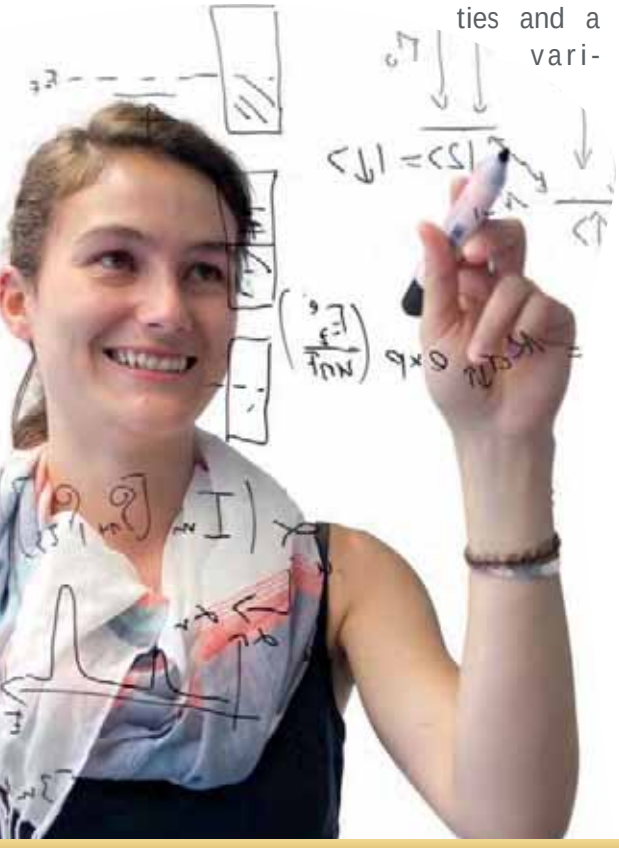
Nanoparticles in a planet-satellite model (Page 2)

Nanosystems NEWS

New building, start-ups and ideas

Recent months have been eventful for NIM. The detailed planning phase for the new NIM research building has begun after conclusion of the architectural design competition. The Nano Institute Munich will be erected on an LMU campus in immediate vicinity of the "Englischer Garten". There, NIM research groups will find state-of-the-art laboratories, conference facilities and a variety of offices. The NIM administration will also move into this new building. The research labs will provide the necessary infrastructure for investigating the basic aspects of energy conversion and storage in nanoscale material systems. To this end, the Free State of Bavaria has generously provided the LMU with the necessary financial funds within the scope of the project "Solar Technologies Go Hybrid" (SolTech in short).

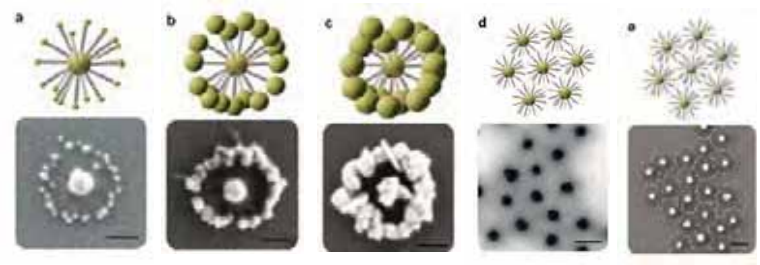


For many doctoral students, starting their own business often seems too risky despite a good business idea. To help NIM graduate students who consider setting up a business evaluate the situation, NIM organized a spin-off workshop in July 2013. Ten company founders from the local nanotechnology industry told their own founding stories and answered all questions the next generation of company founders had. Having received all the information first-hand, the participants' feedback was highly positive.

This newsletter also covers fascinating research projects at NIM, the Summer Research Program, the "Young Ideas in Nanoscience" workshop and the research work of new members. Enjoy reading!

