



DNA as building components for nanomachines (see p. 2)

# Nanosystems NEWS

## A sincere “Thank You!”

Once again, in this current issue of the Nanosystems News, we can report on a number of new activities and success stories at NIM. From my point of view, things at NIM run very smoothly. Reason enough to put the coordination of NIM, for which I have been responsible for eight years now, into the hands of someone else.

I would particularly like to thank all scientific members of NIM, the NIM Executive Committee as well as the NIM Advisory Board. My special thanks go to the NIM Office, in particular to Dr. Peter Sonntag for his excellent support in many respects. Many thanks also to the Executive Boards of the Ludwig-Maximilians-Universität (LMU), the Technische Universität München (TUM) and the University of Augsburg as well as to the Bavarian State Ministry for Science.



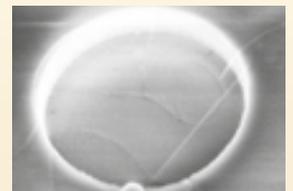
Construction site of the new Nano Institute

The construction of two state-of-the-art buildings for research in the nano-areas - the ZNN at TUM in Garching and the current construction of the LMU based Nano-Institute near the Englischer Garten (see picture) – are outstanding highlights of local research funding. These sustainable infrastructure measures will enable Munich’s research activities in the nanosciences to play an internationally competitive role also in the future.

Jochen Feldmann  
NIM Coordinator

## Content

**Page 3**  
Precise and local treatment of lung cancer

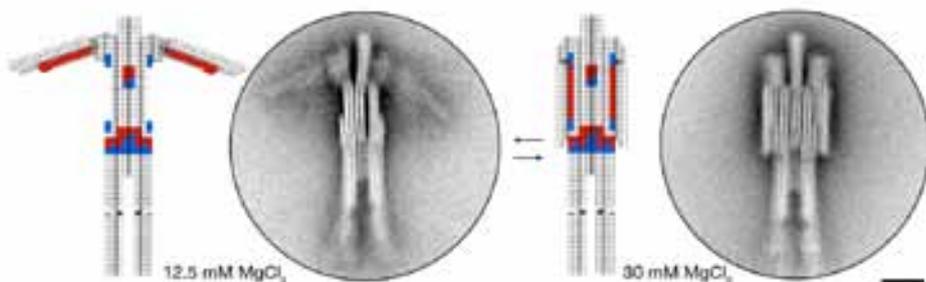
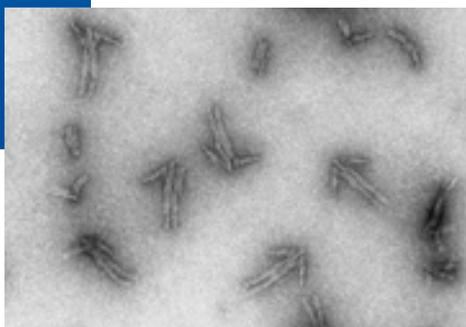


**Page 5**  
PhD... and then?



**Page 7**  
Kick-off in Hong Kong





Electron microscope images and schematic illustrations of the nanorobots (100 nm)

## Toolbox for building dynamic DNA nanomachines

### Arm-waving nanorobot signals new flexibility in DNA origami

NIM scientists presented new DNA nano-objects in the journal *Science*: a robot with movable arms, a book which opens and closes, a switchable gear wheel and an actuator – fascinating objects which demonstrate an entirely new approach to connecting and configuring three-dimensional DNA components. The new technique paves the way for applicable nanomachines with movable parts. The research field known as “DNA origami” – in reference to the Japanese art of folding paper – is based on the method of pairing DNA bases in order to connect individual DNA strands and assemblies dissolved in solution to others. The novelty presented by Prof. Hendrik Dietz (TUM) and his team of researchers is a new type of “glue.” “If you build a unit with DNA base pairs, you get stable connections. But they are hard to break apart again,” explains Dietz. “Therefore, dynamic structures had to be built in a very simple way so far, so that not many base pairs were required. This limitation no longer exists.”

