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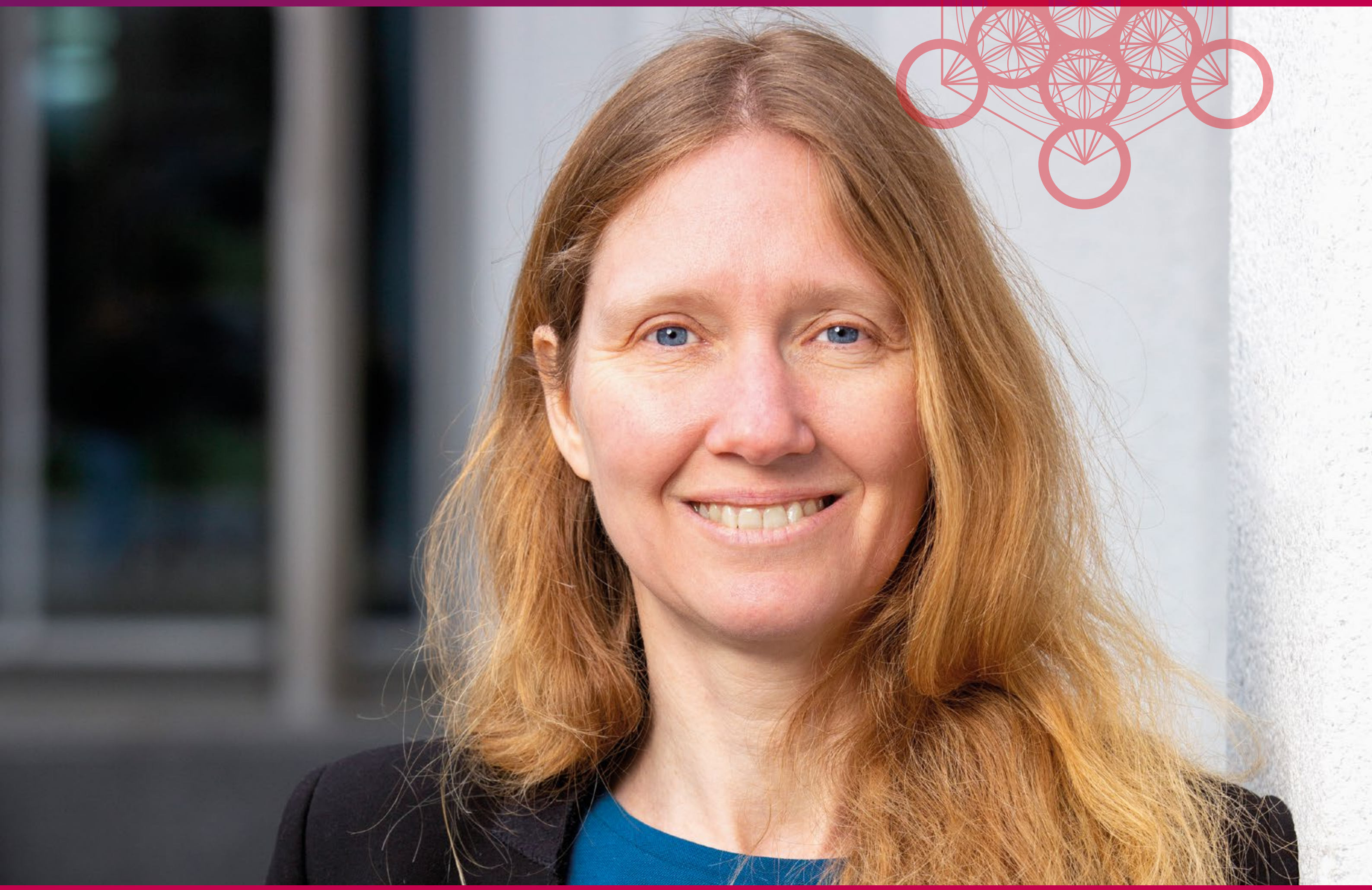

IN THIS ISSUE:

Interview with Spinoza Prize winner Nynke Dekker

Prof. dr. Nynke Dekker is one of four scientists who received the Spinoza Prize in 2020 – the highest scientific award in the Netherlands – for her pioneering work in understanding DNA and RNA replication. Her efforts have also let to ground-breaking bio-medical insights, for instance into the development and behavior of tumor cells. What drives her interest in molecular biophysics?

Q: Congratulations on winning the Spinoza prize! Which aspect of your work fascinates you most?
A: "What I like most is working with molecular machines that play important roles in biology. To see one of these biological proteins in action, to watch it change aspects of DNA, and to understand how this is carried out. And to build our own microscopes to study these molecular motors. First we examined how enzymes such as topoisomerases were able to cut DNA and paste it back together; now we have moved towards understanding more complex molecular machines such as polymerases that incorporate new nucleotides into DNA and as such permit its copying."

Q: What has been the biggest surprise in your career up till now?
A: "When we added chemotherapeutic agents to DNA topoisomerases in 2007 and found out novel aspects of how these enzymes function. Think of DNA like an old-fashioned telephone cord: the more it is coiled, the more torsion builds up.

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FROM THE DIRECTORS

This Newsletter covers a flood of interesting news in our institute. Nynke Dekker, Hans Mooij, and Marie-Eve Aubin-Tam were given prestigious awards. Ronald Hanson was appointed Distinguished Professor. Major grants were awarded to Simon Gröblacher and Stan Brouns. We highlight the successful ending of Artist In Residence 2020. And don't miss self interviews by a PhD student, Niccolo Fiaschi, and three new faculty members: Jos Zwanikken, Natalia Chepiga, and Kristin Grussmayer!

Chirlmin Joo

COLUMN

Higher learning

From a quantum internet to a synthetic cell, many groups in our institute are trying to build something that the world has never seen before. In doing so, they try to kill two birds with one stone, connecting the 'applied' and 'sciences' in our faculty name. For the 'science' part, the work is frequently motivated by quoting Feynman, stating that what we cannot create, we do not understand.

Unfortunately, this statement carries an intrinsic pitfall in the form of a classical logical error: the (implicit and tacit) assumption that if we can create something, that means we also understand it, which does not follow from what Feynman said. Therefore, even if we assume Feynman was right (which I'm inclined to do), being able to create is not sufficient for understanding.

While it is reasonably clear what we mean by 'create' in the lofty projects going on in our institute, it may not be so obvious what it means that we 'understand' them. This problem does not stand alone. Being able to predict the outcome of an experiment is a good test for a scientific theory, but doesn't prove it right. In that light, science might be like one of Zeno's paradoxes – we can approach understanding, but never reach it.

Zeno's paradoxes are only just that though: they are apparent contradictions, not real ones. We can explain why using calculus. There, I believe, lies the crux of the matter: understanding something requires both the ability to explain and the ability to apply.

The best way to test if you can explain something is to go do it. That is why teaching is often even more useful to the teacher than to the student. As a student, you learn to apply the new method or theory to a problem of the teacher's choosing, but as a teacher, you have to both explain the science and find a new application for the students to test their knowledge.

So, if you wish to be a researcher, you should teach, or you can never claim you understand something. You don't need to be a professor to teach though, and the people you're teaching need not be younger than you – if you master your topic, no matter your age (real or academic), you can teach it to anyone, and Nobel prize winners can be your students.

On the other hand, if you wish to be a teacher, you should immerse yourself in research. Just like applying alone does not cut it, neither does explaining alone. Yes, some people will be stronger in the application part, and some in the explanation part. That's fine, we can learn from each other. In the end though, it is the combination that makes us what we are: an institute for higher learning. I hope to learn a lot more in the years to come.

Timon Idema

Self-interview Kristin Grußmayer

I first visited the TU Delft campus during the Quantitative BioImaging conference at the end of my PhD. A city with a more than 350-year long history of light microscopy, Delft felt like the right place to discuss new imaging techniques and biological findings. I remember walking alongside the canals at nighttime and having cheerful discussions over beers with colleagues. My second visit to Delft in 2019 for the Single Molecule Localization Microscopy was also a bit of a family trip; it was the first conference after the birth of my daughter. During a hot summer with a conference dinner on the beach, we immediately felt at ease in the city with such welcoming people and beautiful scenery.

Since high school, I was interested in all things science. I couldn't quite decide whether I should study Physics or Biology and went for Physics in the end. An enthusiastic Physics teacher helped and at the time I thought there were just too many names of proteins and processes in Biology to memorize (now I know better). I studied at Heidelberg University since it was one of the few in Germany that offered a specialization in Biophysics. During an exchange year at Cornell University I fell in love with single-molecule imaging. I then worked with a FRET-biosensor during my Diploma thesis and followed my interest in quantitative microscopy during my PhD at the BioQuant in Heidelberg. I exploited photon-antibunching – a fundamental quantum property of fluorescent dyes – to establish a method for counting molecules with the main goal to learn more about cell biology. When I was reaching for first experiments in cells to analyze clustering of membrane receptors, I realized how limited I was by the conventional resolution of confocal microscopy.

In my postdoc at EPFL in Switzerland, I delved into super-resolution and 3D multiplane imaging. My main interest is in super-resolution approaches based on single-molecule imaging, always on the quest to learn more about the underlying sample than just producing an image at higher spatial resolution. I also discovered the advantages of quantitative phase imaging and collaborated with neurobiologists. I am interested in developing versatile microscopes, establishing the latest developments in fluorescence labeling as well as advancing image processing. After all, imaging live cells at high spatial and temporal resolution remains a formidable challenge.