Jochen Feldmann, NIM Coordinator

Content

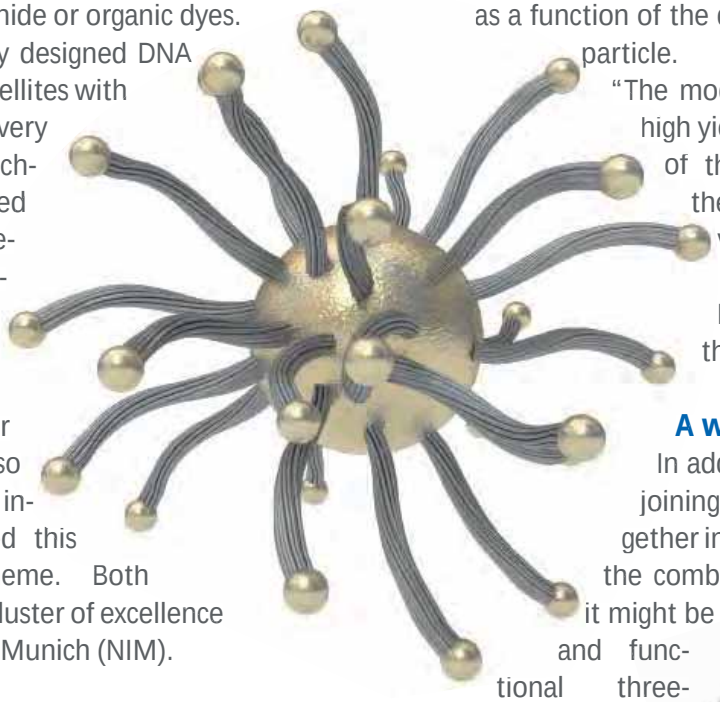


Above: Schematic illustrations
Below: TEM and SEM images of nanoclusters (Scale bar: 100 nm)

Nanoparticles and their orbital positions

NIM physicists have developed a "planet-satellite model" to precisely connect and arrange nanoparticles in three-dimensional structures. Inspired by the photosystems of plants and algae, these artificial nanoassemblies might in the future serve to collect and convert energy.

If the scientists' nanoparticles were one million times larger, the laboratory would look like an arts and crafts room at Christmas time: gold, silver and colorful shiny spheres in different sizes and filaments in various lengths. For at the center of the nanoscale "planet-satellite model" there is a gold particle which is orbited by other nanoparticles made of silver, cadmium selenide or organic dyes. As if by magic, cleverly designed DNA strands connect the satellites with the central planet in a very precise manner. The technique behind this, called "DNA origami", is a specialty of physics professor Tim Liedl (LMU München) and his team. Together with the group of Professor Jochen Feldmann (also LMU München) they introduced and analyzed this novel assembly scheme. Both groups are part of the cluster of excellence Nanosystems Initiative Munich (NIM).



Large or small, near or far

A distinctive feature of the new method is the modular assembly system which allows the scientists to modify all aspects of the structure very easily and in a controlled manner: the size of the central nanoparticle, the types and sizes of the "satellites" and the distance between planet and satellite particle. It also enables the physicists to adapt and optimize their system for other purposes.

Photonic systems

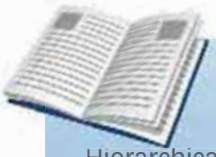
Metals, semiconductors or fluorescent organic molecules serve as satellites. Thus, like the antenna molecules in natural photosystems, such satellite elements might in the future be organized to collect light energy and transfer it to a catalytic reaction center where it is converted into another form of energy. For the time being, however, the model allows the scientists to investigate basic physical effects such as the so-called quenching process, which refers to the changing fluorescence intensity of a dye molecule as a function of the distance to the central gold nanoparticle.

"The modular assembly principle and the high yield we obtained in the production of the planet-satellite systems were the crucial factors for reliably investigating this well-known effect with the new methods," explains Robert Schreiber, lead author of the study.

A whole new cosmos

In addition, the scientists succeeded in joining individual planet-satellite units together into larger arrays, while maintaining the combinatorial freedom. This way, it might be possible to develop complex and functional three-dimensional nanosystems, which could be used as Raman spectroscopy platforms, as plasmonic energy funnels or as nanoporous materials for catalytic applications.

The print version of the paper has been published as cover article in the January issue of Nature Nanotechnology. ■



Publication

Hierarchical assembly of metal nanoparticles, quantum dots and organic dyes using DNA origami scaffolds

R. Schreiber, J. Do, E.-M. Roller, T. Zhang, V. J. Schüller, P. C. Nickels, J. Feldmann and T. Liedl

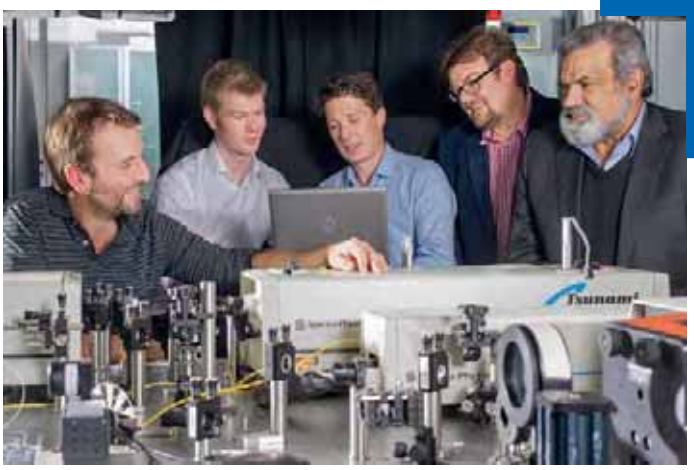
Nature Nanotechnology
Published online:
01 December 2013

