life has turned upside down since we choose to join the TU Delft in November 2017, and there has been more adventure than we ever anticipated. But even though we faced many hurdles, we somehow continued moving forward. (But the Dutch recycling system still confuses me, in particular the PMD bin.) We have traded the mountains against the beach, and the Canadian cold against the Dutch rain. We have added two more bikes to our already quite large collection, and the kids have started speaking Dutch to each other. And we are happy. It was a good choice.

NEW EMPLOYEES

Name	Date of employment	Title	Lab
Rob Stockill	01-06-18	Postdoc	Groeblacher Lab
Yue Zhang	15-06-18	MSc	Zandbergen Lab
Kui Yu	01-07-18	PhD	Marie-Eve Aubin Lab
Lars-Eric Fielmich	01-07-18	Postdoc	Hyun Youk Lab
Hadi Arjmandi-Tash	01-07-18	Postdoc	Steele Lab
Lin Han	09-07-18	PhD	Kouwenhoven Lab
Simon Baier	01-08-18	Postdoc	Hanson Lab
Luka Bavdaz	15-08-18	PhD	Veldhorst Lab
Matthew Weaver	20-08-18	Postdoc	Hanson Lab
Rasa Rejali	15-08-18	PhD	Otte Lab
Andreas Krogen	01-09-18	PhD	Tittel group
Cecillia de agrela Pinto	01-09-18	Technician	Chirlmin Joo Lab/Arjen Jakobi Lab
Boris Estrada	01-09-18	Technician	Stan Brouns Lab
Alfredo Rates Soriano	01-09-18	Guest PhD	Van der Zant Lab
Antariskha Das	10-09-18	PhD	Tittel group
Vukan Levajac	15-09-18	PhD	Kouwenhoven Lab
Maria El Abbassi	15-09-18	Postdoc	Van der Zant Lab
Jaap Wesdorp	01-10-18	Phd	Kouwenhoven Lab
Biswajit Pradhan	01-10-18	Postdoc	Cees Dekker Lab
Milan Lacassin	01-10-18	PhD	Hyun Youk Lab
Dimphna Meijer	01-10-18	Faculty	Dept. Bionanoscience
Jiyin Wang	15-10-18	Postdoc	Kouwenhoven Lab
Qinzheng Wang	01-11-18	PhD	Goswami Lab
Prasanna Rout	01-11-18	Postdoc	Goswami Lab
Kim Poyhonen	01-11-18	Postdoc	Wimmer group
Chunxiao Liu	01-11-18	Postdoc	Wimmer group
André de Almeida Nascimento e Melo	01-12-18	PhD	Akhmerov Group
Viktoriia Kornich	15-11-18	Postdoc	Nazarov Group
Ainhoa Atxabal Arraste	01-12-18	Postdoc	Van der Zant Lab
Sonakshi Arora	15-12-18	PhD	Kuipers Lab
Luca Ornago	01-01-19	PhD	Van der Zant Lab
Chunwei Hsu	15-02-19	PhD	Van der Zant Lab

The Kavli prizes – an American Science award show with a Norwegian flavor

Earlier this month the prestigious Kavli prizes were awarded in Oslo to top scientists in the field of Nanoscience, Astrophysics and Neurobiology. The Kavli prizes are Science awards introduced by Fred Kavli to honor breakthrough fundamental research, and I can't help but think that the prizes do a good job at nibbling away at the foundation of Alfred Nobel's explosive legacy of honoring scientific achievements.

The Astrophysics prize was awarded to Ewine van Dishoeck, a Leiden professor who has studied the chemical composition of the universe, and in particular of extra planetary systems and clouds. She uses ALMA, the Atacama Large Millimeter Array, a huge set of telescopes in the Chilean dessert to peek ever further into space using spectroscopy-based molecular fingerprinting. Knowing where water is found in the universe may ultimately predict where we might be able to find extra planetary life.

The Neuroscience prize was awarded to three scientists studying hair-cells in our inner ear that convert sound to electrochemical signals. I was quite fascinated to learn that hair-cells resonate at different frequencies in the inner ear, and that this leads to mechanical opening of a molecular hatch on the top of these hair cells to let in calcium and potassium, which then propagates as an electrochemical signal to our brain. Although a little bit ridiculed during an interview with science reporters the day before the award ceremony, major steps to unravel this system were taken by studying turtles' ears, which apparently, have a simpler sound perception and a more accessible inner ear.

The Nanoscience prize went to three of my colleagues in the CRISPR field, Jennifer Doudna, Emmanuelle Charpentier and Virginijus Siksnys, who have been the driving forces behind the fundamental Cas9 science necessary to develop Cas9 into a genome editing nuclease. For some of them this finding has been a life-changing, and one of the laureates told me she now frequently meets kings and presidents, including our king Willem Alexander and good old King Harald at this particular event.

The Kavli prizes were concluded with a banquet held at the Oslo Municipality, a stunning Art-Deco place that could feature in any futuristic movie. There I learnt of all the mischief that the Vikings had committed from my dinner neighbor, including a raid on Paris that involved hiding weapons in a coffin trying to bury a comrade within city walls, after the Vikings had been 'converted' to Christianity first.

All in all I learnt from the laureates that it is good to study turtles sometimes, and that major discoveries seem to be made mostly by scientists changing their field, and who then choose the right new topic. The challenge is set for us all.