### Bio-inspired flexibility

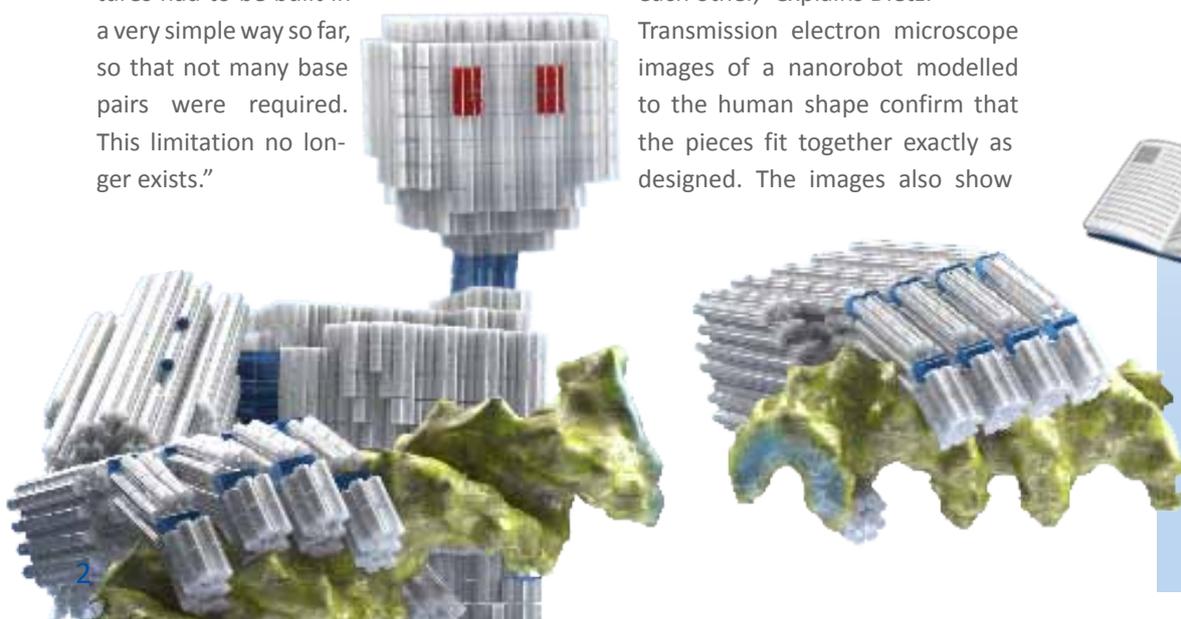
For the experiments presented in the journal *Science*, Dietz and his co-authors drew their inspiration from a mechanism that allows nucleic acid molecules to connect to each other through interactions weaker than base pairing. When building a dynamic DNA nanomachine, the researchers begin with programming the self-assembly of the three-dimensional complementary components. A weak, short-ranged binding mechanism – the stacking of nucleobases – can then be activated so that the units connect correctly.

Three different methods are available for controlling the shape and action of the objects created this way. “So now we have a portfolio of interactions with clearly tiered binding strengths on hand, which allows us to position several components as precisely as we want them relative to each other,” explains Dietz.

Transmission electron microscope images of a nanorobot modelled to the human shape confirm that the pieces fit together exactly as designed. The images also show

how a simple control method – changing the concentration of positive ions in the solution – can actively switch between different configurations: disassembled or assembled, with arms wide open or resting at the side. Previously, switchable nano-objects were worn out after only a few switching cycles. In the paper, Dietz describes a scissor-like actuator which completed more than a thousand switching cycles over a four-day period with no signs of degradation.

“Raising and lowering the temperature cyclically is a way to put energy into the system,” adds Dietz. “If we now also manage to couple the folding in and out of our objects to a continuous process – like with a ratchet for example – we should be able to build and also to power nanomachines.”



### Publication

Dynamic DNA devices and assemblies formed by shape-complementary, non-base pairing 3D components.

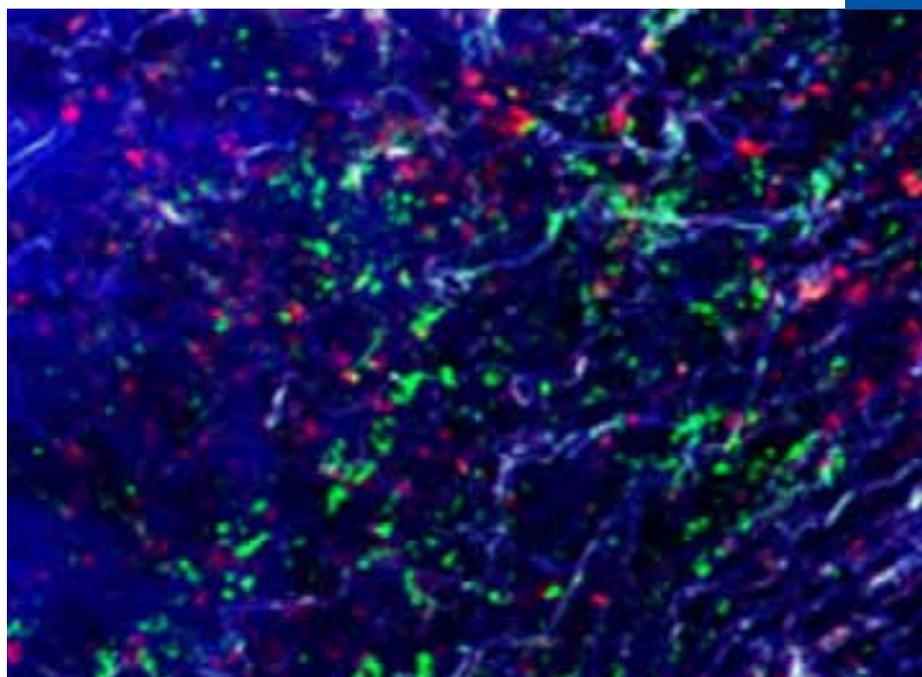
Thomas Gerling, Klaus F. Wagenbauer, Andrea M. Neuner, and Hendrik Dietz.  
*Science*, 27 March, 2015

## Precise and local treatment of lung cancer

### Medical nanoparticles

Nanoparticles can function as targeted carriers for drugs to fight lung cancer. In a joint project at the Cluster of Excellence “Nanosystems Initiative Munich” (NIM), scientists from the Helmholtz Zentrum München (HMGU) and the Ludwig-Maximilians-Universität (LMU) in Munich have developed special nanocarriers that release drugs precisely at the tumor site in the human lung. In the journal *ACS Nano*, the scientists reported that this approach led to a significant increase in the effectiveness of current cancer drugs in the lung’s tumor tissue.