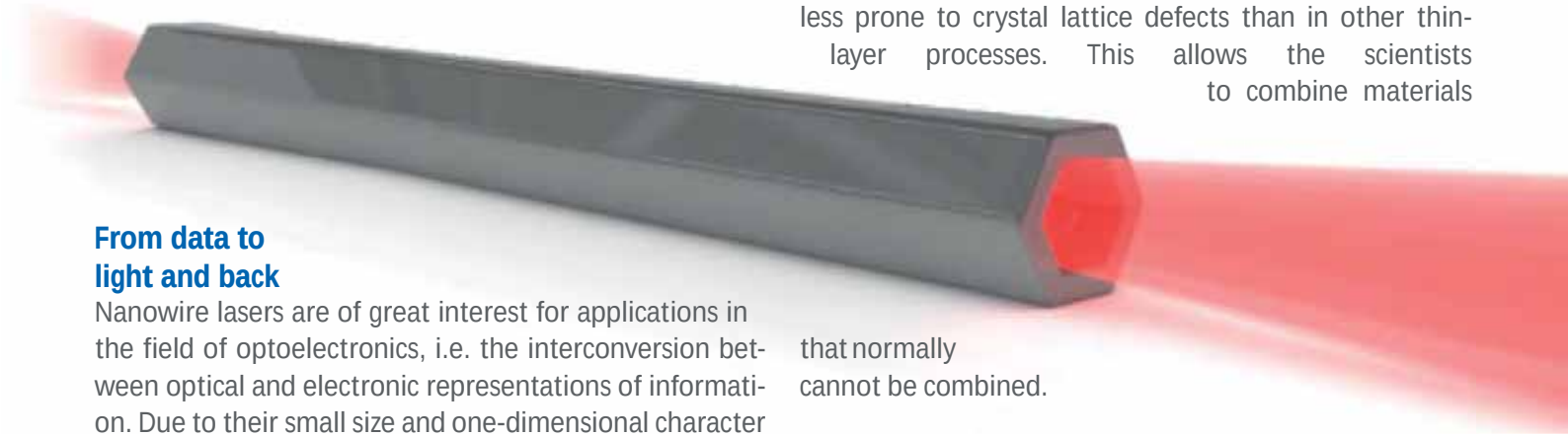
Laser light from nanowires

The world's smallest infrared laser

The world's smallest lasers are about ten times thinner than a spider's thread and consist of a perfect crystalline semiconductor nanowire that emits intense highly coherent light at a well-defined wavelength. What has so far only been possible for light in the UV and visible regions of the spectrum, NIM scientists are now able to extend into the near infrared.

Professors Jonathan Finley and Gerhard Abstreiter and their team have specialized in the growth and characterization of these complex nanowires, which are composed of a core-shell structure of different semiconductor materials. In a recent publication in Nature Communications, the physicists based at TUM's Walter Schottky Institute presented nanowire heterostructure lasers emitting in the near-infrared and operating up to room temperature. It is hoped that the nanoscale size and operation up to room temperature will open up new perspectives, both for fundamental research and future applications.





From data to light and back

Nanowire lasers are of great interest for applications in the field of optoelectronics, i.e. the interconversion between optical and electronic representations of information. Due to their small size and one-dimensional character they have the potential to be faster, more efficient and more temperature-stable than other systems. The fact that the nanowire lasers generate near infrared radiation is a great advantage, because at these wavelengths considerably less information is lost than in the visible range.

In the future, nanowire lasers could be used for on-chip optical data interconnections, as optical transistors to speed up computation, in fiber-optic networks and for laser arrays with steerable beams. Moreover, the lasers are small enough to, for example, penetrate biological cells. They could thus also prove useful in environmental and biological sensor technology.

Flawless growth

It is advantageous for production that nanowires can almost flawlessly be grown directly onto silicon chips. In addition, Finley explains, the nanowire geometry is much less prone to crystal lattice defects than in other thin-layer processes. This allows the scientists to combine materials that normally cannot be combined.