Stan Brouns

Stan Brouns receives donation by The Delft University Fund

Stan Brouns is leading research aimed at developing a possible alternative for antibiotics:
"I want to create the possibility to help patients in the Netherlands with phages, when antibiotics have stopped working. That's why, in addition to the fundamental phage research in Delft, we are also working on setting up a foundation in the Netherlands that harbors a phage library, and I am working hard to put phage therapy on the map."

The Delft University Fund has in close cooperation with the Faculty of Applied Sciences organised a fundraising towards her alumni. Together with this income The Delft University Fund donated EUR 100.000 for a national phage library and the research of bacteriophages. With this support, Stan Brouns' research on bacteriophages can be accelerated and a phage library can become reality.

Artist in Residence

We will start an 'Artist in Residence' program at our Kavli Institute! This will annually offer a talented international artist working in the fields of conceptual art, visual art, photography, music, design, dance, film, theatre, or poetry an opportunity to work on a project within our institute. He/she will be invited to come visit us for a period of about 3 months, in which he/she will have the opportunity to closely interact with the scientists at the institute, join in work discussions, experience lab work, and the like. The expectation is that the Artist-in-Residence fellowship will result in a piece of art that relates to our nanoscience. We hope that the cross-fertilization between the creative approaches and our scientific discipline will evoke disruptive new insights, strengthen ties, and trigger novel approaches. We have now opened a call that is open for artists to apply. Notably the **deadline for applications is December 31**. Further information is given at http://kavli.tudelft.nl/kavli-artist-residence.

CIFAR Azrieli Global Scholar Award

CIFAR (Canadian Institute For Advanced Research) held an international competition to select young investigators around the world of any nationality in the following fields - astrophysics, quantum physics, neuroscience, biophysics, psychology, and microbiome - to be appointed for 2-years as a "CIFAR Azrieli Global Scholar". Out of ~ 400 candidates from 55 countries, Hyun Youk was selected as one of 12 global scholars. He will be appointed as a member of CIFAR's "Molecular Architecture of Life" program for the next 2 years along with a $100,000 (CDN) funding, seed money to start collaborations with CIFAR's members, and invitation to CIFAR's annual meetings.

Three members of the Kavli Institute of Nanoscience are recently appointed Antoni van Leeuwenhoek professor. Below the "self-interviews" from Sander Otte, Gary Steele and Leo di Carlo.

Gary Steele

Can you briefly explain the focus of your research?
The core focus of my research is quantum circuits, with three directions that we use these for: mechanics, simulating interesting quantum physics, and exploring new materials.

Quantum circuits themselves are small superconducting circuits made from inductors, capacitors, and Josephson junctions. Typically we make these circuits so that they have natural oscillation frequencies in the gigahertz frequency range, which means that we can bring their oscillations naturally to their quantum ground state by cooling them to milli-kelvin temperatures in one of our dilution refrigerators. By incorporating Josephson junctions into our circuits, we can use oscillating microwave signals, like those emitted by your phone when you sent a WhatsApp message, to have complete control of the quantum state of the oscillating currents and voltages in our devices.

The largest focus of my group is using these quantum circuits to try to create quantum superpositions of heavy "macroscopic" objects. To do this, we need to couple the motion of a mechanically moving part of our device to the quantum state of the circuit. This is a challenging task as it requires incorporation of the tricky cleanroom work to make the quantum circuits with the "magic" of making suspended mechanical devices in one chip, such as shown below in the image of a beam embedded in a superconducting quantum interference device (SQUID).

What does the appointment mean to you personally?
For me personally, I view the appointment as an recognition of the high quality of the work we do in my group, and of myself as one of the leading researchers in Delft.

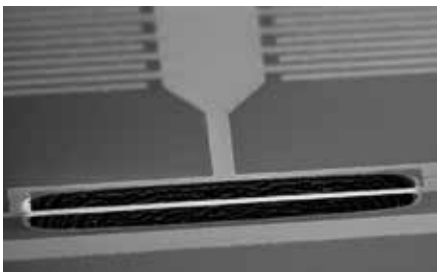
What was the feedback from your colleagues, friends and family?
I received many congratulations from my colleagues. From my research group, I got a really great surprise: a framed and signed, picture with images of my research since my undergraduate studies, complete with a 2 inch wafer with a congratulatory message and a picture of me etched in a superconducting film (complete with "holey ground"!). My family in Delft was proud of me, and my family in Canada seemed to think it was probably good (and were simultaneously perplexed at my "smashing of the limits of quantum mechanics" described in the Delta article).

What has changed for you with the AvL professorship?
Primarily, I get to wear a hat at the defense ceremony!