It is a challenging time to start a lab and I am thrilled to find a home in the Department of Bionanoscience at Kavli. Already during my interview, I felt the welcoming and collaborative atmosphere and the collective sense of curiosity. A great scientist once gave me the advice: choose a place where you and your family will enjoy living, then you'll be able to do great science as well. All things considered, our move went smoothly and we are starting to feel at home. I had a lot of help from support staff already and I am excited to embark on this next chapter with you to "think big about life at the smallest scale".

In my free time, I love being outdoors with my family and I enjoy skiing and playing tennis. For tennis, I am sure it will be easy to find a club once it is allowed again. For skiing, I will figure something out… There was already plenty of snow just after we arrived, as you can see in the picture that shows me not far from our new home. Coming originally from the Black Forest and having lived in Switzerland with a view of white mountain tops, this was a familiar sight. What was a surprise though was to see people still going courageously by bike and enjoying the frozen canals. Time for me to buy a pair of skates!

INTERVIEW

› **Continued from page 1**

By cutting the DNA backbone, topoisomerases release torsional constraints from DNA and are capable of removing excess twist from it. For molecular machines such as polymerases to advance on the DNA, this torsion needs to be removed. My team was able to see that in the presence of chemotherapeutic agents, the rate at which torsional stress was removed from DNA - so the rate of uncoiling - was greatly reduced (compare panel b to panel a in the figure below)."

"We were astonished that the signal was so super clear: we could clearly see how the chemotherapeutic inhibitor would insert itself into the cavity of the topoisomerase enzyme and reduce the rate of uncoiling, and also when the inhibitor came out again. To get such a clear, unexpected positive signal is rare. What I encounter much more frequently is that something doesn't work like I expect it to. But negative or noisy signals are always informative: ultimately you do a better experiment. We spend most of our time trying to debug or improve experiments."

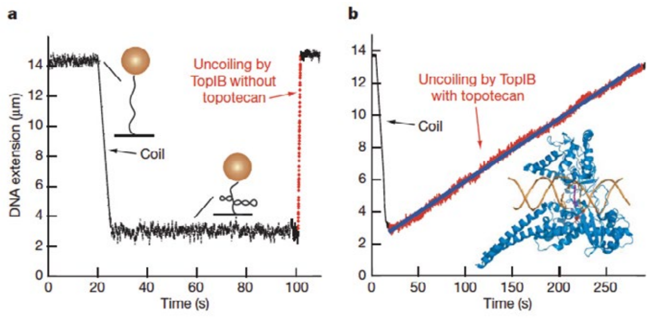
Q: You've described your work on interactions between enzymes as a slow journey. Did you have moments of doubt, and how did you deal with that?

A: "Sometimes advances can be very slow, or incremental. For example, with a lot of effort the signal from an experiment gets a little bit better but it's still not convincing, and you wonder: do I need to try harder, be more creative, use other instruments, or what? This is one of the most difficult things in research. At what point do you say: this isn't going anywhere? In my lab, we've sometimes put a stop to a project, at least temporarily until we had better ideas; and sometimes we've kept going

because we were convinced that our persistence would pay off and that we would eventually reach our goals." "New biological systems are hard to study. I don't have a recipe for that, it depends on many factors, like the project and the people. Some people are better at generating high quality data than others. Sometimes you should in principle keep going with a project, because it's interesting and important, but maybe you don't have the right person. Sometimes there is a gap in a project for scientific reasons – for example, a biological protein may be insufficiently well purified - and after that gap we return to it. Within my group I have multiple projects, so to some extent I can wait for results on any particular project. But for the junior researchers that is their project, and they've invested a lot in it already. So deciding how best to advance is never easy."

Q: Do you have any advice to share with other Kavli researchers?

A: "The Kavli Institute is very diverse, and the more interdisciplinary the research, the better it is to work in a team. Within that context, I certainly find that you can achieve much more as a team than working solo. Developing that skill is super useful. This can be hard sometimes, because of the way individual researchers are evaluated based on their publication lists. That can make it seem like the system disfavors working together. But I recommend to try and ignore that: it's not just the number of first-author publications that defines a good scientist. For-



tunately these days, if multiple people contributed equally to a project, for example from different disciplines, you can indicate this on the publications that result from it." "The Kavli Institute in Delft has always been very strong in the area of DNA-protein interactions. My work in DNA replication is fully connected to understanding these interactions. I regret that in recent years, we have not attracted good new groups focused on this area of expertise. In my view, the Department of Bionanoscience has not been as strategic about maintaining strength in this discipline – which on a worldwide scale is thriving as never before - as it could have been. Recent hiring has gone too much in other directions, which I find unfortunate."

Q: You've stated that with this Spinoza prize you want to bring more attention to your research: what are your ambitions?

A: "All scientific fields are constantly in motion. An increasing fraction of the instrumentation developed in biophysics is mature now, meaning that we have less technological development to do – at least for a little while. That allows us to go more deeply into biology, which is why a growing component of our research relies on advances in biochemistry. This requires my group to work more closely together with biomedical research institutes, but that is a challenge we are happy to take on. In that context, together with several of them I've put together an application that's just been submitted to this year's Gravitation call for proposals."

Q: What direction is your research going at the moment?

A: "My lab is focused on studying the fundamentals of DNA replication using biochemistry and biophysics to understand the fundamentals. And precisely because we as a community have developed great biophysics tools over the years, a lot is possible now! At present we look at replication in yeast, because it is a simple eukaryote whose replisome can be reconstituted from its protein components. But ultimately this type of fundamental research will be useful in understanding the development and subsequent behavior of tumor cells in humans. To do so, we will examine how aspects of DNA replication can fail, and what the signatures of those failures are, using both purified components and components inside of cells."

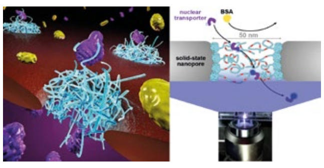
"Defects in DNA replication lead to perturbations to the genome, but cells that have the means to deal with such problems can survive and become cancerous. Thus, my ultimate goal will be to link our understanding of the molecular and cellular consequences of failures in DNA replication to tumor-related questions. The fact that similar types of cancer can differ substantially between patients remains a challenge. It is already possible to trace some of these differences back to DNA replication defects present in a patient's first cancerous cells . The more we are able to understand these defects, the better we will be able to develop personalized treatments."

Violet van Houwelingen

Anders Barth receives Marie Curie fellowship

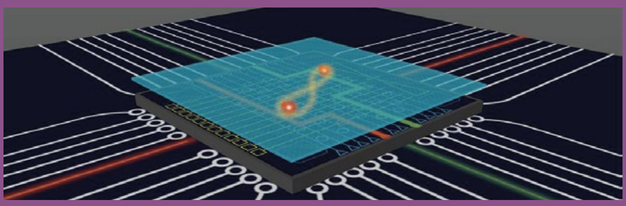
Postdoc Anders Barth has received a Marie Skłodowska-Curie Actions (MSCA) fellowship with his work on unraveling the mechanism of nuclear transport using optical nanopores. The nuclear pore complex is the gatekeeper of the nucleus and safeguards our genomic material from external intruders. It remains largely unclear how this selective, yet efficient gate works in detail - mainly because its secret lies in the lack of structure.

In a bottom-up approach, MSCA fellow Anders Barth will assemble biomimetic nanopores and shed light on the mechanism of nuclear transport using ultrasensitive single-molecule fluorescence methods. Understanding the principles of the nuclear pore means we will better understand why it sometimes fails, as mutations have been linked to neurodegenerative diseases and various forms of cancer.



Left: The nuclear pore complex.
Right: The experimental design.

Modular quantum computers



Quantum computers have the potential to revolutionize many sectors, for example in the field of drug development. By performing calculations using the fundamental laws of quantum mechanics, quantum computers have the ability to solve certain problems much faster than 'classical' computers. The reason for this increase in speed is the fact that quantum computers use different building blocks, called qubits, while classical computers work with ordinary bits. Many different approaches exist for the realization of qubits, one of which is the use of spins in diamond. Diamond-spin qubits offer several advantages. For example, because they can be linked together via optical channels, they enable large quantum processors to be constructed by connecting many independent modules.

Read more: https://qutech.nl/2020/10/13/qutech-and-fujitsu-announce-their-new-research-collaboration-on-quantum-computing-technology

ERC Consolidator grants for Stan Brouns and Simon Gröblacher

The European Research Council (ERC) has awarded a Consolidator Grant to Stan Brouns (BN) and Simon Gröblacher (QN). In the research funded by ERC, Stan Brouns aims to uncover how antiviral immune systems protect bacteria from bacterial viruses (bacteriophages) at the molecular and cellular level. The findings of the proposed research will be vital to develop effective therapeutic strategies to treat antibiotic resistant pathogens based on bacteriophages.

For his Consolidator grant, Simon Gröblacher aims to control acoustic phonons to the same level as we currently achieve in the manipulation of optical photons in quantum optics. This will allow his group to probe new physical phenomena, understand the decoherence mechanisms of quantum systems, and potentially create novel hybrid quantum devices.
Read more: https://www.tudelft.nl/2020/tu-delft/erc-consolidator-grants-voor-tu-delft-researchers

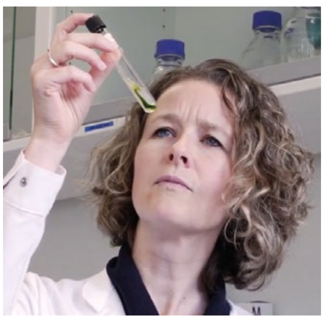
QuTech, KPN, SURF and OPNT join forces to build a quantum network (Nov 2020)

QuTech, KPN, SURF and OPNT are launching a collaboration designed to make significant progress in building a first ever quantum network connecting the Randstad, i.e. one of the main metropolitan regions in The Netherlands. The project will focus on connecting different quantum processors over significant distances in a Dutch network. The aim is to build the very first fully functional quantum network using high-speed fibre connections.