The next step is for the scientists to gain a better understanding of the physical phenomena surrounding nanowires. In the long run, their aim is to develop electrically injected nanowire lasers from the optical devices, to optimize their performance and to integrate them into silicon photonic systems.

"At present, there are only very few laboratories which have the capability to produce nanowires with the required precision," says co-author Prof. Gerhard Abstreiter, director of the TUM Institute for Advanced Study. "Our processes and designs are compatible with industrial production methods for computer and communication technology. Experience shows that today's groundbreaking experiments can result in tomorrow's commercial technologies, and often do." ■

Publication

Lasing from individual GaAs-AlGaAs core-shell nanowires up to room temperature

B. Mayer, D. Rudolph, J. Schnell, S. Morkötter, J. Winnerl, J. Treu, K. Müller, G. Bracher, G. Abstreiter, G. Koblmüller, and J. Finley

Nature Communications, 5 Dec. 2013. DOI: 10.1038/ncomms3931

Summer, sun and science

From India to Ecuador, from Estonia to Egypt: Young researchers from all over the world are guests at NIM

Every year in July, Silke Mayerl from the NIM office welcomes twelve master students from all over the world at the Munich Airport. The young scientists are participants of the Summer Research Program (SRP), which she coordinates. For eight weeks, the students are guests at a NIM work group. Supervised by a PhD student, they work on their own small research project and, in addition, get to know life in Germany.

Nayyera Mahmoud from Egypt and Anna Sanina from Estonia did research work on organic solar cells in the group of Prof. Thomas Bein (Chair of Physical Chemistry, LMU). Nayyera will soon take her final master exams in nanoscience and technology at Nile University, Cairo, and Anna has recently been awarded her bachelor's degree in chemistry in St. Petersburg. Both are visiting Western Europe for the first time. They were interviewed on their experiences with the Summer Research Program, living in Germany, their respective home countries and their plans for the future.

How did you learn about the NIM Summer Research Program?

Anna: I know the head of our university's international students' office quite well. A few months ago she asked me: "What are you planning to do in summer?" Then she told me about the NIM program.

Nayyera: My fellow students and I have already applied to participate last year. Three were accepted. This year, they accepted me and one other student. Maybe my fellow students left a good impression. And I hope we will too. (Smiling)

What is your research project during the Summer Research Program?

Nayyera: My mentor Fabian Hanusch and I have tested a new method of producing Perovskite solar cells. So far, spin coating has been used to apply the material to the cells' glass surface. We tried to do that by using wet chemical procedures, which are easier to control and adapt.

Anna: Together with Alesja Ivanova I did research work on dye-sensitized solar cells. We tried to create mesoporous [sponge-like] layers with a particularly ordered structure, this way enlarging the surface area for taking up dyes. For this purpose, we applied a solution of tin oxide and a structure-bearing nanocrystalline cellulose to a substrate and heated it so that the carbon burnt away, thus leaving the tin oxide structure.

What role does nanotechnology play in Egypt and Russia?

Nayyera: It was maybe four years ago that the word "nano" was heard in Egypt for the first time. So far, the Nile University is the first institution offering studies in nanoscience. And it's the first university to introduce a new model of studying: It is not publicly funded and every student passing the qualifying test is awarded a scholarship. At all public universities, master or doctoral students have to pay for the courses and even the used consumables and chemicals.

Anna: In Russia, "nano" is generally very popular. You can buy nano-creams, nano-detergents for cars etc. People think "Nano is new and great!" and so everybody wants to buy and try nano-products. What "organic" is in Germany, "nano" is in Russia!

What was your idea of Germany before you came visiting?

Nayyera: I knew that there is a lot of greenery and nature in Germany. And before I will return to Egypt's drought and revolution, I will once again climb the Olympiaberg to watch a sunset and say goodbye to the nature.

Anna: Before I came to Germany, I thought that all Germans are very, very punctual and not happy if you are late. And I always have problems being on time...

And what were your first impressions? What did surprise you?

Anna: My arrival day was the first sunny day in Munich. And I liked the city from the very first minute, especially the Olympiapark. What surprised me was, for example, that all shops are closed on Sundays. So I didn't have anything to eat on my first weekend here. And people drink so much beer! Even in the university cafeteria! What's more, all Germans buy organic food.

What's the difference between a carrot and an organic carrot? Is the first one chemical?