Nanoparticles are the smallest of particles and can advance to the most remote parts of the body. Researchers explore different approaches for using these nanoparticles in the medical field – for example to deliver substances to a specific site in the human body.



*Lung tumor tissue*

### Targeted drug transport for the first time verified in human cells

The Munich-based scientists have developed nanocarriers that release the carried drugs only in a defined environment – the lung tumor area. With this, the team of Silke Meiners, Oliver Eickelberg and Sabine van Rijt from the Comprehensive Pneumology Center at HMGU, working with colleagues from Thomas Bein’s group at the LMU Chemistry Department, was able to provide first-time evidence of the nanoparticles’ targeted drug transport to human lung cells.

### Tumor-specific proteins release drugs from the nanocarriers

Tumor tissue in the lung contains high concentrations of certain proteases, enzymes which break down and cut specific proteins. The scientists took advantage of this by modifying the nanocarriers with a protective layer that only these prote-

ases could break down, a process that then releases the carried drug. Protease concentrations in the healthy lung tissue are too low to cleave the protective layer. “This way we can release a drug, a chemotherapeutic substance for example, specifically at the tumor site,” explains Silke Meiners, head of the research group. “We observed that the drug’s effectiveness in the tumor tissue was 10 to 25 times greater. At the same time, this approach offers the chance of decreasing the total dose of the required drug, thus avoiding undesirable side effects.” Further studies will now investigate the safety of the nanocarriers in vivo and verify the clinical efficacy in the tumor model. ■

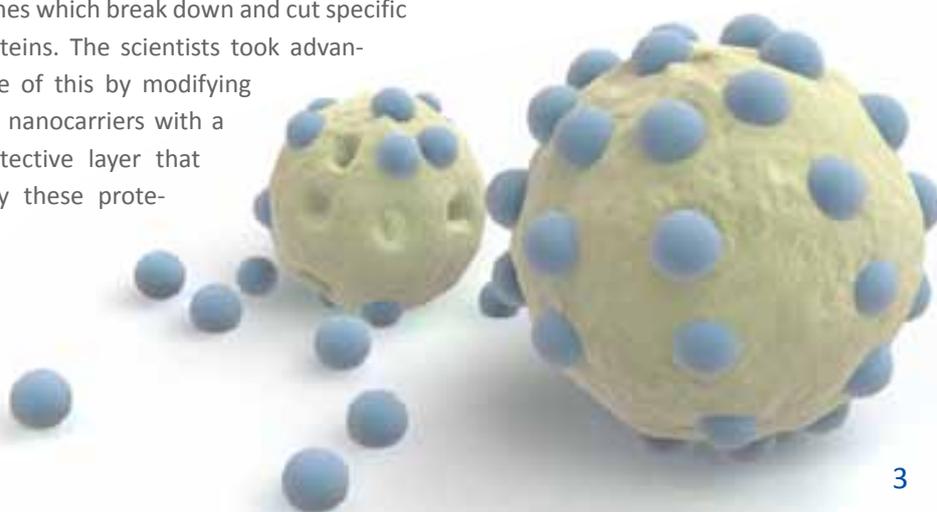
*Source: Helmholtz Zentrum München*

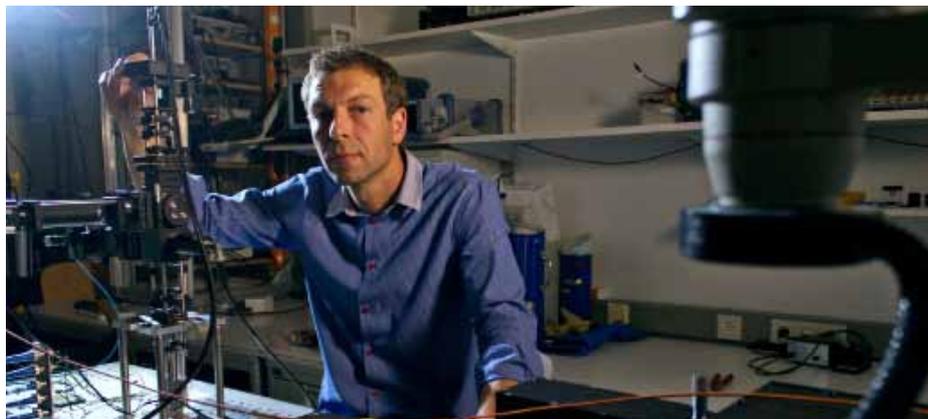
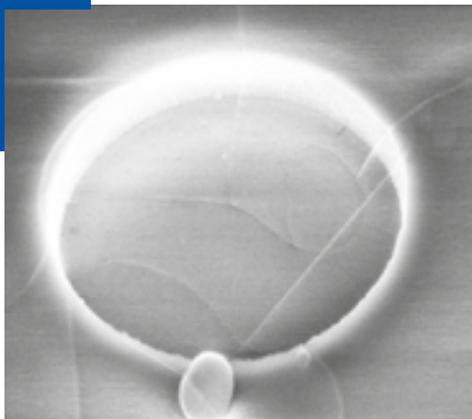
### Publication



Protease Mediated Release of Chemotherapeutics From Mesoporous Silica Nanoparticles to Ex Vivo Human and Mouse Lung Tumors. Sabine H. van Rijt, Deniz A. Bölükbas, Christian Argyo, Stefan Datz, Michael Lindner, Oliver Eickelberg, Melanie Königshoff, Thomas Bein, and Silke Meiners.