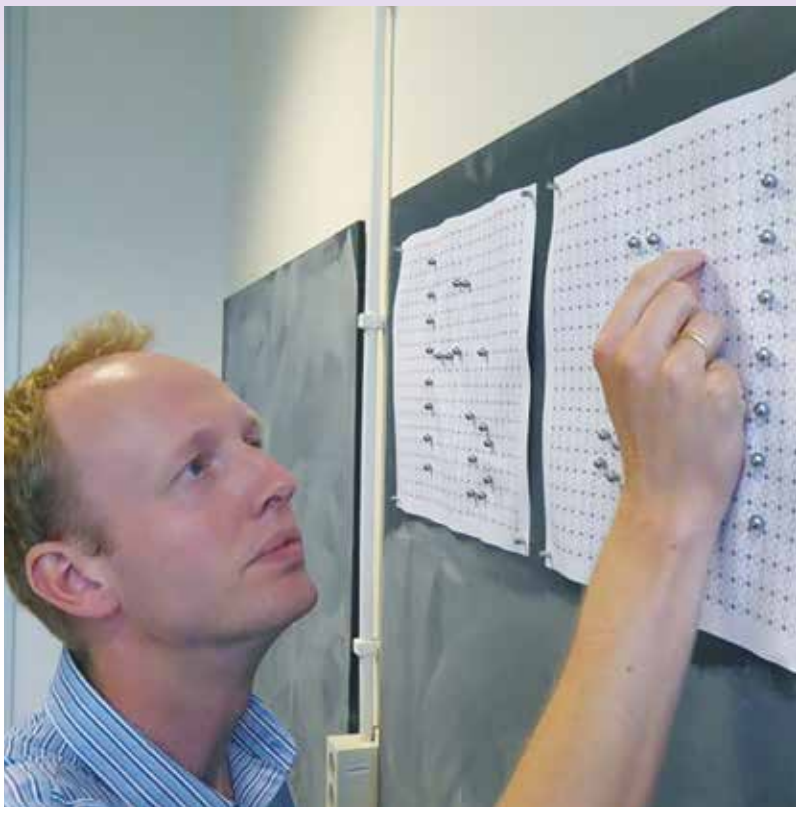
For my research group, not much will change except the title on my door might someday get updated…

I also look forward to being able to use the title Professor (which I have learned one should never dare to do in the Netherlands if you are a "docent", English translations of the titles aside…) Jokes aside, it does mean that I am expected to take on a more serious role in helping form and improve the university at a wider level, which is something I am happy to get involved in.

What would you like to have accomplished in 10 years from now, what is your "dream" at this point in your academic career?
It would be fantastic if we could demonstrate in the group that gravitational forces must behave somehow in a quantum way: experimental evidence of coherent quantum superpositions of space-time. But for me, it is more than enough if in 10 years I get to continue doing fun physics with a great team like I have today.


A mechanical beam embedded in a superconducting quantum interference device

Sander Otte



Leo DiCarlo

Can you briefly explain the focus of your research?
My research team ambitions to build a useful prototype of a quantum computer based on superconducting quantum circuits. In collaboration with colleagues from the EWI faculty, TNO, and industrial partners like Intel and Zurich Instruments, we work on all layers of this computer, from the quantum hardware, through the control electronics, to the software. We ambition to make all such layers scalable, so that our current efforts with 7 qubits will apply seamlessly at 17 and 49 qubits (our near-term goals)… and beyond.

What does the appointment mean to you personally?
The appointment is a valued vote of confidence by the university and the research community (through the recommendation letters). It provides affirmation of my team's achievements in these 8 years and a supportive message to keep growing for another 25! Personally, this is a key milestone in my academic career and thus an opportunity to thank the numerous people who have helped me pursue the dream of becoming professor since I first considered it some 20 years ago. Family, friends, teachers, mentors, research group, staff, colleagues… all come to mind in superposition.

What was the feedback from your colleagues, friends and family?
I learned the news from Dean Lucas van Vliet minutes before performing with the QuTech rock band at our summer BBQ, so I had the instant opportunity to celebrate with my group and the QuTech community. The enormous bouquet of flowers that later arrived at my place gave the moment a uniquely Dutch touch. The best part remains being teased with *"Professor Leo!"* when I walk into a meeting or pass by, it has a funny ring that makes me smile every time. I do not come from a historically academic extended family, so I had some explaining to do to the folks back home in Argentina, who remain my biggest supporters despite the distance.

What has changed for you with the AvL professorship?
So far only my business card! Titles do not fundamentally change a person, certainly not in this short time. But, seriously, the AvL professorship is an invitation to spread my wings beyond my research group, to seek and create positive impact for QuTech, Kavli and the university at national and international levels. These are interesting times for quantum technology, with key decisions being made (locally and in Brussels) that will have lasting impact over the next decade. I want to contribute more actively to this process, and believe the AvL professorship will open many doors in this context.

What would like to have accomplished in 10 years from now, what is your dream at this point in your academic career?
Ten years from now, I hope we have realized a quantum computer that is both fault tolerant (more resilient to errors via quantum error correction) and is also useful in the sense of beating a non-quantum computer in a task of societal relevance, not just a mathematical problem of no significance to you and me.

Can you briefly explain the focus of your research?
In my group we build pieces of matter one atom at a time. By doing so we aim to learn how certain material behavior comes about. We focus particularly on structures built from magnetic atoms, for which there are many open questions. For example, even if you know the exact quantum mechanics of a single magnetic atom, even the strongest computers in the world will not be able to predict how a collection of 100 of those atoms will behave. Let alone a real macroscopic piece of magnetic material, like a chunk of iron consisting of 10^23 atoms! Nobody can explain the behavior of that chunk starting from the fundamental laws of physics. The only way to truly understand how magnetic correlations arise inside matter is by building sample materials from the ground up. Once we have the building blocks under control, we might even design more sophisticated forms of matter that don't exist in nature.