Nayyera: When I arrived here in Munich, it rained. And I thought "the city celebrates my arrival!" I love rain! I don't even have an umbrella and I enjoy walking in the rain.

What are your plans for the future?

Anna: Before I came here I applied for the master program "Advanced Materials Science" here in Munich. And now I got the admission, so I will stay in Munich and start the master program in October.

Nayyera: Once I am back in Cairo, I will first have to take my final master exams. After that, I would very much like to go abroad again to write my doctoral thesis. It's my dream to explore the development of artificial cells as a biophysicist, preferable in Munich or another city in Germany or Europe. ■

We wish you and your fellow Summer Research participants all the best for your graduation and your future!

Under www.nano-initiative-munich.de/summer you can watch a film on the Summer Research Program.

The dream of owning a company

NIM spin-off workshop: Ten entrepreneurs tell their story

Some of the companies have only existed for a few weeks, while others have been in the business for more than ten years, employing up to 50 people. Though the newcomers are still investing money, the established companies already generate millions in revenues. The range of spin-offs invited to the NIM workshop in Oettingenstraße was very wide. What they all have in common is that their story began in the work group of a NIM scientist. On July 24 and 25, 2013, the entrepreneurs took our NIM PhD students on an exciting journey through the ups and downs of establishing a company.

Of old hands and fresh faces

Three of the companies are old hands and have been on the market for more than ten years: nanotools, ibidi and Nanion Technologies. The companies baseclick, Chromotek, GNA Biosolutions, ethris and NanoTemper, which were established between 2008 and 2010, have also come well through the crucial early stages of their business. The fresh faces among the spin-offs are the companies Dynamic Biosensors and nextnano, which were only founded last year.

PhD Student Representative Ida Pavlichenko was also very pleased with the perfect mix of newly founded and established companies: "This way we get first-hand information about the successes and challenges of each phase of the business development of a spin-off." The companies' product range is also very broad and ranges from tailor-made biomolecules for medical purposes, devices for active-agent screening to DNA, protein and cellular analysis as well as software for the semiconductor industry and the worldwide finest tip for atomic force microscopes.

No money, no fun

The young entrepreneurs obtained their start-up capital from investors, start-up programs or the business-plan competition. "Participating in the competition was fun and helped us to specify our founding idea," tells Nanion founder Niels Fertig. He remembers the beginnings very well: "The hardest thing was to acquire the first three, four customers. But we made good experiences abroad, especially in Japan. While customers in Germany tend to be very critical of new technologies, the Japanese immediately fell for our products according to the motto: 'New? Small? Made in Germany? We buy it!'"

Munich – the perfect founding location

All speakers agreed on the fact that Munich is the ideal location for founding a company. Company founders can find plenty of competent support here: from the founding offices at the two universities, the LMU Spin-off Service and UnternehmerTUM, to experienced entrepreneurs and so-called Business Angels. What's more, many potential customers from the academic sector can be found here.

The representatives of the two founding offices and NanoTemper founder Philipp Baaske used an experimental game to put the participants in the shoes of a company founder for a while. The young scientists assembled in small groups to answer the following questions: "What is my product? Who are my customers? How can I market my product?"

A good idea and a bit of luck

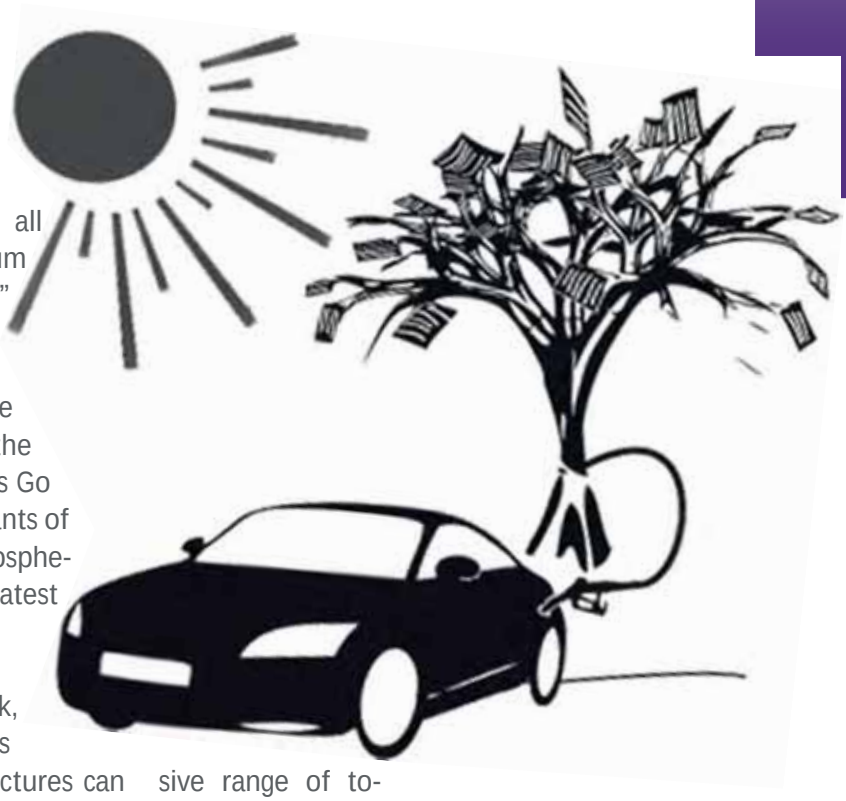
Apart from a good idea and a business plan, young entrepreneurs also need a bit of luck. Some older publications stipulated, for example, that the basic principle underlying Nanotemper's technology – microscale thermophoresis – is physically unfeasible. "Obviously we were a bit negligent here and didn't even know these publications," grins Philipp Baaske, one of the two founders of NanoTemper. The result of their research is a device for highly sensitive active-agent screening and a successful company, employing 30 staff members.