Quantum brings secure communication

A quantum network is a radically new internet technology, with the potential for creating pioneering applications. Such a network connects quantum processors to each other via optical channels, and this enables the exchange of so-called quantum bits (qubits). Qubits have a number of features that make them very different from the bits we currently know and use in classical networks. For example, quantum communication is potentially immune to eavesdropping practices. Quantum communication networks are expected to evolve over time towards a global quantum network, and this would allow secure communication; position verification; clock synchronisation; computation using external quantum computers; and more. Among other things, the project is intended to lead to new techniques, insights and standards that will bring a quantum network closer.
Read more: https://qutech.nl/2020/11/25/qutech-kpn-surf-and-opnt-join-forces-to-build-a-quantum-network

Marie-Eve Aubin-Tam wins Waterman Award



Researcher Marie-Eve Aubin-Tam has won the 2020 H.I. Waterman Sustainability Award during an online award ceremony on the 26th of November, for her innovative work on bio-inspired materials. The Waterman Award, which is handed out once every two years to a scientist from the Applied Sciences (58) building, is given to a scientist who contributes to developments that strengthen the economy and improve the environment at the same time.
Read more: https://www.tudelft.nl/2020/tnw/marie-eve-aubin-tam-wint-watermanprijs

Langerhuizen Oeuvreprijs for Prof. Hans Mooij (Sept 2020)

Prof. Hans Mooij has received a prestigious career award: the Langerhuizen Oeuvreprijs. The prize is awarded annually and celebrates scientists who have greatly contributed to the fields of the natural sciences. Prof. Hans Mooij has been a true pioneer in superconducting devices, nanotechnology and quantum computing. His highly successful scientific work and his strong leadership over several decades have led to the Kavli Institute and QuTech as we know them today. His work is of high influence: 6 Spinoza Prize winners have co-nominated his work. Watch back the award ceremony on the KHMW website.

Nynke Dekker appointed member of the Royal Holland Society of Sciences and Humanities

Nynke Dekker has been appointed as member of the Royal Holland Society of Sciences and Humanities in the beginning of February 2021. This society comprises approximately 380 science promoters (known as directors) and about 480 scholars (known as members) drawn from the natural sciences, the humanities and the social sciences. The Royal Holland Society of Sciences and Humanities serves in the review process for a number of prestigious awards and fellowships.

Professor Ronald Hanson appointed Distinguished Professor in Quantum Computing and Quantum Internet

TU Delft has appointed Professor Ronald Hanson as Distinguished Professor in Quantum Computing and Quantum Internet. The title of Distinguished Professor is reserved for full professors who are important figureheads in specific fields both at and outside the university.

Ronald Hanson is internationally regarded as one of the leading quantum scientists of his generation. He is a pioneering researcher of perhaps the most fascinating phenomenon in physics: quantum entanglement. Under his leadership, the existence of quantum entanglement was conclusively demonstrated for the first time in 2015, putting an end to a debate initiated 80 years earlier by Einstein. Quantum entanglement is at the basis of research into quantum networks and quantum computers and the eventual development of a quantum internet, an internet that is inherently safe. This is only one of the milestones in Hanson's still relatively young scientific career.
Read more: https://qutech.nl/2020/12/04/professor-ronald-hanson-appointed-distinguished-professor-in-quantum-computing-and-quantum-internet

NWO Veni Grant for Filip Malinowski: bringing new tools for topological quantum computing

The Dutch Research Council (NWO) has awarded an Veni Grant to Filip Malinowski. The grant (250 thousand euros for a three-year program) will allow him to use a new kind of sensor to further uncover the properties of so-called topological materials, which are promising materials for developing robust quantum devices.
Quantum information is very fragile and easily lost, which is one of the main problems for performing large quantum computations. A certain type of material, called topological materials, could offer a solution: these materials are a promising platform for constructing extremely robust quantum bits, the building blocks of quantum devices. However, studying the properties of these topological materials is notoriously hard.
Read more: https://qutech.nl/2020/11/07/nwo-veni-grant-for-filip-malinowski-bringing-new-tools-for-topological-quantum-computing

QuTech spin-off QBlox receives UNIIQ-investment to enhance quantum computing's scalability

Across the globe, quantum computing is looked upon as the next step in computing. Before quantum computers can live up to this promise, several crucial steps in their development must be made. One of those steps involves the development of an accurate and scalable control system, allowing control of hundreds or even thousands of qubits at a time. The Delft-based company Qblox has made it their mission to develop extremely scalable and modular control systems for exactly this purpose. To further develop their technology and to reach a broader market, Qblox has received an investment of proof-of-concept fund UNIIQ. The investment was announced by the Mayor of the City of Delft, Marja van Bijsterveldt, during a working visit to Qblox.

New grant to bring quantum computing closer to its future users through Quantum Inspire

On November 25th, the Dutch Research Council (NWO) announced 93 million euros available for 21 interdisciplinary research projects under the second round of the Dutch Research Agenda Programme: 'Research along Routes by Consortia' (NWA-ORC). One of the grants (4.5 million euros) is going to an interdisciplinary consortium in which several public and private partners will collaborate to bring quantum technology closer to potential users across society. This consortium has taken steps to develop the first European quantum computer in the cloud, named Quantum Inspire.

Is society ready for quantum computing?

Quantum technology has the potential to impact society at large. It may provide answers to societal challenges in many different fields such as energy, food supply, security and health care, all of which could be revolutionized once quantum computing matures. In order to fully understand and realize the impact of quantum computing on our society, it's important to bring the technology closer to its future users. In comparison: the full potential of early digital computers was realized only when users were able to interact with them. The consortium aims to follow a similar path for quantum computing by enabling future users to interact with Quantum Inspire.
Read more: https://qutech.nl/2020/11/25/new-grant-to-bring-quantum-computing-closer-to-its-future-users-through-quantum-inspire-platform

QuTech and Fujitsu announce their new research collaboration on Quantum Computing Technology

QuTech and Fujitsu signed a collaboration agreement to combine efforts in a multi-year research project. The aim of the project is to develop the building blocks for a modular quantum computer based on diamond spin qubits. By joining forces, both parties seek to stay at the forefront of quantum technology.

Artist in Residence 2020: analogies between science and art

Thursday 28th January marked the finish of a four-month creative exchange between researchers at Kavli Institute and visual artist John Walter, Kavli Artist in Residence 2020, inspiring both the Kavli scientists and the artist in their work. Gijsje Koenderink: "Both are fields of inspiration and transpiration."

Three Kavli scientists as well as John Walter share how they experienced the discussions on arts and sciences during the past few months of John's residency, as well as what they will be taking with them from this exchange into their own work.

John Walter (Kavli Artist in Residence 2020)
"There's two profound insights that I have gained from working alongside researchers at Kavli, which fall neatly between the bio and the quantum. My improved understanding of the various aspects of the synthetic cell project and how they might conjoin, has provided me with a rich new repertoire of analogies that I will apply to compositional approaches in painting. The quantum research into entanglement and chaotic cavities has revolutionized my understanding of my own art-making at a fundamental level (probably not a Quantum one but the closest to that scale that I operate at as an artist) and this is going to liberate me to make things quicker, fresher and weirder in the future."

Gijsje Koenderink (Department of Bionanoscience)
"I discovered surprising parallels between the arts and the sciences. Both are fields of inspiration and transpiration, for example: each day you go to the lab/studio, stubbornly try out experiments and you have to keep at it until your idea works out. Artists and scientists also need to be a jack of all trades: not only do they need to master the creative and intellectual aspect, they also need to be handy in terms of financing and acquisition, financial planning, as well as networking. All these things require soft skills which are not always associated with artists or scientists. It's nice to recognize that 'even' an artist can't be busy with his art all the time; so if you can't spend 100% of your time on practicing science, that does not make you less of a scientist – it's simply not possible. John as a person as well as his art both gave our department much needed colour in the dreary daily life during corona!"

Cytoskeleton (Life Buoy), Latex vinyl on honeycomb board with acrylic and oil on canvas (each in 4 parts), 122 x 244cm, 2021

Stills from Chaotic Cavities, HD Video, 14'14", 2021

Mark Ammerlaan (QuTech)
"The exchange with John and his presentation made me aware of the daily speed of life, but also the little details that are important. As a general technical engineer within QuTech, I asked myself how to balance this. And this is also a question for the scientific world: how do scientists experience the balance between speed and details in their work?"

Nicola De Franceschi (Department of Bionanoscience)
"It has been a real pleasure to meet John and have a chance to discuss his work. We are synthetic biologists who simply play with different tools; so it felt almost natural to dive into his surreal world, to find that those seemingly alien landscapes describe the microscopic reality in a fascinating way, capturing a dynamic and chaotic aspect that is often overlooked by his academic peers. So much so that the VR tools that he uses to create his artworks could just as well be used to visualize real data by the scientific community."

A dinner party with artist-in-residence John Walter

I've invited Ashmiani van den Berg, Gijsje Koenderink, Sam van Beljouw, Mark Ammerlaan and Liedewij Laan to a virtual dinner party.