What does the appointment mean to you personally?
I view it as a gesture of confidence from the university. Not just in the quality of my research, which is judged primarily by my colleagues in the field anyhow, rather than by the university. The real challenge in my view is to transmit the way of thinking that enables that research to our students; to help shape the education we offer. This is a huge responsibility and it is a great feeling to be given such confidence.

What was the feedback from your colleagues, friends and family?
Mostly positive, of course. Except, when my kids saw a picture of me in a gown, they begged me to please never dress like that again.

What has changed for you with the AvL professorship?
In eight weeks? Not much, other than a sudden surge in interview requests. Ask me again in two years!

What would you like to have accomplished in 10 years from now, what is your "dream" at this point in your academic career?
I want to demonstrate that our approach of assembling atomic structures can truly contribute to our understanding of quantum matter. At this stage we have made tremendous progress in our abilities to engineer atomic magnetism, but the scale of our structures is still too small to compete with numerical calculations. I believe we are close to being able to exceed the limit of these calculations.

More ambitiously, I want to scale up atomic assembly to the point where it becomes interesting for non-scientific applications. The kilobyte memory that we built a few years back from 60,000 individual atoms was a significant step in that direction. What form such applications would have I honestly don't know at this stage, but by starting a dialogue with relevant industry and by making them aware of the possibilities, new ideas will emerge automatically. My dream is to take the lead in this development.

COLUMN

About names

Did you ever think about how we name discoveries? Take for example this sentence:
"Majorana fermions are Andreev states (solutions of the Bogoliubov-de Gennes equation) appear in the Kitaev chain, which turns into the Ising model after applying the Jordan-Wigner transformation."
If I used it in a manuscript, it would blend right in. While this sentence does not sound special to a researcher, it contains names of nine physicists—almost half of the sentence by length.
I would like to discuss if naming the discovery after its discoverer is a good tradition.

First of all, let us compare with traditions existing in other communities.
Geography has a mixed standard with some places indeed named after their discoverers.
Examples of this are America and Cook islands (not actually discovered by Amerigo Vespucci or James Cook).
Astronomers name new celestial bodies after anything or anyone they like, often living people. For example the asteroid 4942 Munroe named after the author of the popular XKCD webcomic.
Likewise biologists frequently name new species in the honor of famous people, like the recently discovered parasitic flatworm Baracktrema obamai or a wasp Idiogramma elbakyanae named after Alexandra Elbakyan, the creator of a popular webportal Sci-Hub for pirating journal articles.
Mathematics and physics are more similar to geography: researchers do not name their discoveries after someone they admire (also not themselves), but still the community together often names phenomena after their discoverers.

Honoring great researchers by commemorating their work in this way likely promotes ambition and maybe motivates a handful of our colleagues. Nevertheless I think we should avoid attaching names to phenomena.
Firstly, people are much more complex than phenomena: Newton did invent the laws of motion, but he also caught some twenty eight counterfeiters and ensured that they were hung, drawn, and quartered. Or take Hans Asperger, the researcher who described the Asperger syndrome: he is now known to be a supporter of the Nazi government and their child 'euthanasia' program.
Then, some names might be unwieldy: if there are two back-to-back papers with three authors each, do we call their work the "LSSORO model" or do we pick one author from each paper?
Naming often happens spontaneously: one paper dubs a phenomenon after the discoverers, then the new term becomes popular and stays forever. Unlike a decision by for example a prize committee, the primary task of the authors of that paper was not figuring out who has contributed to the idea.
A poorly chosen name can then promote hostile competition and scheming, ultimately poisoning a complete field.

However in my opinion one reason for not naming discoveries after people trumps them all.
Thinking that discoveries are made by individuals is similar to believing that running is done by Usain Bolt. He is certainly the absolute best, but his lifetime improvement is exactly 0.16 seconds over the previous record.
I think that in research just like in sport we should celebrate personal achievement, but also remember that it took a complete research community to come to where we are and that the second best is only a split second behind.

Anton Akhmerov

2018 Kavli Delft publication prize for Mahipal Ganji's paper Real-time imaging of DNA loop extrusion by condensing"

On our Kavli Day, the 2018 Kavli Delft publication prize was awarded, a prize for the best publication that resulted from our Kavli Institute in the previous two years. The prize, which consists of an award and an amount of € 3000 for the laureates, is given out every two years. Various nominations had come in. A selection committee consisting of 4 senior and junior professors from our Institute read the papers that were sent in and ranked them. The selection committee had a hard task because of the excellent quality of many of the papers that were sent in, but in the end, the committee reached a verdict and selected the winning paper.

The 2018 Kavli Delft publication prize was awarded to M. Ganji, I.A. Shaltiel, S. Bisht, E. Kim, A. Kalichava, C.H. Haering, C. Dekker for their paper "Real-time imaging of DNA loop extrusion by condensing" that appeared in Science 360 in 2018.

We are proud that we can award Mahipal Ganji and all co-authors the 2018 Kavli Delft publication prize for this wonderful work.

ERC Grants

Nynke, Attilla and Sonia

Advanced for Nynke Dekker (BN)

The European Research Council has awarded Professor Nynke Dekker an ERC Advanced Grant of 2,5 million euros. Nynke Dekker, professor of Biological Physics, will map the replication of chromatin in yeast using single-molecule techniques.