*ACS Nano*, 2015, 9 (3), pp 2377–2389





(left) Scanning electron microscope image of nanotubes above a perforated silicon surface

## Starting grant for nano suspension bridges

Prof. Alexander Högele received an ERC Starting Grant through NIM seed funding

The Nanosystems Initiative Munich (NIM) provides part of its annual budget to particularly creative research projects of its members. This so-called seed funding is intended to give scientists the possibility to test the implementation of their ideas. The money should be used to further develop the ideas until there is a reasonable chance of getting follow-up funding from other sources.

### Ultra-thin suspension bridges

Alexander Högele can proudly look back on a textbook example of successful seed funding. The aim of the Junior Professor at the Faculty of Physics at LMU München was to suspend carbon nanotubes in the air for a length of several micrometers, “nano suspension bridges,” so to speak. This allows the tubes, the walls of which measure only one atomic layer and have a diameter of about one nanometer, to be physically investigated more thoroughly. The bridge construction reduces environmental influences, such as from

a substrate. With the help of seed funding, Högele was able to employ a PhD student for a period of 10 months. “This was a great help for a small group in which all staff members work to capacity,” says Högele. The team was able to realize their aim within only a few months’ time.

### The money came rolling in

With the result of their work, Högele was able to submit an application to the European Research Council (ERC). “The seed funding came at the perfect time,” said the physicist, who is still enthusiastic about it, because it ultimately enabled him to get an ERC Starting Grant. So the 35,000 euros from NIM eventually became around 1.75 million euros, and allowed Högele to not only provide for devices, consumables and travel expenses, but also to pay three PhD students and one postdoc for a period of five years.

This way, the

physicists can tackle an exciting project for using the suspended nanotubes.

### About photons & phonons

In the future, they intend to use the coupling of light and electron-hole pairs (excitons) to also investigate the mechanical and magnetic degree of freedom of semiconducting nanotubes. The exciton will act as a link between the elementary excitations of light and the solid, i.e. it mediates the coupling of photons and spins (elementary magnetic excitations) or phonons (elementary mechanical excitations). The experiments are, among other things, intended to provide the basis for using nanotubes in future technologies such as quantum cryptography and quantum metrology. ■



## Visiting the Greek gods at DESY in Hamburg

PhD students Melanie Stamp and Isabella Almstätter report on the NIM GP excursion to one of the world's leading accelerator centers

When talking about Hamburg, most people think of the bustling port, the Alster river or the vivid cultural life. Natural scientists also have another highlight in mind: DESY, the German Electron Synchrotron. In March 2015, a group of ten students of the NIM Graduate Program visited Germany's largest research center, where scientists investigate the origin of life with the help of particle accelerators.

### World-famous facilities

The special tour began in the perhaps most famous facility, the "PETRA hall." PETRA III is DESY's latest source of synchrotron radiation. Its fourteen beamlines are used by more than 30 workplaces in parallel to investigate structures at micrometer and nanometer scale with the help of state-of-the-art imaging techniques.

The famous free electron laser FLASH and ZEUS, a detector for electron-proton collisions, are largely shielded by massive concrete walls or hidden underground. But even the exhibited 1:10 models towered above us and were very impressive.

### The Greek goddess hidden in the deep

ZEUS is not the only Greek god at DESY. Thirty-two meters underground there is the HERA tunnel, a six km long ring which was used to store electrons and protons up to a few years ago. Special mine laws have to be observed when visiting this tunnel. We had to check in and out, for example, because otherwise a rescue team would have been sent out. As fascinating as the tunnel itself were the "historical" detectors stored there. One of them made cosmic radiation audible and visible, which – astonishingly enough – is still detectable so deep underground and