Part of my practice has addressed hospitality. I have used bars as a device for joining objects, people and diverse aesthetic components together. Playing host has allowed me to create new connections, both intellectually and socially, for myself and for others. If COVID-19 hadn't been restricting socialising I would have liked to throw a dinner party at my apartment in Delft during the residency. This would have provided me with an opportunity to mix up people that I'd met who had things in common with one other, but who hadn't met each another before, despite working in the same institution. I was able to do this by saying "you should chat to so-and-so…". I think this cross-cutting effect of being an outsider was an important part of my role.

As it is a virtual dinner party, what's on the table this evening?

Tonight, I am serving Executive Realness (*that's a drag reference for those of you not in the loop*). No, tonight, I am serving Mint Juleps to start – that's a very Southern US drink – bourdon and mint on crushed ice, that should get us going. Then we'll have a prosecco with the starter. Let's have a soup because it's cold outside – maybe a kind of Thai spiced soup, with some nice bread. Main course I'm doing a tajine… are any of you vegetarian? I'll make a lamb one for those that aren't… We might need some red wine with that, loosen the cogs so everyone can chat and press the flesh a bit, ask some probing questions (like "why have I never met you before?"). Dessert is going to be a baked Japanese cheesecake with cream. Really though, aside from food, a good dinner party depends on the host setting the right atmosphere and getting everyone relaxed enough to gel with the other guests. It's harder to do this virtually. You need people in real space. We're humans after all. Wetware not hardware. Visual and other sensory cues are important and can get lost in the digital.

How do the Delft paintings feel in London?

Argh, because of BREXIT the paintings are delayed in coming back. However, some other boxes of stuff have arrived and I'm back in the studio. It feels on the one hand like time froze and on the other hand that there is an exciting intellectual stitching process ahead of me in which I negotiate the advances I just made in Delft with the work I left behind in London. I hardly slept last night as my mind was racing. I think my sub-conscious is mashing up lots of stuff in my timeline, dredging up people and experiences from the deep past and refitting them with recent events in order to extrapolate a new future, or something like that. I'm interested to see how things settle. This will have implications in the work.

Which two things would you bring from Delft to London that gave you inspiration?

That's an easy one (and a good one!). I'm bringing a Delft blue plate, or more correctly I'm bringing the pictorial logic of the Delft blue plate and the learning that I've acquired by studying it of how it deals with the compositional conundrum of the circle. Secondly, I'm bringing Pardoes, the mascot from The Efteling. I'm obsessed with him. He's like a cross between Mickey Mouse and a jester. He's deeply weird. He might just sit in the corner of my studio cheering me on, cos I'm not sure he can feature in the work, he's just too recognisable. Let's see. The Efteling was very inspiring. It was poetry for me. I mean seeing Dutch people in their element was like having been inducted into a secret society. I loved it.

What do you prefer: virtual or personal?

Definitely personal. I like the analogue. I even like the analogue in digital things. When I curated *Shonky: The Aesthetics of Awkwardness* I thought about this a lot. We are culturally trained to ascribe authenticity to traces of the hand.

So, in drawing things in virtual reality by hand the same, or a similar, emotional range can be produced in the digital. As I said in Alien Sex Club, though, sex hasn't become completely disembodied yet, so I'd say there's a strong probability that we will have a new *roaring 20s* as a reaction to coming out of covid.

How do you anticipate your Kavli experience will influence your further work?

I often think about William Blake's proverb "without contraries is no progression". I have a brief window of opportunity now I'm back in London to work in a completely opposite way to how I did in Delft – *to work against it for a bit* – and something odd (new) might emerge. But there seem to be several lines of enquiry coming out of my time at Kavli that I will begin to explore, and it will be interesting to see which are the hot leads. I think there's lots more to be done with shaped paintings, with circular paintings especially, with recursive paintings (paintings embedded within paintings) and with using pattern as camouflage (or visual glue) within which to smuggle unlikely things (Trojan horses). I have a much richer repertoire of analogies at my disposal now to do with the synthetic cell, because of our conversations. The paintings are likely to use those ideas to grow in new directions over the coming years. Because I transplanted myself and regrew my work in Delft, I'm now shipping it back and I will begin intellectually (and physically) joining it back onto where I left off in October. The new hybrids are going to be very interesting. So are the new diaries I make here, fuelled by the approach I took in the Netherlands. I'm sort of bringing a neural net that I knitted in Delft back to London and throwing it back on things here and seeing what I catch that is different to before I came to Kavli. There's probably a bunch of literal hybrids that I make where I systematically go back through the data (my drawings) and graft parts of it onto images that I was using in London before I left, or onto new images that I find.

When will you come back?

Good question. Hopefully there's another project in the Netherlands for me in the future. Finding a professional excuse to come back is always the best motivation for me. It would be great if we can do an exhibition of the *Patterns in Time* work in the coming year but I'd be surprised if I get back during 2021 given how international travel is looking more difficult than ever. Getting home to England was a mission after they cancelled flights. Taking the Eurostar felt like some sort of war repatriation scheme instead of the glamorous experience it is meant to be.

Continue to read on page 8 ›

› **Continued from page 7**

What is the simplest (doable) thing we as scientist at Kavli can integrate into our scientific routine to become more creative/groundbreaking or out-of-the-box thinking/disruptive of paradigms?
Oy vey that's a killer question! The simplest thing you could do would be to talk to somebody in the building that you don't already. I think that's the whole point of this dinner party really. The profound implications of engaging with another point of view have the capacity to open up a whole new line of enquiry. Conversations are nano-collaborations. If they go well, they can grow into bigger ones. Having the bravery to put oneself out of one's comfort zone and see what happens is the big creative challenge. What happens if you stop for a day and just make a drawing of your research? What happens if you have to explain what you do to a group of children? Or a group of non-scientists at a bar? What happens if you take on a new habit? Just incorporate something into your routine…? It could throw you off on a tangent but that could be a core line of enquiry that's been missing. It's worth speculating on new approaches however fruitful your current ones are, I reckon.

Do you think purple and yellow are the right colours for BN?
I know what you mean… I don't think it's those specific colours, it's just how they're deployed. Although, having said that the actual shade of yellow isn't pure enough; it's a touch mustard rather than a nice sharp canary yellow. The purple is a bit murky; a dirty magenta with a bit of dioxazine in it. These things matter on the eye. I found the effect of working in a corporate building really got to me in the final month. All the glass and wipe-down surfaces were starting to have a negative effect on me. It's what Hundertwasser has to say about the grid – we need spirals and the geometries of nature. You should read his *Mouldiness Manifesto*. I mean I wouldn't choose to work in a building like that if I had carte blanche. I suppose the question is how do you modify a building like that to make it more human? To invoke Hundertwasser again, he talks about "window rights" meaning giving an individual the right to customise the distance they can reach outside their window. I'd say the same probably applies to an office. I can see why the corporate powers want to keep it clean and neutral and it's a constant battle between the human and the architectural. Why not wallpaper the entire building except for the labs?

Entanglement (Two Memojis), acrylic on canvas, 190 x 170cm, 2021

Has your stay at BN driven you even more to maximalism, or did you get infected with our tendency for minimalism (it looks like your Entanglement paintings are less maximal)? Where should we hang your art in our building?
Good question. I know what you mean about the *Entanglement* series being spare, but they're not minimal, and they fit within a longer trajectory within my oeuvre as a whole. To clarify, maximalism isn't about visual excess, it's about complexity as opposed to simplicity. Those paintings aren't simple. I was being flippant about Piet Mondrian. He's a maximalist in fact; those paintings are so exact in how they measure one area of colour against another. They go through the eye of the complex needle and come out the other looking (deceptively) simple. My other series, *Cystoskeleton*, look more traditionally maximal. I can see how people would think that. I suppose what you haven't see is how the work would actually be exhibited. You've only seen it in the studio and in progress. That's not how it should be seen. It should be staged. Then I can mix it up and hang it in bigger sequences. Then the maximalism can really get going! I wouldn't hang the work in a corridor. It'll get scuffed and need repairing in no time. I think I'd hang the work in an office and maybe move it once a year to share the love around. That way people can get to know it and the secrets can unfold slowly. The artist David Reed talks about "bedroom paintings". Living with a painting is different to viewing one in a gallery. Paintings compress time unlike other objects and as a result the way they are viewed needs to be slow release too.

What is a characteristic feature you find in the Artist that would do well in the Scientist, and vice versa?
I've learned from working with people in a variety of fields beyond art, including science, that some people are good at collaborating. The qualities that those people who are good at interacting with others from outside their field possess include (1) liking their collaborator and wanting to work with them – this sounds obvious but without that chemistry it's a failure (2) sharing a sense of humour (3) having some status in their native field that grants them space to test the limits of their field. I think this distance is crucial. I find it harder to work with another artist that with a scientist because we the artist and I are competing for territory more. Both parties need to have good sense of the territory they're on, and not feel insecure. Then they can drop their guard, talk about what they do openly and share ideas.

Is there a particular detail of Delft city that most of us didn't see but that you will remember?
The charm of the historic centre grows cloying quite fast, preserved in aspic like a museum. However, some odd spaces like Doelenplein and Bagijnhof can be surprising. I was definitely a fan of the overlooked bits. I ran a lot and found lots of funny nooks and crannies off the beaten path. I got interested in the tunnels that go under the N470 motorway separating Tanthof from the rest of Delft. I didn't know how to traverse that road at first but once I discovered those cut throughs a whole range of new possibilities opened up. Abtswoudepark fascinated me with its weird monumental archways. There's also a bridge at Woudselaan that takes you over the A4 that I got excited about when I found it because it allowed me to connect up Wateringen and parts of Den Haag in interesting ways. Above all the De Diamanten Ring bakery will live with me forever.