Starting for Sonia Conesa-Boj (QN) and Attila Geresdi (QuTech)

The European Research Council has awarded ERC Starting Grants to two Kavli Delft researchers. The grants (1,5 million euros for a five-year programme) are intended to support scientists who are in the early stages of their career and have already produced excellent supervised work.

Sonia Conesa-Boj

Research on 'Living on the Edge: Tunable Electronics from Edge Structures in 1D Layered Materials'. The main goal of this project is to obtain precise understanding and control of the unique relationship between structural and electrical edge-induced properties of 1D LMs.

Attila Geresdi

Research on 'Simulated Majorana states'. He proposes to utilize a well-understood and flexible platform: a linear array of quantum dots.

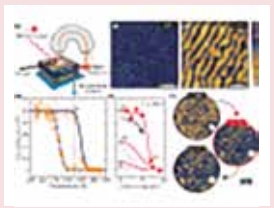
KAVLI DAY

August 30 2018

Zeeland, Neeltje Jans

Photography Sacha Khaiboulov

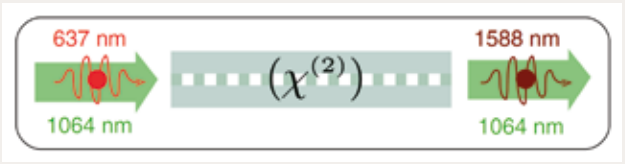
Light control of the nanoscale phase separation in heteroepitaxial nickelates



The class of materials known as nickelates presents a nanoscale phase transition which has important implications for nanoelectronics.
Sending a very fast, high energy pulse of laser light researchers at TU Delft managed to control on-demand the properties of the material from insulating to conducting.

G. Mattoni, N. Manca, M. Hadjimichael, P. Zubko, A. J. H. van der Torren, C. Yin, S. Catalano, M. Gibert, F. Maccherozzi, Y. Liu, S. S. Dhesi, and A. D. Caviglia
Phys. Rev. Materials 2, 085002, 2018

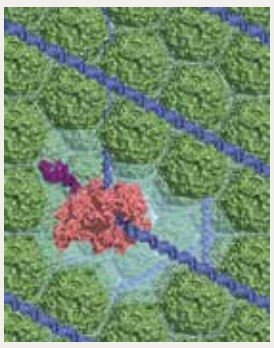
Quantum Frequency Conversion of Single Photons from a Nitrogen-Vacancy Center in Diamond to Telecommunication Wavelengths



NV centers are promising nodes for future quantum networks. Dreau and co-workers demonstrated the quantum frequency conversion of single photons emitted by NV centers to photons in the so-called telecom band. This result opens the door to generating entanglement between NV centers over metropolitan distances (>30km).

A. Dréau, A. Tchebotareva, A. El Mahdaoui, C. Bonato, and R. Hanson
Phys. Rev. Applied 9, 064031

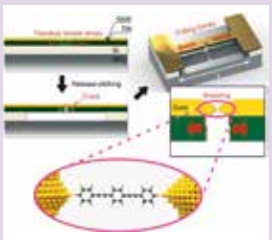
Global DNA Compaction in Stationary-Phase Bacteria Does Not Affect Transcription



In bacteria, nucleoid-associated proteins (NAPs) dynamically restructure the nucleoid and modulate protein biogenesis processes. While this hypothesis holds for most NAPs, this study discovered that nucleoid reorganization by the DNA-protecting protein Dps is entirely decoupled from basal gene expression processes. Despite markedly condensing the bacterial chromosome, Dps selectively allows access to RNA polymerase and transcription factors at normal rates while excluding ancillary DNA-binding proteins, such as restriction endonucleases. This observed behavior provides the first evidence that phase-separated organelles may also exist in prokaryotes.

R. Janissen, M. M.A. Arens, N. N. Vtyurina, Z. Rivai, N. D. Sunday, B. Eslami-Mossallam, A.A. Gritsenko, L. Laan, D. de Ridder, I. Artsimovitch, N.H. Dekker, E.A. Abbondanzieri, A.S. Meyer
Cell, 2018, 174(5):1188

Massively parallel fabrication of crack-defined gold break junctions featuring sub-3 nm gaps for molecular devices



Nanogap electrodes, basically pairs of electrodes with a nanometer-sized gap between them, are attracting attention as scaffolds to study, sense, or harness the smallest stable structures found in nature: molecules. So far this was realised using the common methods of mechanically controlled break junctions, scanning tunneling microscopy based break junctions or electromigrated break junctions. These techniques, however, are not useful for applications due to their lack of scalability. A team from TU Delft in collaboration with researchers from the KTH Royal Institute of Technology in Sweden has now developed a novel way of fabricating molecular junctions.

V. Dubois, S.N. Raja, P. Gehring, S. Caneva, H. S. J. van der Zant, F. Niklaus and G. Stemme, *Nature Communications* 9, 3433 (2018).