"Be audacious!"

"You don't necessarily need in-depth entrepreneurial knowledge. If you really want to establish your own business, then do it," was the advice Bernd Irmer, CEO of nanotools, gave to the doctoral students. "If it doesn't work out, you had a year to gather valuable experiences. And if it does – all the better!" ■

Energy in flux

International symposium on energy conversion



At the end of July 2013, scientists from all over the world gathered for the symposium "Nanosystems for Solar Energy Conversion," held at the LMU HighTechCampus in Munich Großhadern. The event was organized by the Munich-based cluster of excellence "Nanosystems Initiative Munich" (NIM) and the Bavarian research network "Solar Technologies Go Hybrid" (SolTech). The more than 140 participants of the three-day event enjoyed the inspiring atmosphere, where they could present and discuss their latest findings.

Apart from members of the SolTech network, numerous internationally renowned scientists presented their ideas on how novel nanostructures can help convert solar energy into electric power or solar fuel. Prof. Thuc-Quyen Nguyen of UC Santa Barbara, USA, and Prof. Udo Bach of the Monash University in Melbourne, Australia had a particularly long journey to the symposium.

They and all other participants were offered a comprehensive range of topics: nanosystems for organic photovoltaic systems, hybrid solar cells, nanocomposites, quantum-dot and dye-sensitized solar cells and nanostructures for the production of solar fuels. The experts enjoyed the opportunity to jointly make plans for the future of renewable energy sources and to find partners for collaborating on exciting projects. ■

Plans for the Nano Institute Munich gather pace

Two chairs of physics and NIM to move into the new building in Königinstraße in 2017

The schedule for the new NIM research building, to be located near Englischer Garten, is very tight. With just three years to go until the opening, architects and planning engineers at LMU, the building authority and engineering firms have already been working to full capacity for months. To coordinate their work, they meet every two weeks at Munich's public building authority (Staatliches Bauamt) right next to the Ludwigskirche in Munich. Representing the LMU is NIM Coordinator Prof. Jochen Feldmann.

The NIM office will move into new rooms at the first floor of the Nano Institute in Königinstraße. On the same floor, the auditorium will offer space for workshops and conferences. A spacious foyer with a view of the Englischer Garten is designated for poster sessions and conference breaks.

The Chair of Photonics and Optoelectronics, which is currently located in Munich's Amalienstraße and Schellingstraße, will be accommodated in the upper floors, along with a new chair which will explore materials for the conversion and storage of energy.

A cleanroom and specialist laboratories for electron microscopy and nano-optics will be housed in the basement. This provides optimum conditions for the nanoscale vibration-sensitive measurements. ■

Young and experienced nanoscientists in a lively dialogue

NIM workshop on "Young Ideas in Nanoscience" demonstrates NIM's full range of activities

On November 19 and 20, 2013, young researchers and renowned scientists stood on the podium of the conference center at the Hans Seidel Foundation in Munich, where NIM, the cluster of excellence in nanotechnology, organized its workshop on "Young Ideas in Nanoscience." About 150 participants followed the talks, which covered the entire range of NIM's research activities – from quantum nanophysics through nanosystems for energy conversion to nanomedicine.