Based on your time here, which of the panels in The Garden of Earthly Delights by Hieronymus Bosch would you say is most accurately depicting the Kavli institute? ...And why hell?
Hilarious. You made me go and look at the triptych again. I was really into that painting about 15 years ago and got into reading about Bosch's imagery, alchemy, all that. That hell passage is bonkers with the pink bagpipes on the plate on top of that woman's head. He probably wasn't even on drugs! That kind of inventiveness is impressive. If only the Kavli institute looked like one of those pink architectures in the central panel…

What is your favourite memory of working at the TU as an artist in residence?
I think the tarot-reading day was pretty memorable. I met such a wide range of people that day and connected with some on a really personal level. I think the conversation that Sam and I had that day about tarot cards, systems, lexicons, sequencing, pedagogy etc. was really exciting for me because I felt like we really "got" what the other was talking about. These kind of epiphany moments are what it's all about I think; where something rhymes with somebody else and a new mental join is made. This happened several times with different people.

Would you consider coming back to decorate the whole department?
Yes. Bring it on!

The quanta of motion

By Niccolo Fiaschi

During the last decades, humanity has explored the quantum world to ever greater depth. While we are working towards understanding how to use this research, one question still remain open: where are the limits of the quantum world?

Almost a century after the initial emergence of quantum physics, we have attained several milestones on the way to understanding quantum mechanics. Quantum theory was originally needed to explain phenomena that classical mechanics failed to predict and is known to describe the behaviour of very small systems like atoms and molecules. In recent years, quantum effects for bigger systems have been demonstrated. The Bose-Einstein condensates (BEC) for example can contain up to 10^{8} atoms, and nano-mechanical systems that can be formed by more than 10^{10} atoms.

The nano-mechanical system has some peculiarities that makes it highly intriguing. First of all, nano-mechanical oscillators are a solid state system, made of a monolithic block of material. That means these oscillators are much more similar to objects that we experience in our every-day life than a cloud of atoms. Secondly, this system can be fully designed and engineered and the fervid minds of scientists have produced a tremendous variety of nano-mechanical oscillators: from ultra-long strings with fractal geometries, to ultra-wide membranes. Some of these systems are so big that they can be easily seen by the naked eye!

To fabricate such devices we generally start with a piece of a wafer of a few millimeter wide that is composed of several layers of materials (most often Silicon on Insulator, SOI). We then manufacture our devices on the top layer, which are then suspended by removing the layer underneath. This process allows flexibility of design and only uses commercially available machines developed in last decades to fabricate the chips that are in our smartphones, computers, etcetera.

The nano-mechanical device is designed in such a way that it can vibrate at a certain desired frequency, hence the "mechanical" part. All objects at a certain temperature vibrate, and the higher the temperature the more energy is in the vibration of the device. At room temperature the energy is so high, that the granularity of the excitation predicted by the quantum mechanics is extremely difficult to see, so that the quantum effects are hidden. The single grain -quanta- of mechanical vibrations are called phonons; the counterpart of the photons of the electro-magnetic field.

The temperature of the nano-mechanical device must be lowered to see the quantum effects, and there are two ways to do so: the first is called passive cooling, and consists of placing the devices in a special fridge that can reach temperatures of a few millikelvin. The second way is to cool the device actively (starting at a temperature of a few kelvin generally, with the future goal to start from as close as possible to room temperature) using lasers, a similar approach to the BEC in some ways. In the first method, the one I will focus on, the goal is to reduce the movement arising from the finite temperature as much as possible, so that a single excitation, a single quanta of motion, can be resolved.

In our lab we are using so-called opto-mechanical devices. This allows us to manipulate and probe single phonons through pulses of laser light. With lasers that work at different frequencies and which we can control to either write or read single quanta of motion. A few years ago in our lab, we used this technique to entangle the motional state of one nanomechanical device with that of another. We further showed the non-classicality of the state of the system via a Bell test, a test that prove that any theory describing nature can not obey locality and realism at the same time. This means that these massive devices, composed by an impressive amount of atoms, should be described by the laws of quantum mechanics. The group further demonstrated that the system can be used as a memory for a future quantum network.
In my project, I am focused on extending the possible application of the opto-mechanical devices to quantum information processing tasks and to investigate the fundamental nature of the phonon. The goal is to explore the boundary of the quantum realm, find possible applications, and maybe see if these type of devices can be used to shed some light on quantum gravity.

New Kavli Institute for NanoScience Discovery at University of Oxford

A new institute for nanoscience research is to open in Oxford thanks to a $10 million gift from The Kavli Foundation.
The new Kavli Institute for NanoScience Discovery (Kavli INSD) at Oxford will be a unique combination of structural biology with world-leading biochemistry, pathology, chemistry, physics, physiology and engineering. Based in a new building at the centre of Oxford's Science Area site, it will house more than 40 faculty and 400 students, postdocs and research staff. The Oxford Kavli institute is the 20th Kavli Institute in the world and the fifth institute in nanoscience.

Photo: The Kavli Foundation / University of Oxford

Read more: https://www.kavlifoundation.org/kavli-news/meet-new-kavli-institute-nanoscience-discovery-university-oxford

First of all, congratulations with your new position in the department of ChemE!
BN. It is the department of Bionanoscience, but yes, thank you, it is a great privilege.

Oh, I am so sorry, I must have confused you with Bijoy Bera. I get all confused these days.
Not a problem.

Could you tell us something about yourself?
Sure! My name is Jos Zwanikken, and I studied Physics in Utrecht, and did my PhD there as well, under the mentorship of René van Roij. We studied the stability of colloidal suspensions and oil-water interfaces with theoretical physics, and had lively interactions with the experimental groups. Then I moved to the Chicago area for six years, working at Northwestern University as a postdoc with Monica Olvera de la Cruz, and later as a research faculty in the department of Materials Science and Engineering. It was a very exciting period of research, working on DNA-functionalized nanoparticles and their applications, block-copolymers and their structural properties, ion-selective membranes, and more. Then I moved to the Boston area to pursue a tenure-track at the University of Massachusetts Lowell, where I discovered what an adventure teaching can be, and also how fulfilling it can be.

Yes, and you won the Teaching Excellence Award 2017 in your former department!
True, but I don't know exactly what it is based on. The reviews from the students were very positive, and perhaps it helped that the university had struggled with finding a good instructor for the Quantum Mechanics courses for many years.

What was your secret? Did you just give everyone an A?
Ha! That would have been clever! I'm afraid I don't know, but whatever it was, it took a lot of energy, dedication, and time. Precious goods that are not always and equally available.

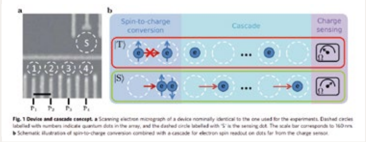
Is that why you are so glad to have a Van Rijn position?
I think focusing more on education certainly helps raising the quality of teaching, and improving the connection between young talent and the field where they can engage their knowledge and skills.

Can making courses more applied improve the connection between young talent and the field?
That could open a long discussion. There is a strange paradox that one sometimes needs to forget all about use, and learn passionately, without bothering about applications, before one can discover something of profound use. Many great minds such as Erwin Schrödinger, Richard Feynman, and Robbert Dijkgraaf wrote long essays about it (and they did not use the word "sometimes", as I did). The students generally embrace this quote. However, despite the favorable effects on learning, it will be an exciting challenge to stay connected with all the developments in research, and opportunities for the future generation, and I think there are simple and direct solutions to work in this direction.

I wish we could talk more about this, but before we finish, a last question: what will you miss most from the US?
Having cold pizza breakfast next to my RV in the middle of nowhere California. And of course my dear friends in Chicago and Boston. But I am too grateful to be in Delft, in this position. As they say, "a dream come true".

Thank you! All the best in your new position!

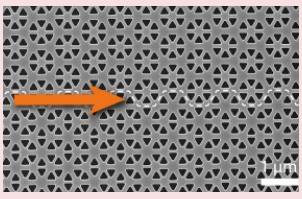
Electron cascade for distant spin readout



Creating a powerful, large-scale quantum computer depends on a clever design such that many qubits (the building block of a quantum computer) can be controlled and read out. Researchers at QuTech have invented a new readout method that is an important step forward on the road towards such a large-scale quantum computer, based on a phenomenon that all of us know from our childhood: toppling dominoes.

C.J. van Diepen, T.K. Hsiao, U. Mukhopadhyay, C. Reichl, W. Wegscheider, L.M. K. Vandersypen
Nature Communications 12, art. 77 (2021)

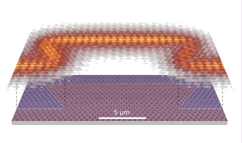
Direct quantification of topological protection in symmetry-protected photonic edge states at telecom wavelengths



With topologically non-trivial photonic crystals we mimic the quantum valley Hall effect at telecom frequencies. With near-field microscopy we map the photonic edge states. We show that at the topological protection of these states makes them at least two orders of magnitude more robust to back scattering than convention photonic crystal waveguides.

N. Parappurath, F. Alpeggiani, L. Kuipers, E. Verhagen
Science Advances 6, eaaw4137 (2020)

Direct quantification of topological protection in symmetry-protected photonic edge states at telecom wavelengths
With topologically non-trivial photonic crystals we mimic the quantum valley Hall effect at telecom frequencies. With near-field microscopy we map the photonic edge states. We show that at the topological protection of these states makes them at least two orders of magnitude more robust to back scattering than convention photonic crystal waveguides. This direct experimental quantification of topological robustness comprises a crucial step toward the application of topologically protected guiding in integrated photonics. This allows for unprecedented error-free photonic quantum networks.