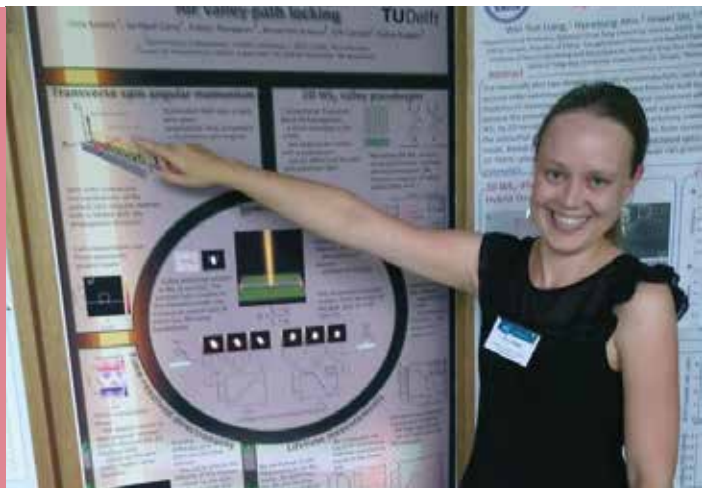
NWO Start-up grant for Toeno van der Sar

Magnetic imaging of binary electron waves in 2D materials for the chips of the future

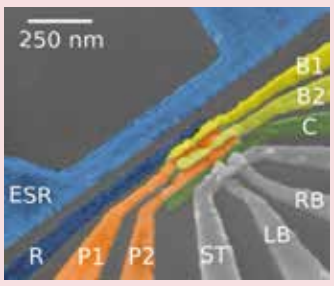
Recently discovered, atom-thin crystals have caused considerable excitement in physics. Their electrons have new, binary properties that could lead to a completely different and faster computer architecture. Van der Sar will investigate these properties using a diamond mini-MRI scanner with an exceptionally high nanometre resolution.

Irina Komen wins NFO poster prize

Irina Komen (QN, Kuiperslab) was awarded the poster prize at the international Near-Field Optics conference (NFO15), held last August in Troyes, France. Her contribution was selected among more than 400 posters.
She presented her work on achieving valley-to-path locking, combining plasmonic nanostructures with 2D materials. The poster prize was offered by the journal MDPI Photonics.



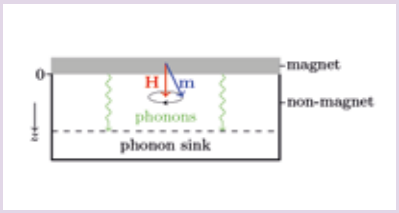
Spin lifetime and charge noise in hot silicon quantum dot qubits



While most quantum circuits today operate at very low temperatures, the available cooling power in this regime may be incompatible with future quantum integrated circuits hosting thousands to millions of qubits required for practical quantum information. Here we study hot silicon spins and show that spin lifetimes can be significant, even above one Kelvin, thereby providing avenue for hot silicon qubits.

L. Petit, J.M. Boter, H.G.J. Eenink, G. Droulers, M.L.V. Tagliaferri, R. Li, D.P. Franke, K.J. Singh, J.S. Clarke, R.N. Schouten, V.V. Dobrovitski, L.M.K. Vandersypen, and M. Veldhorst
Physical Review Letters 121, 076801, 2018

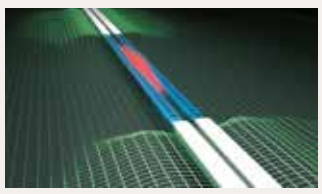
Damping of magnetization dynamics by phonon pumping



In this paper we predict an enhancement of magnetization damping when a phonon angular momentum current is pumped into an attached non-magnetic substrate. This "phonon pumping" is the phonon analog of "spin pumping" into metals which is a widely observed phenomenon in spintronics. However, in contrast to spin pumping, which simply increases the Gilbert damping of the magnet, the damping enhancement by phonon pumping cannot be described by Gilbert phenomenology.

S. Streib, H. Keshtgar, G. E. W. Bauer,
Phys. Rev. Lett. 121, 027202
(2018)

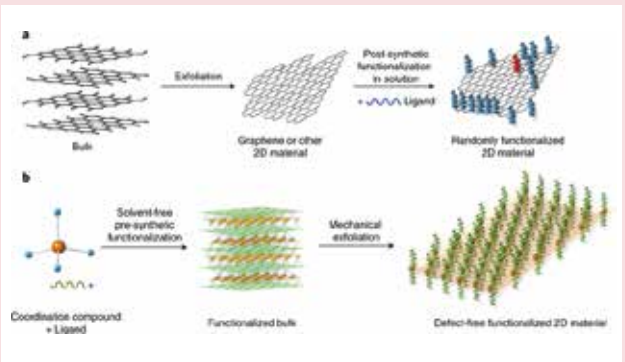
Uncovering the interplay between two famous quantum effects



The Casimir force and superconductivity are two well-known quantum effects. Separately, these phenomena have been thoroughly studied. But what happens when you bring the two effects together in a single experiment? For the very first time, researchers at Delft University of Technology have done just that. They've created a microchip on which two wires were placed in close proximity, in order to measure the Casimir forces that act upon these wires when they become superconducting.