Renowned researchers as advisers

The special guests at the workshop were members of NIM's Scientific Advisory Board. This top-class panel of internationally renowned scientists counsels NIM's Executive Committee on important questions. The Advisory Board, for example, examines the applications of NIM members for start-up funds provided by NIM for new research projects. They are also valuable advisers in other strategically important areas. During the "Young Ideas in Nanoscience" workshop, they provided insights into their own research work. Klaus von Klitzing, Nobel laureate in physics, reported on the latest findings regarding the quantum Hall effect, which he has discovered. Viola Vogel, biophysicist at ETH Zürich, presented the activity of macrophages in impressive video scenes which were recorded with a microscope. The audience could witness how these scavenger cells employ different, though usually successful, strategies to destroy bacteria. She also explained new findings on the interaction of this important activity of the immune system with the use of antibiotics.

New ideas for the future of nanoresearch

The young nanoresearchers from Munich also had their chance to speak. Nine junior scientists working in the NIM environment lectured on their research work. In addition, about 50 doctoral students contributed to the scientific discussion with individually designed posters. The Advisory Board awarded prizes to five posters presented by Silke Kirchner (LMU), Andreas Brenneis (TUM), Martin Langecker (TUM), Florian Schülein (University of Augsburg) and Oliver Viehmann (LMU). Apart from a certificate, they all also were given a gift card for books. ■

Honored

NIM professors Alexander Högele and Tim Liedl (LMU) have received a starting grant of about two million euros from the European Research Council (ERC).

The Deutsche Physikalische Gesellschaft (DPG) will honor Prof. Gerhard Abstreiter, director of the TUM Institute for Advanced Study, by awarding him the Stern-Gerlach Medal 2014, the most prestigious award of the DPG for experimental physics.

Prof. Ignacio Cirac, director at the MPI of Quantum Optics, was awarded the Wolf Prize in Physics. This prize is one of the most prestigious prizes in the field of natural sciences and worth 100,000 USD. Cirac was also awarded the Niels Bohr Institute Medal .

The 2013 Körber European Science Prize endowed with 750,000 euros was awarded to Prof. Immanuel Bloch. The physicist is professor at LMU Munich and director at the MPI of Quantum Optics. Moreover, Bloch was awarded the Senior International BEC Award 2013 of the Bose Einstein Conference Series.

Swiss investment company Nanonica awarded its annual prize for the "Breakthrough of the Year 2013" to Prof. Jochen Feldmann (LMU). The prize honors the development of the nano-ear, a novel type of highly sensitive acoustic detector.

Prof. Hendrik Dietz (TUM) was awarded the Research Prize 2013 of the Peter and Traudl Engelhorn Foundation dedicated to promoting research in biotechnology and genetic engineering. The prize was endowed with 10,000 euros.

Prof. Victor Klimov (Los Alamos National Laboratory, USA) has been honored with the Humboldt Research Award. In summer 2014, he will study the properties of colloidal semiconductor quantum dots with the team at the chair of Prof. Jochen Feldmann.

Hello, Goodbye

NIM welcomes as new PIs:

Prof. Müller-Buschbaum (holder of the Chair of Functional Materials, TUM)

Prof. Jan Lipfert (W2 professor, "Biophysics and Molecular Materials", chair of Prof. Gaub, LMU)

Prof. Alessio Gagliardi (NIM-financed W2 professorship, "Simulation of Nanosystems for Energy Conversion", chair of Prof. Lugli, TUM)

NIM welcomes as newly associated members:

PD Dr. Markus Lackinger (TUM School of Education and Deutsches Museum)

Dr. Hans Hübl (Walther Meißner Institute)

Accepted calls / farewells:

Prof. Patrick Cramer (Gene Center, LMU) is director at the Max Planck Institute for Biophysical Chemistry in Göttingen as of January 1, 2014.

Dr. Ulrich Rant (Walter Schottky Institute, TUM) has been chief executive at his company "Dynamic Biosensors" since July 2013.

Prof. Christina Scheu (Physical Chemistry, LMU) has accepted a call to the Heinrich Heine University Düsseldorf.

The double life of plastics

Peter Müller-Buschbaum – conductive polymers

About 20 million tons of plastic are produced in Germany every year and used primarily for packaging, construction and insulation materials. "Plastics, that is to say, artificially produced polymers, are much more versatile and have been underestimated for a long time," explains Peter Müller-Buschbaum, Professor for Functional Materials at the Physics Department at TUM. This was recognized by the general public in fall 2000, when the Nobel Prize in Chemistry was awarded for the discovery and development of electrically conductive polymers. This paved the way for plastics to become ever more ubiquitous in modern physics.