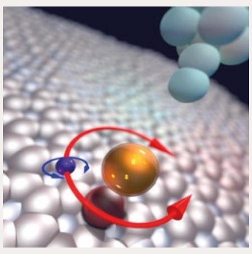
S. Arora, T. Bauer, R. Barczyk, E. Verhagen, L. Kuipers
npj Light: Science & Applications 10 (1), 1-7

High-frequency gas effusion through nanopores in suspended graphene

Most conventional gas sensors are based on chemical reactions that are often slow and power hungry. This set us thinking on another route for realizing microscale gas sensors using microscopic nanoporous graphene membranes. We show that the mechanical motion of porous graphene membranes allows to distinguish gasses based on their mass and molecular velocity. Artwork credit: Makars Šiškins.

I.E. Rosłoń, R.J. Dolleman, H. Licona, M. Lee, M. Šiškins, H. Lebius, L. Madauß, M. Schleberger, F. Alijani, H.S.J. van der Zant, P.G. Steeneken
Nature Communications 11, 6025 (2020)

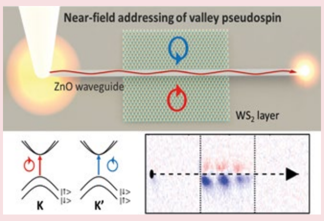
Complete reversal of the atomic unquenched orbital moment by a single electron



We use a scanning tunnelling microscope to perform controlled rotations of the spin and orbital angular momentum of an individual iron atom. While conservation laws limit the former to changes of at most one Bohr magneton, we find that the latter is not bound by quantum selection rules. These results demonstrate independent control over the spin and orbital degrees of freedom in a single-atom system.

R. Rejali, D. Coffey, J. Gobeil, J.W. González, F. Delgado, A.F. Otte
npj Quantum Materials 5, 60 (2020)

Nanoscale optical addressing of valley pseudospins through transverse optical spin



Confined photonic eigenstates exhibit transverse optical spin in their evanescent tails. Through optical spin-orbit coupling a one-to-one relation exists between the sign of the spin at a point in space and the propagation direction of the mode. Here, we exploit this phenomenon to address specific valley pseudospins locally in atomically thin WS2.

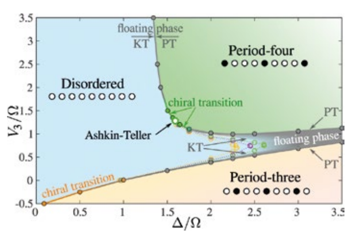
S.H. Gong, I. Komen, F. Alpeggiani, L. Kuipers
Nano letters 20 (6), 4410-4415

Predicting Evolutionary Constraints by Identifying Conflicting Demands in Regulatory Networks

We show that one can predict the limitations of a gene regulation network in experimentally evolving bacteria. Strikingly, detailed information on the genetic sequence or even the network topology is not required. The findings show what can and cannot be predicted in this notoriously complex process.

M. Kogenaru, P. Nghe, F.J. Poelwijk, S.J. Tans
Cell Systems 10 (2020)

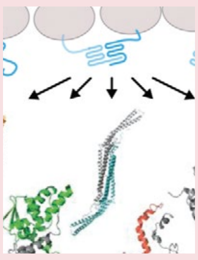
Kibble-Zurek exponent and chiral transition of the period-4-phase of Rydberg chains



Chains of Rydberg atoms have emerged as an amazing playground to study quantum physics in 1D. Playing with interatomic distances and laser detuning, one can in particular explore the commensurate-incommensurate transition out of density waves through the Kibble-Zurek mechanism, and the possible presence of a chiral transition with dynamical exponent.

N. Chepiga, F. Mila
Nature communications 12, art. 414 (2021)

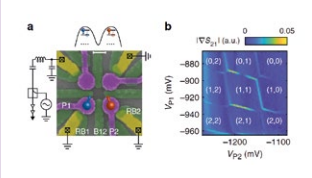
Interactions between nascent proteins translated by adjacent ribosomes drive homomer assembly



We report that 800+ proteins assemble into complexes while still being synthesised by ribosomes, using a novel genome-wide screen. Protein assembly thus can be controlled in time and space, contrasting with assumed random diffusion. The findings impact folding, assembly, and chaperone models, and suggests that multi-ribosome polysomes are essential to efficient protein expression.

M. Bertolini, K. Fenzl, I. Kats, F. Wruck, F. Tippmann, J. Schmitt, J.J. Auburger, S. Tans, B. Bukau, G. Kramer
Science 371 (2021)

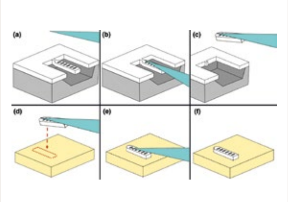
A single-hole spin qubit



Transistors – semiconductor devices – are the key active components in nearly all modern electronics and therefore the most replicated manmade structure in the history of mankind. Charge carriers within these semiconductors can be either electrons or holes – a hole being the lack of an electron where one could be present in the semiconductor's atomic lattice.

N.W. Hendrickx, W.I.L. Lawrie, L.Petit, A. Sammak, G. Scappucci, M. Veldhorst
Nature Communications 11, Article number: 3478 (2020)

Hybrid integration of silicon photonic devices on lithium niobate for optomechanical wavelength conversion

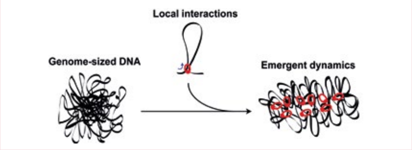


We present a novel nanointegration method that can combine independently fabricated device components of different materials into a single device. The method allows for precision alignment by continuous optical monitoring during the process.

I. Marinković, M. Drimmer, B. Hensen, S. Gröblacher
Nano Letters 21, 529-535 (2021)

Genome-in-a-Box: Building a Chromosome from the Bottom Up

In this perspective article, we argue for a new in vitro approach (Genome-in-a-box) to build and study chromosomes: take megabasepair DNA, add individual chromosome building blocks, and build a chromosome from the bottom up. The name comes from the 'particle-in-a-box' models that provided basic insights in quantum mechanics.



A. Birnie, C. Dekker
ACS Nano 2021 15 (1), 111-124

What would you want to be when you grow up?

There was no such question for me. Since the age of thirteen I was deep in love with physics. In high school I often skipped classes to study physics together with four close friends and our dedicated teachers. Luckily my school fully supported my sense of exploration and settled all the conditions for my first research projects. My path to computational condensed matter physics has not been straight - I obtained my BcS in the field of theoretical nuclear physics.

I joined the group of quantum magnetism led by F.Mila at EPFL as a master student working on Berry phases in topologically non-trivial spin systems. I was using an open source code when I realized that I could do much better if I would design numerical algorithms sharpened specifically for my own research needs. During my PhD I implemented my own 1D tensor network (DMRG) code that along with the standard ground-state simulations could provide excitation spectra without additional computational cost. This opened up a new way to study quantum phase transitions in 1D and for the first time revealed rich critical behaviour inside the magnetic gap. Recently, I proposed constrained tensor networks – new and extremely powerful algorithms operating directly in the restricted Hilbert space distinct for systems with Rydberg blockade, for non-abelian anyons, for quantum dimer models and for many other applications. This new method brings the study of quantum phase transitions onto a whole new level of accuracy. In particular, it enabled resolving the long-standing puzzle of a chiral melting that was unsolved for almost 40 years.

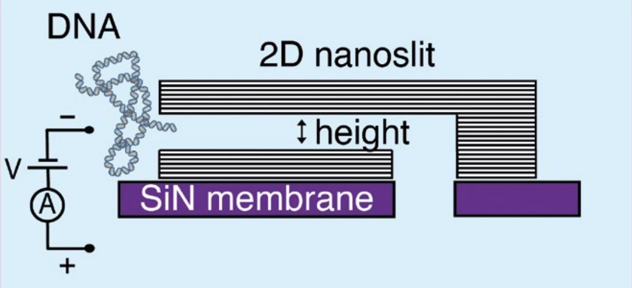
All phase transitions in nature, from evaporating water to Bose-Einstein condensation, from cooling of the Universe to melting of DNA, are not arbitrary, but form small number of universality classes. However, not all of them are known yet. The goal of my group is to expand the list of known universality classes and to develop protocols for their experimental realization. Recent developments of constrained tensor networks make these discoveries more likely than ever. The mission of my group at Kavli Institute of Nanoscience is to bring numerical approaches, and in particular tensor networks, from the point where numerical data are compared with the existing theory predictions, to the point where the numeric itself drives the discovery of new field theories, new critical phenomena, new materials.

The beauty of all tensor network algorithms is their flexibility with respect to microscopic details of the Hamiltonian. My favorite example is a comb tensor network that I elaborated during my postdoc in California. It has been designed for multi-component systems and multi-orbital atoms, successfully applied to quantum magnets, recently used in biochemistry to simulate nitrogenase, and suitable for numerical study of interacting black holes. Although my main research interests are centered around quantum magnetism, Rydberg atoms and conformal field theory, I remain open for interdisciplinary collaborations and looking forward to bring my developments to the new contexts.