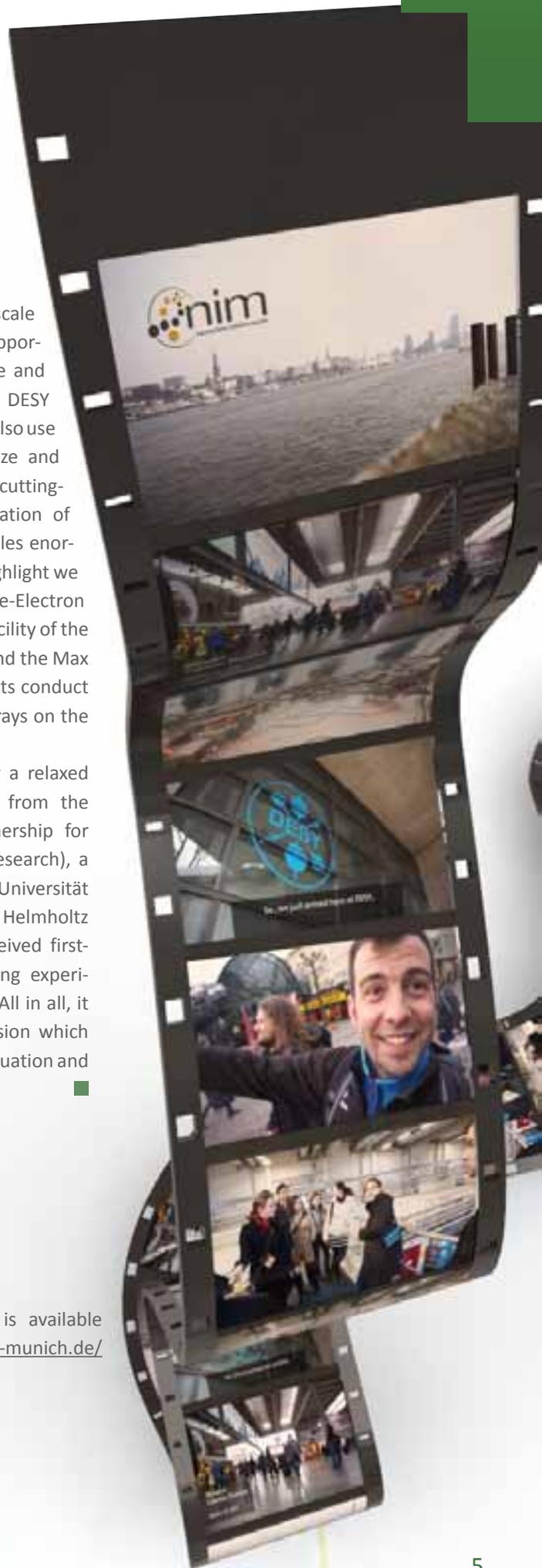
shielded by tons of concrete.

### From the tera- to the nanoscale

In addition to all these terascale systems, we also had the opportunity to see some nanoscale and subnanoscale facilities at the DESY Nano Lab. The scientists here also use X-ray techniques to synthesize and explore nanostructures with cutting-edge methods. This combination of terascale and nanoscale enables enormous possibilities. The last highlight we visited was the Center for Free-Electron Laser Science (CFEL), a joint facility of the Universität Hamburg, DESY and the Max Planck Society, where scientists conduct experiments with ultrafast X-rays on the femtosecond time scale.

The trip was rounded off by a relaxed evening with PhD students from the graduate school PIER (Partnership for Innovation, Education and Research), a joint institution of the Universität Hamburg, DESY and the Helmholtz Association, where we received first-hand information on Big Bang experiments and the string theory. All in all, it was a very interesting excursion which gave new impulses to our graduation and the time after. ■

The film on the excursion is available here: [www.nano-initiative-munich.de/graduate-program](http://www.nano-initiative-munich.de/graduate-program)





## PhD... and then? The careers of NIM alumni - part 1

Towards the end of their PhD years, most students have to make some important decisions: industry or research? Family or career?

In our two-part alumni series, former NIM graduate students recount their professional path and their experiences

### To industry and back again

Dr. Christoph Westerhausen – Junior Group Leader Biophysics, University of Augsburg

As the work on his doctoral thesis drew to an end, Christoph Westerhausen felt he wanted a job which involved projects with a clearly defined timeline, which were application-oriented and showed fast progress. He found this job at an engineering office, where he was responsible for measurements and 3D sound propagation calculations, for the approval and acceptance testing of industrial plants,

among other things.

While he was working on a concept for a more comprehensive measurement project on infrasound and the subsequent project implementation, he realized that he really liked investigating things, developing concepts and working with an emphasis on research. At the same time, he was presented with the prospect of becoming head of the department soon.

“I liked working at the engineering office a lot,” says Christoph Westerhausen. “But accepting this position would have meant more management tasks and less in-depth work on technical themes.” When he learned that his former university chair advertised the position of Group Leader in the field of Biological Physics/Microfluidics, he started weighing the pros and cons. The cons of a scientific career are obvious: the pay is lower, the contracts are short-term and the future is uncertain. “But in this case, the job was for three years, and included a renewal option,” explains Christoph Westerhausen. “And if it doesn’t work, you can still go back and look for a job in industry.” At the moment, though, he really enjoys the fact that his new job offers everything he likes: project management, personnel responsibility, research and teaching. ■



*Christoph Westerhausen is a group leader at the University of Augsburg*



## A good compromise: the 32-hour work week

**Dr. Nina Mauser – R&D Light Measurement (Instrument Systems, Munich)**

**W**hen her daughter Hanna was born, Nina Mauser was working on her doctoral thesis. After a parental leave of eight months, she started to work full-time again while her husband took five months parental leave. When Hanna started to go to a day nursery, Nina Mauser reduced her weekly hours (3/4-time position). But there were no suitable part-time jobs advertised in industry. So she applied for full-time jobs, often without mentioning her family situation at first. In the job interview, her current employer finally agreed on an 80-percent job. "It was all very uncomplicated," she recounts. "My husband also reduced his weekly hours and we both take turns at picking up Hanna at the day nursery. This way, we both have time for ourselves and neither of us has the feeling of lagging behind in our career."