R.A. Norte, M. Forsch, A. Wallucks, I. Marinković, and S. Gröblacher, Phys. Rev. Lett. 121, 030405 (2018)

Isoreticular two-dimensional magnetic coordination polymers prepared through pre-synthetic ligand functionalization



A pre-synthetic method that allows the synthesis crystalline, robust and magnetic functionalized monolayers of coordination polymers that can be mechanically exfoliated. When exfoliated, 2D materials are obtained that retain their long-range structural order and exhibit good mechanical and magnetic properties. This, together with the possibility to functionalize their surface at will, makes them good candidates to explore magnetism in the 2D limit and to fabricate mechanical resonators for selective gas sensing.

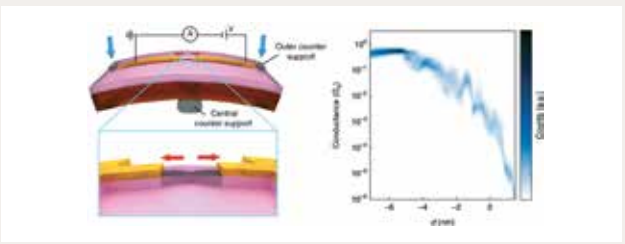
López-Cabrelles, J., Mañas-Valero, S., Vitórica-Yrezábal, I.J., Bereciartua, P.J., Rodríguez-Velamazán, J.A., Waerenborgh, J.C., Vieira, B.J.C., Davidovikj, D., Steeneken, P.G., van der Zant, H.S.J. and Espallargas, G.M., Nature Chemistry augustus 2018.

Gate-controlled quantum dots and superconductivity in planar germanium

High-quality quantum dots and gate-tunable supercurrents are demonstrated in strained germanium heterostructures, with record mobilities for undoped systems. Planar germanium thereby becomes an excellent platform for spin, superconducting, and topological quantum electronic devices for fast and coherent quantum hardware.

N.W. Hendrickx, D.P. Franke, A. Sammak, M. Kouwenhoven, D. Sabbagh, L Yeoh, R. Li, M.L.V. Tagliaferri, M. Virgilo, G. Capellini, G. Scappucci, and M. Veldhorst
Nature Communications 9, 2835 (2018)

Mechanically Controlled Quantum Interference in Graphene Break Junctions



Graphene mechanically controlled break junctions exhibit large conductance oscillations as a function of nanometre displacement between two overlapping graphene sheets at room-temperature. Our findings, supported by DFT and tight-binding calculations, are a direct experimental observation of the quantum interference of standing waves in sliding bilayer graphene.

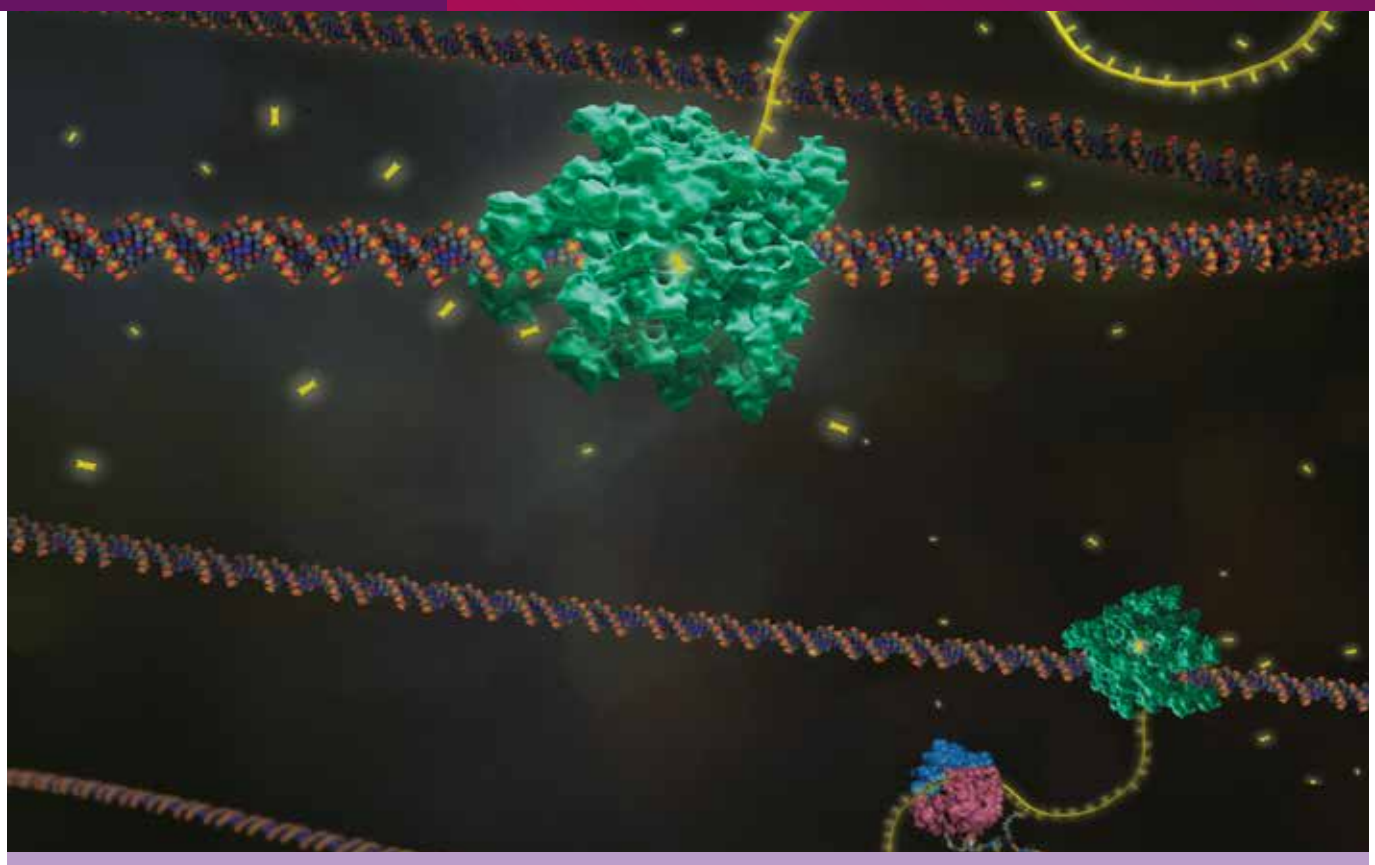
S. Caneva, P. Gehring, V. M. García-Suárez, A. García-Fuente, D. Stefani, I. J. Olavarria-Contreras, J. Ferrer, C. Dekker and H. S. J. van der Zant
Nature Nanotechnology, 2018, DOI: 10.1038/s41565-018-0258-0