One of my favorite aspect of being a scientist (apart from endless challenges, discoveries and justified curiosity) are scientific travels. Short-term, long-term – no matter. I love to see new countries, new cities, to meet new people. I like that returning to the places in Spain, Japan, France,... where I spent a few months in the past, I feel at home. I love that my collaborators and friends, my memories and various tiny pieces of my life are scattered all over the globe. I am looking forward to the post-corona era when video-conferences will no longer be the only option, when scientific discussions will come back from zoom to Conference halls, cafeterias, trains, and on mountain peaks…

Translocation of DNA through Ultrathin Nanoslits

We investigate the passage of double-stranded DNA molecules is studied through nanoslits fabricated from exfoliated 2D materials, such as graphene or hexagonal boron nitride. The DNA polymer behavior is examined in this tight confinement. DNA molecules, including folds and knots in their polymer structure, are observed to slide through the slits with near-uniform velocity without noticeable frictional interactions of DNA with the confining graphene surfaces.



W. Yang, B. Radha, A. Choudhary, Y. You, G. Mettela, A.K. Geim, A. Aksimentiev, A. Keerthi, C. Dekker
Advanced Materials 2021/2007682

EMBO Laboratory Leadership course for postdocs at Kavli Institute of Nanoscience

By Paola de Magistris

For 3 full days, on January 2021, postdocs belonging to the Bionanoscience, Quantum Nanoscience, and QuTech departments embarked together on a 3-day exploration of the meaning of leadership in the 'Laboratory leadership for Postdocs' online Zoom course, with the support of Kavli Institute of Nanoscience. The course included practical strategies on how to bring one own's strength and unique vision into the leader role, without crushing under the pressure of the role itself; how to navigate potential setbacks that often result in conflict, how to identify and resolve conflict itself, and proficiently grasp the challenging skills of negotiation and time management, while keeping the focus on the practicalities of problem solving at all times. Overall, the course successfully encouraged the participants to actively shift to a mindset that, combined with their technical work, will increase their proficiency in science.

The professional vulnerability and the time-sensitive challenges faced by postdoc researchers all over the world are sharpened by the temporary nature of the job, and grounded in inequality and biases, as highlighted in more than one investigative survey[1,2,3,4,5,6,7]. Among the scientific body of literature that you regularly encounter on high impact factor journals, this is a subject that you may not focus on during your weekly scavenge. And there is a reason for that: it's not the most pleasurable read for students, and mostly overlooked by senior scientists; yet, it depicts the challenges of postdoc researchers pretty well.

In the laughable wait for a decrease in pressure to secure competitive scientific positions in just a few years after their graduation, postdocs must find a way to come out from under their PIs influence so they can cast their own shadows and prove themselves to the scientific community; all while looking for their own funding, expanding their body of expertise, establishing their own collaborations, acquire teaching and/or supervision experience (depending on their personal career ambitions), and most importantly, publish, publish, publish.

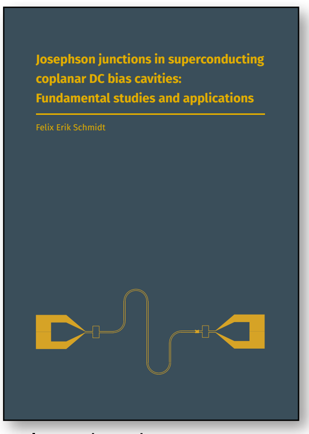
The requirements for postdocs to access not only their next position in the career ladder, but also permanent, non-academic research positions have dramatically changed over the course of the last 30 years as well. Back then, it was not infrequent for a freshly graduated PhD student to directly land a professorship[7,8]. While scientific excellence remains the main criterion for access to any profession in the field, as it should be, achieving scientific excellence transcends the correct execution and analysis of well-planned, timely performed experiments. Postdocs know that. And, after years of collective experience, EMBO knows that even better. This was the reason why Kavli EMBO Solutions, a wholly-owned, no-profit daughter company of EMBO, added the 'Laboratory leadership for Postdocs' course to its scientific training offer..

My readers can therefore imagine how during this course, the recommendations and experiences of 16 young scientists at different stages of their postdoc careers, made the course a success. Potential for participants to keep mum was high; yet the course construction was so wise, that every participant was included at all levels, and for once ZZoom felt like a safe space to bring real situations into the group. This way, participants were keen to apply the course content directly, and resolve what is perceived as an obstacle in each of their careers. As unlikely as it sounds, I personally approach Zoom gatherings with much more optimism after this course.

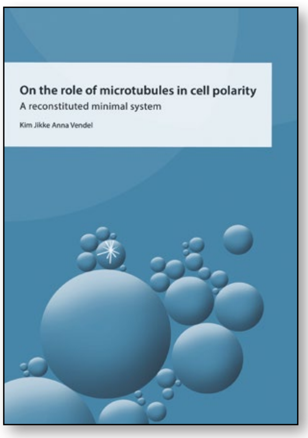
1. https://www.nature.com/articles/d41586-020-03191-7
2. https://www.nature.com/articles/d41586-018-07652-y
3. https://www.nature.com/articles/d41586-018-06794-3
4. https://www.nature.com/articles/d41586-019-00587-y
5. https://www.nature.com/articles/d41586-019-00688-8
6. https://www.sciencemag.org/careers/2020/02/three-bad-reasons-do-postdoc
6. https://socialsciences.nature.com/posts/55118-the-path-to-professorship-by-the-numbers-and-why-mentorship-matters
7. Hope Jahren, **Lab Girl**. Alfred A. Knopf, Penquin – Random House Publications. 2016
8. https://www.sciencemag.org/careers/2020/08/scientists-aren-t-trained-mentor-s-problem

PHD IN KIND

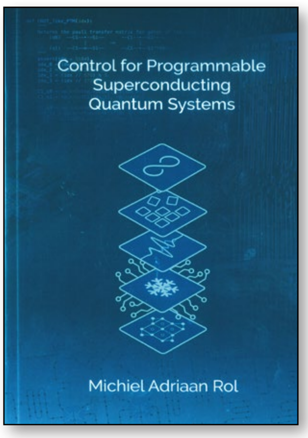
RECENT PHD THESES



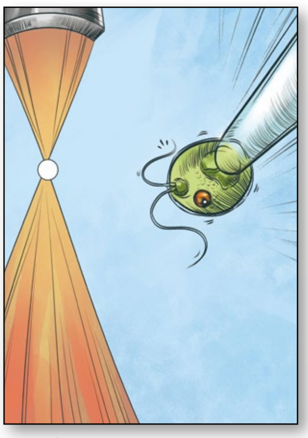
Felix Schmidt
28 August 2020



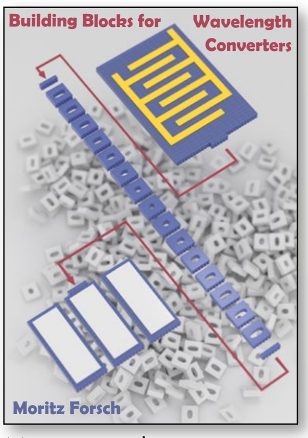
Kim Vendel
21 September 2020



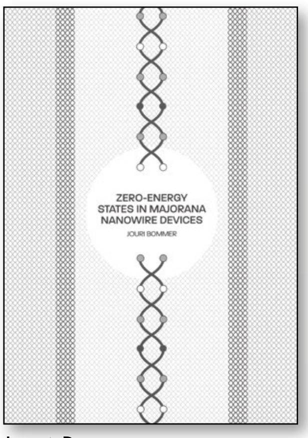
Michiel Adriaan Rol
09 October 2020



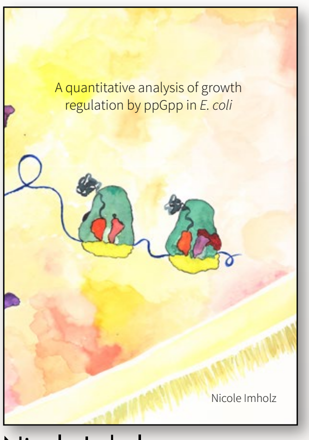
Da Wei
01 October 2020



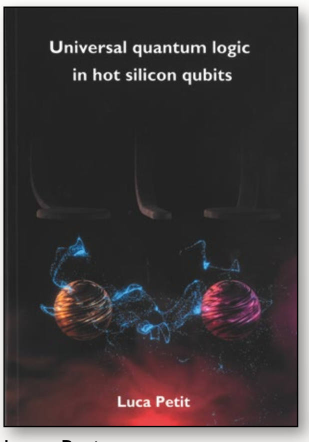
Moritz Forsch
17 December 2020



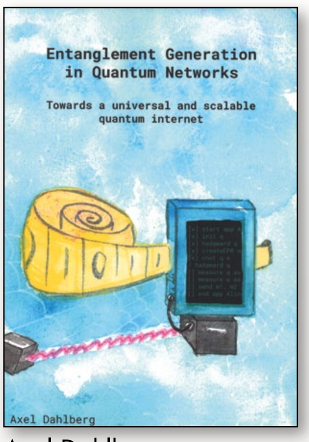
Jouri Bommer
6 January 2021



Nicole Imholz
18 December 2020

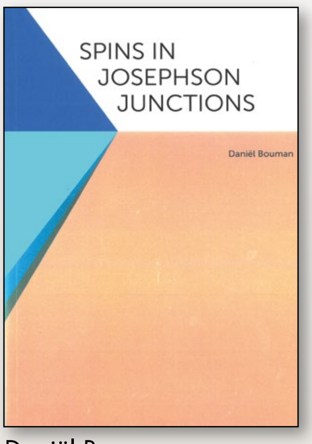


Luca Petit
7 January 2021

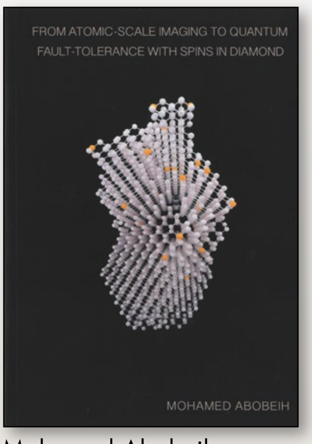


Axel Dahlberg
12 January 2021

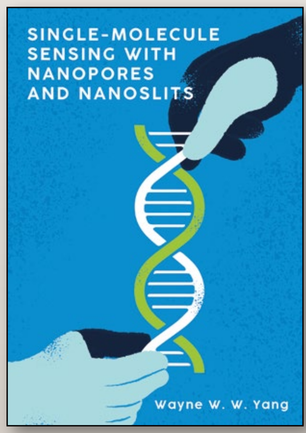
Michel Bengston
13 January 2021



Daniël Bouman
15 January 2021



Mohamed Abobeih
21 January 2021



Wayne Yang
3 February 2021

Guoji Zheng
12 February 2021

Workshop on rare-earth ions for quantum information processing – a brief report

By Wolfgang Tittel

The 15th workshop on rare-earth ions for quantum information processing took place from October 7-9, 2020. The Coronavirus pandemic forced us to make it an online-only workshop. It turned out to be a huge success: feedback from the participants was very positive, and the steering committee decided to include online elements in future workshops as well.