## Variety guaranteed

**Dr. Stephan Heucke – Business Consultant (McKinsey, Munich)**

**S**ome of the clichés related to business consultants are true, says Stephan Heucke: he indeed spends three nights a week in a hotel and does lots of overtime. "But, on the other hand, my work is extraordinarily varied. And on Fridays we always have an office day at our home location," he emphasizes. "The most important thing, however, is that my colleagues are very nice, so the job is fun even when it's stressful."

Even while he was still a student, Stephan Heucke already had an eye on jobs that were not typical for a physicist. When a fellow PhD student started working for McKinsey, he gained good insights into



*Nina Mauser has both child and job*

In her company, she is responsible for the development of light-measurement devices such as cameras. "I like the approach to work in our company. Similar to working in the academic world, I work very independently and spend a lot of time in the laboratory, evaluating data, programming and running simulations."

She is still very happy with her 80-percent

job. "Working 32 hours means that my colleagues don't really notice that I work part-time. We have our lunch break together, for example, and I am there for almost all meetings." ■

the company and so also applied for a job there. A surprising number of Stephan Heucke's colleagues are also physicists. "Many of them are responsible for projects in the automobile industry or with high-tech companies, and they have the advantage of understanding technical project details more easily," he explains. Apart from the variety of topics, one thing he appreciates above all about his job are the insights into very different working and living environments he gets. "Actually, the first years as a business consultant are a further training period, similar to the PhD years. You learn a lot and you gain a lot of experiences, quickly. And, based on the fact that your own market value continues to rise, you still have numerous career options if you decide not to be a business consultant for the rest of your professional life. Many consultants switch to one of their clients, to start-up companies or start their own business." ■



*Stephan Heucke*

*A varied life as a business consultant*



## Kick-off in Hong Kong

**An international workshop kicked off the cooperation between NIM and the Centre for Functional Photonics in Hong Kong**

In May this year, the Nanosystems Initiative Munich (NIM) organized a three-day workshop together with the Hong Kong Centre for Functional Photonics (CFP). The workshop focused on functional photonics and nanosystems. Sixty scientists gathered at the City University in the Hong Kong district of Kowloon to exchange information about their research. A poster session offered the PhD students among them – nine from Munich – the opportunity to present their own research results. The organizers were also able to attract



*View of the city of Hong Kong*

four particularly renowned external keynote speakers for the workshop: Dmitri Talapin from the University of Chicago (USA), Alexander Eychmüller from TU Dresden (Germany), Hong-Bo Sun from Jilin University in Changchun (China) and Hiroaki Misawa from Hokkaido University in Sapporo (Japan).

### Nanocrystals & fuel cells

Dmitri Talapin opened the workshop with a talk on artificially fabricated nanocrystalline structures. Unlike conventional solids, they can be tailored in terms of their electronic, magnetic, optical and catalytic properties. Talapin demonstrated how the fabrication of electronic, thermoelectronic and photovoltaic components can particularly profit from this method.

Hiroaki Misawa's talk focused on artificial photosynthesis with the aid of plasmons, i.e. oscillations of electrons in solids. The procedure he has developed to split water into hydrogen and oxygen uses both sides of a crystalline strontium titanate substrate simultaneously in two different chambers. With a similar system, he succeeded in using solar energy to produce ammonia.

Alexander Eychmüller is as well concerned



*Prof. Misawa reported on successes in photocatalytic water splitting*

with the conversion of energy, with the aid of fuel cells. Conventional polymer electrolyte fuel cells are too expensive, their efficiency is low and they are not suitable for long-term use in commercial applications. In Hong Kong, Eychmüller presented a promising cathode material which is based on platinum and palladium nanoparticles.

Hong-Bo Sun reported on an innovative 3D laser printing technique, allowing dif-

ferent objects to be produced with an accuracy of only a few tens of nanometers. He presented a tiny magnetically powered turbine with rotor blades measuring around ten micrometers, a protein microlens with variable focal length and a microresonator for miniature lasers.

### New cooperation

For the participating PhD students, the Hong Kong visit began one day before the workshop started. The Centre for Functional Photonics had organized an extensive laboratory tour of all nano-related areas of the City University. The tour was rounded off by a visit to the newly established laboratories in the Science Park beyond the central campus.

The workshop has been the kick-off event of a new cooperation between the Centre for Functional Photonics and the NIM Cluster of Excellence. Speakers and students from Hong Kong are therefore expected to participate in the next NIM Winter School (see p. 12).