A cross bar network for silicon quantum dot qubits

A shortcut for quantum dots toward large-scale quantum computation is proposed. Shared control and design based on semiconductor manufacturing avoid an interconnect bottleneck and enable the construction of scalable qubit tiles with silicon spins.

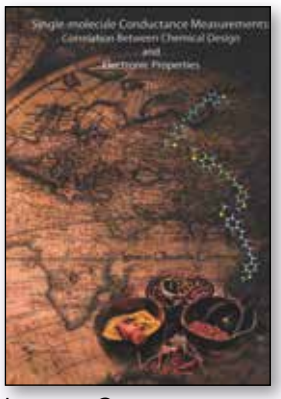
Ruoyu Li, Luca Petit, David P. Franke, Juan Pablo Dehollain, Jonas Helsen, Mark Steudtner, Nicole K. Thomas, Zachary R. Yoscovits, Kanwal J. Singh, Stephanie Wehner, Lieven M. K. Vandersypen, James S. Clarke and Menno Veldhorst
Science Advances 4,7 eaar3960 (2018)

SCIENCE ART

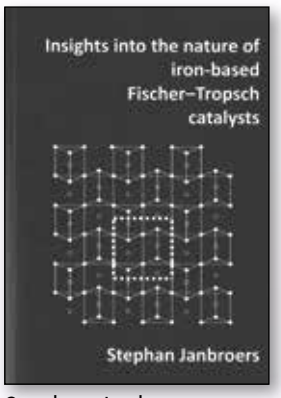


Author's impression of DNA-dependent RNA polymerase during the transcription process that regulates protein biogenesis responsible for cell survival in all living organisms. The investigation of the starvation-survival response in *E. coli* that yields genome compaction and protection not only revealed that the basal gene expression machinery is unaffected, but that ancillary DNA-binding proteins are effectively repelled from the shielded genome. This work provides the first evidence that phase-separated organelles also exist in prokaryotes (Cell, DOI: 10.1016/j.cell.2018.06.049).
Credits: Richard Janissen, Nynke Dekker Lab, 2018

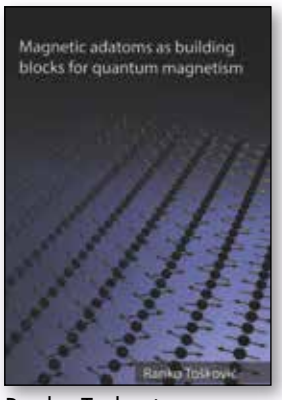
RECENT PHD THESES



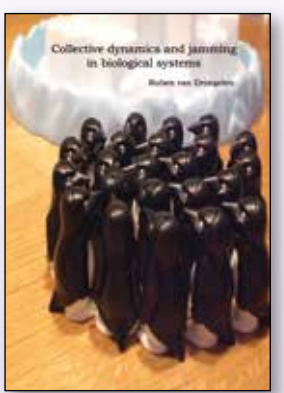
Ignacio Contrereas
2 June 2018



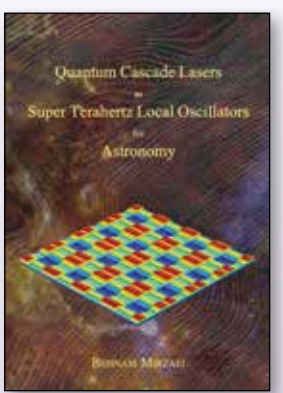
Stephan Janbroers
19 June 2018



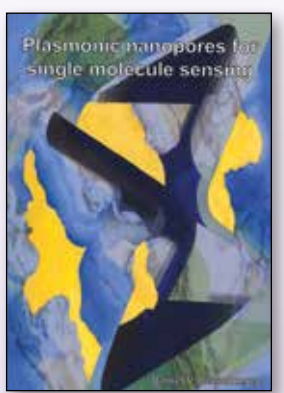
Ranko Toskovic
19 June 2018



Ruben van Drongelen
02 July 2018



Behnam Mirzaei
4 September 2018



Daniel Verschueren
24 September 2018

COLOFON

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Haagsblauw

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