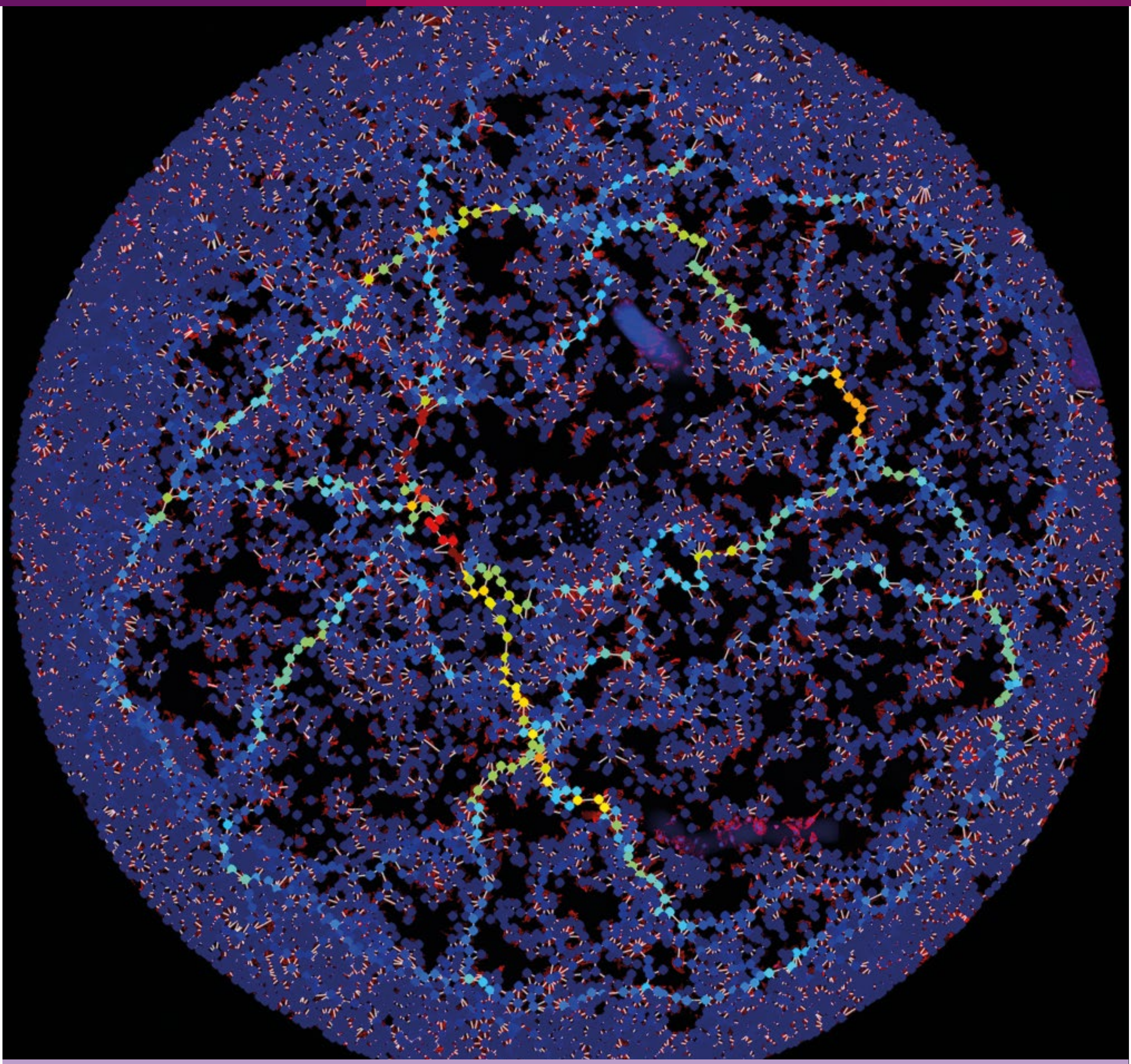
A total of 95 participants from Europe, North America, China, Australia and New Zealand participated, and 29 presentations were delivered live using zoom. Recording these presentations allowed participants from all time zones to learn about the latest developments in the fields of nano-cavity-enhanced interactions between light and single rare-earth ions, quantum transduction, spectroscopy, and classical plus quantum information processing. Extra sessions were scheduled between 22:00 and 23:00 on Wednesday and Thursday evening to facilitate the exchange of ideas with and between researchers from other continents and widely different time zones.

To enable interactions during breaks, we used Gather.town – an online platform that is inspired by video games and enables one to spontaneously meet other participants, thereby mimicking social contacts during a normal workshop with real people. The online workshop benefits researchers from far away in particular, for whom it is time consuming, tiring, and/or expensive to come in person.

NEW EMPLOYEES

Name	Date of employment	Title	Lab
Roel Smit	01-08-2020	PI/Director of BSc education	Smit lab
Eliska Greplova	01-08-2020	PI	Greplová lab
Yufan Li	16-08-2020	PhD	Van der Sar lab
Nina Codreanu	16-08-2020	PhD	Hanson & Groeblacher lab
Maurits Houmes	01-09-2020	PhD	Van der Zant en Steeneken lab
Dong Hoon Shin	01-09-2020	Postdoc/Kavli Fellow	Steeneken lab
Serge Vincent	01-09-2020	Postdoc	Nynke Dekker lab
Serhii Volosheniuk	01-09-2020	PhD	Van der Zant lab
Nemo Andrea	01-10-2020	PhD	Marileen Dogterom lab
Ali Maleki	01-10-2020	PhD	Marileen Dogterom lab
Yu Zhang	01-10-2020	PhD	Groeblacher lab
Jean-Paul van Soest	01-10-2020	PhD	Steele lab
Bektur Murzaliev	01-10-2020	Postdoc	Dobrovitski lab
Hanifa Tidjani	01-10-2020	PhD	Veldhorst lab
Liubov Markovich	01-10-2020	Postdoc	Borregaard lab
Fenglei Gu	01-10-2020	PhD	Borregaard lab
Marie-Christine Röhsner	01-10-2020	Postdoc	Hanson lab
Gabriele Baglioni	15-10-2020	PhD	Van der Zant and Steeneken lab
Anders Barth	01-11-2020	Postdoc	Cees Dekker lab
Richard Janissen	01-11-2020	Postdoc	Cees Dekker lab
Tristan Bras	01-11-2020	PhD	Van der Zant lab
Sebastiaan van der Poel	01-11-2020	PhD	Van der Zant lab
Alvaro Gomez Inesta	01-11-2020	PhD	Wehner lab
Yanthi Deurloo	01-11-2020	Technician	Dimphna Meijer lab
Abel Brokkelkamp	01-12-2020	PhD	Conesa Boj lab
Nicolas Demetriou	01-12-2020	PhD	Taminiau lab
Guliuxin Jin	01-01-2021	PhD	Greplová lab
Rik Broekhoven	01-01-2021	PhD	Otte en Wimmer lab
Natalia Chepiga	01-01-2021	PI	Chepiga lab
Eduardo Matos Maschio	01-01-2021	Data Engineer	Kouwenhoven lab
Daniel Yi	01-01-2021	Nanofabrication Engineer	Kouwenhoven lab
Davide degli Esposti	15-01-2021	PhD	Scappucci lab
Kristin Grussmayer	01-02-2021	PI	Kristin Grussmayer lab
Jos Zwanikken	01-02-2021	PI	Jos Zwanikken lab
Céline Cleij	01-02-2021	PhD	Christophe Danelon lab
Arash Ahmadi	01-02-2021	PhD	Greplová lab
Ulderico Filoppozzi	01-02-2021	PhD	Caviglia lab
Arjen Vaartjes	15-02-2021	Data Engineer	Kouwenhoven lab

SCIENCE ART



"Artist impression of the communication structures through a network of tumour cells. The dots inside each cell indicate how many shortest paths of the network go through that cell. The warmer the colour, the more important that cell would be for the flow of information across this social network."
Credit: Lukas van den Heuvel & Willem Kasper Spoelstra (Dimphna Meijer Lab)

KAVLI DAY 2021

Are we quantum computers, or merely clever robots?

Speaker: Prof. Matthew Fisher of UC Santa Barbara

September 2, 2021

Where: T.B.A.

COLOFON

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Chirlmin Joo, Chantal Brokerhof, Etty van der Leij, Ingrid Romijn and Tahnee de Groot

Lay out
Haagsblauw

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