*NIM and CFP PhD students at conference dinner*

## Resistance is futile

Matthias Punk – of the quantum physics of superconductors

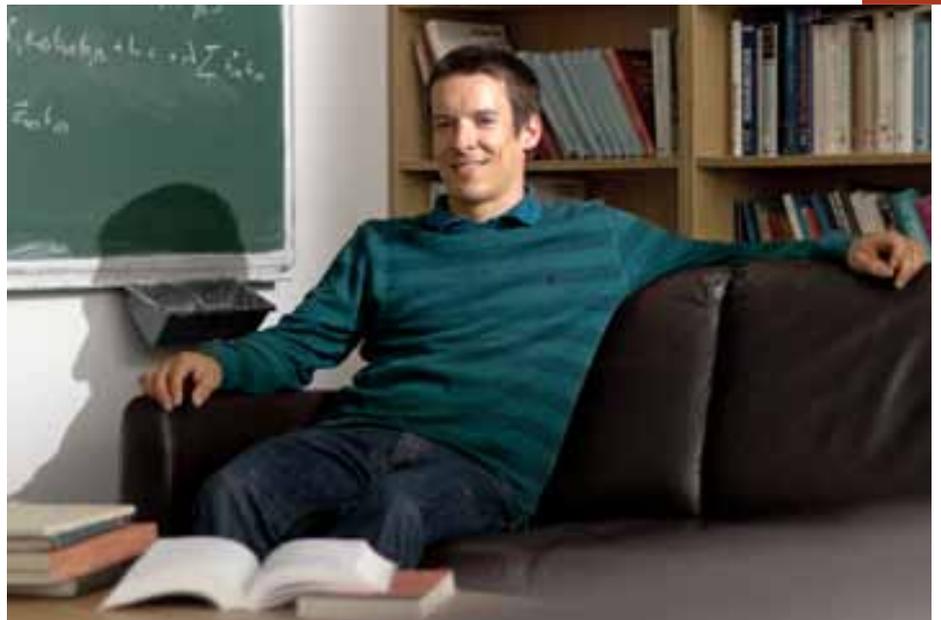
“What is your profession?” Sometimes it requires real explanatory talent to answer this question intelligibly. Matthias Punk can confirm that. The 34-year-old scientist has been appointed professor at LMU’s Chair of Theoretical Solid State Physics in April 2015, where he explores quantum mechanics, and, in particular, “strongly correlated many-body systems.”

### Conducting electricity without resistance

“For theorists, quantum mechanics is above all about calculating probabilities,” explains Matthias Punk. “Put simply, we investigate what can happen if a vast number of particles interact with each other.” A practical example of such many-body systems are superconductors. Depending on the temperature and density of the charge carriers, the material conducts electricity either without any resistance or functions as an insulator or can be in an exotic intermediate state.

With zero resistance, the flow of electric current in superconductors is very efficient, with practically no heat development and no loss in energy. This is the reason why they are of high relevance for a large number of electronics and communication technology applications, but also for strong magnets in high-resolution imaging techniques, such as magnetic resonance tomography.

While conventional superconductors have to be cooled to only a few degrees Kelvin with liquid helium, special high-temperature superconductors already conduct without any resistance at “high” temperatures around 100 degrees Kelvin (-173 °C). They consist of ceramic material and can be cooled with liquid nitrogen, which is significantly cheaper and easier to handle than liquid helium.



### Wild arithmetic expressions

For these superconductors in particular, Matthias Punk and his team want to understand more precisely how and why the resistance changes so drastically in the interesting transition regime between insulation and superconductivity. “There are lots of experimental data on this so-called pseudogap phase, but they often seem contradictory,” explains the physicist. “We develop theoretical models for classifying and interpreting them.”

One of the main reasons for electrical resistance are impurities in the crystal lattice, which cause the electrons to scatter. Whether that happens or not mainly depends on two factors: the probability that an electron moves from A to B and the probability that it scatters off such an impurity. Matthias Punk has described his approach once to a friend as follows: “We add the probabilities of all possible paths which an electron can take on its way through the crystal lattice. This results in pretty wild expressions, which we try to compute in order to obtain detailed information on the resistance of a certain material.”

### Back to Munich

Matthias Punk’s interest in quantum physics was aroused by the highly interesting lectures of Professor Wilhelm Zwerger, which he attended while study-

ing physics in his home town of Innsbruck. When Zwerger moved on to TU München shortly after, Punk followed him for his diploma and doctoral thesis. This was when Matthias Punk first heard of NIM – with Professor Zwerger being one of the founding members of the cluster of excellence. He then spent two and a half years as Postdoc at Harvard University and one year at the University of Innsbruck before he eventually received a call from LMU and thus returned to the familiar city of Munich.

“I am very happy about having been given the chance to do research at LMU,” says Matthias Punk. “The working conditions are excellent, which for us theorists above all means that there are many other outstanding scientists around with whom you can exchange knowledge and that there are interested and motivated students.”

Just as his doctoral supervisor before, Matthias Punk will without doubt manage to fill his young students with enthusiasm for quantum mechanics. He most certainly has the talent to explain to newcomers what the subject is all about. ■



## Electricity in stock

Aliaksandr Bandarenka – New materials storing energy

In countries such as Denmark and the Netherlands, the wind sweeps across the flat countryside and the sea, thereby powering a vast number of wind turbines. No wonder that research on renewable energies plays a central role there. So, during his time as a postdoctoral researcher at the Technical University of Denmark and the University of Twente in the Netherlands, Aliaksandr Bandarenka had boundless opportunities to discover the world of these energy forms and how to store them.

In his home country of Belarus, renewable energies are also gaining ever more importance. Whenever he visits, the 34-year-old physicist discovers new wind turbines in the gently undulating landscape. “People there see a real prospect in wind and solar energy in particular,” he explains. “In addition, Belarus gets EU funds for the expansion of so-called green technologies and is supported by German and other foreign companies.”

Since May 2014, Aliaksandr Bandarenka is professor at the Physics Department

of TU München and member of NIM. His research tackles a problem of renewable energy provision which is very important for the future: how to store excessively produced energy and make it available at a later point in time.

### Materials for enhanced storage

One possibility of converting electricity into the energy carrier hydrogen is by the electrolysis of water. To this end, electrodes are immersed in a solution and an electrical potential is applied. This causes the water to split into oxygen and hydrogen at the electrode/solution interface. The composition of the solution and the surface of the electrodes determine how efficient the reaction is – and both these areas still have potential for optimization. Aliaksandr Bandarenka is presently focusing primarily on developing new electrode materials and identifying so-called active sites at the catalyst surface. These are sites at which certain atoms are arranged in such an optimal way that the decomposition of water is catalyzed there.

### View below the electrode surface

In crystal layers only a few nanometers thick, his team has already succeeded in producing different variants of a novel type of copper-based material with defined active sites and successfully tested them for hydrogen production. The particular challenge now is to observe the efficiency of the electrolysis and stability of the material. This requires new methods which are best developed in a team composed of members with different specialist backgrounds. Bandarenka's group is therefore working closely with chemists and theoretical physicists, among others.

### Traveler across the disciplines

The exchange of knowledge between different specialist areas is a familiar thing to Bandarenka. After all, he is a traveler across the disciplines himself. He studied chemistry in Minsk, where he earned his PhD in physical chemistry. In his postdoctoral positions in the Netherlands and Denmark, he worked in the respective Physics Departments, while the position as group leader at Ruhr-Universität Bochum was in the Chemistry Department. The call to professorship at TU München now takes Bandarenka back to the field of physics.

As easy it is for the Belarusian researcher to travel across the disciplines, as easy it is for him to live in different countries. “I was surprised myself how quickly I was able to settle down wherever I was,” remembers Bandarenka. He has already explored his new home of Freising, Munich and the Bavarian lakes and looks forward to his time here and to many successful projects at NIM. ■

## Hello, Goodbye

### NIM welcomes as new PIs:



**Prof. Matthias Punk**  
(W2 professorship, Chair of Theoretical Solid State Physics, Prof. von Delft, LMU Physics Department)



**Prof. Aliaksandr Bandarenka**  
(W2 professorship, Physics of Energy Conversion and Storage, TUM Physics Department)

### NIM welcomes as new members & employees:



**Sylvia Merbitz**  
Assistant, NIM Office



The members of the **NIM Graduate Program** have elected a new **Student Board** (f.l.t.r.):

- **Linda Brützel** (LMU, Lipfert group)
- **Claudia Lermer** (LMU, Lotsch group)
- **Fabian Flassig** (TUM, Finley chair)
- **Matthias Pernpeintner** (TUM, Hübl group)
- **Matthias Weiß** (Univ. of Augsburg, Krenner group)

### Appointments / farewells:

**Dirk Grundler** (TUM, Physics Dep.) accepted a call to be professor at the EPFL (Lausanne, Switzerland) as of April 1, 2015.

**Birgit Ziller** is on maternity leave and will then add more months of parental leave. We wish her and her young family all the best and look forward to her return next year.

**Barbara Pinto** (Assistant, NIM Office) retired, well-deserved, on March 1, 2015 after more than 25 years at the LMU. We thank her for her relentless support and wish her all the best.



## Honored!



**Christoph Bräuchle** (LMU) was awarded the Walther-Nernst-Denkünze at this year's annual conference of the German Bunsen Society for Physical Chemistry.



**Hendrik Dietz** (TUM) is awarded the Gottfried Wilhelm Leibniz Prize for his research on the mechanical and structural properties of proteins and the development of DNA-based nanomachines.



**Bettina Lotsch** (LMU) receives an ERC Starting Grant for her project "COFLeaf – Fuel from sunlight".



**Thomas Carell** (LMU) was awarded the Michael J. Gait Lectureship at the Nucleic Acids Partnership Development Summit in London.



**Peter Hänggi** (Augsburg University) received the "Distinguished scientist award and medal" of the Ben-Gurion University of the Negev, Israel.



The Bavarian Academy of Sciences and Humanities elected **Matthias Rief** (TUM) as a new member based on his scientific achievements.

# Outlook



■ August 3–7, 2015

## **NIM Conference on Resonator Quantum Electrodynamics**

Organized by: Rudolf Gross, Gerhard Rempe, Jonathan Finley (all TUM)

*Venue: Literaturhaus München*



■ March 13–18, 2016

## **NIM Winter School 2016**

*Venue: Kirchberg, Austria*

## About NIM

Since its foundation in 2006, the Nanosystems Initiative Munich – NIM, for short – has established itself as a leading international nano center. The design and the control of artificial and multifunctional nanosystems are the keystones of the scientific program of the Cluster of Excellence which brings together scientists from nanophysics, chemistry and the life sciences.

The integration of these functional nanosystems in complex and realistic surroundings is the central research aspect at NIM within its second funding phase of the Excellence Initiative. Artificial nanosystems have a wide range of potential applications in areas like information technology and biotechnology, as well as in the efficient use of solar energy.

## Picture Credits

S.1 Photo construction site: Konrad Ibel

S.3 Microscopy image: Sabine van Rijt, Helmholtz Zentrum München

S.8 Photos Hong Kong: Julian Schneider, CityU Hongkong

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