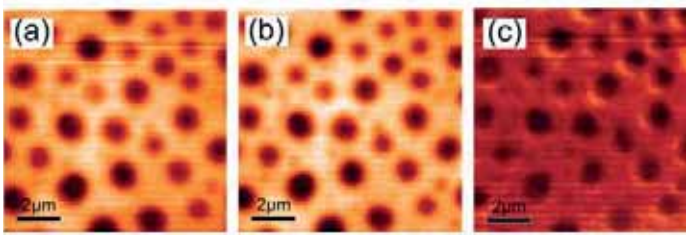
Enthusiastic about physics from an early age

"At that time I myself began to concentrate on conductive polymers. From my point of view, the potential use in organic solar cells was of particular interest," reports Müller-Buschbaum.

Step by step the scientist gained expertise in this very novel interdisciplinary field of research. And he brought together two disciplines which have accompanied him from his youth - physics and chemistry. Peter Müller-Buschbaum knew at an early age that he wanted to study physics and work in research. "Physics was the most interesting lesson of the entire week," he remembers. And the affinity to chemistry runs in his family for his father was professor for chemistry in Kiel and his brother is professor for chemistry at the University of Würzburg.

From up north to down south

After having studied physics in Kiel, where he also received his PhD, Peter Müller-Buschbaum worked at the Max Planck Institute for Polymer Research in Mainz. Before he started his work at the TUM Department of Physics in 1999, he spent time at the Institut Laue-Langevin (ILL) and the European Synchrotron Radiation Facility (ESRF) in Grenoble. The 47-year-old scientist has been heading the Chair of Functional Materials on behalf of Prof. Petry since 2006. Together with his team he investigates the structure and dynamics of polymers and hybrid materials, biopolymers and metal and glass surfaces to explore their functional properties.



Conductive polymer film: X-ray microscopic image (STXM) showing two energy levels (a, b) and respectively calculated amount of solvent (dark = large amount of solvent) (c).

An orientation guide for polymers

Among other things, the scientists are currently trying to structure the polymers in organic solar cells in a more targeted way. Normally, the molecules organize themselves during the formation of the conductive layer. The addition of a third component could influence this self-organization process in a precise manner by forming some kind of artificial scaffolding and result in improved structures. In order to characterize the newly created components, the scientists are primarily working with surface-sensitive scattering methods.

In their own laboratory, the scientists use X-ray and light scattering techniques to explore the materials' structure. In cooperation with international research centers they are also able to examine their samples using synchrotron and neutron scattering, both very powerful methods for determining the structure and dynamics of materials.

Peter Müller-Buschbaum is very positive about the future of organic solar cells: "Now that some large firms have given up, there is more room for the small companies, which are highly innovative and meanwhile also relatively successful. And the chances that the solar cells will be produced in Germany are very good because it will be possible to print them at low cost and printing technology has a long tradition here in Germany." ■

There is an herb for every disease

Angelika Vollmar – developing drugs from natural products

For seriously ill people the proverbial omnipotence of herbs must sound very naïve. But fortunately pharmacists are discovering more and more natural products which have the potential to even cure diseases like cancer.

Amongst them are Angelika Vollmar and her team at the Chair of Pharmaceutical Biology at LMU. Their aim is to find promising substances and use them as pharmaceutical leads for the development of new drugs. Professor Vollmar is highly thrilled by nature's huge repertoire. And she has a conclusive explanation for the partially high biological efficacy of natural products: "Natural products have a biological past. In the course of their formation (biosynthesis), they have to interact with biological structures such as enzymes or membranes so they are used to them from the very beginning. It is therefore very likely that natural products possess properties which are able to influence such structures."

Back to nature

On her way from a doctoral student to the holder of a university chair, Angelika Vollmar has encountered many facets of pharmacy and the life sciences in general. After writing her doctoral thesis about a classic phytochemical topic – isolation and structure determination of natural products from plants – she immersed herself as post-doc at the University of California in Los Angeles (UCLA) in the world of molecular and cellular biology. Back in Munich, Angelika Vollmar habilitated at LMU's Veterinary Faculty in the field of pharmacology, where she later took up her first professorship.

In 1998, the Faculty of Pharmacy at LMU was looking for a scientist with a strong background in molecular biology to head the Chair of Pharmaceutical Biology – and appointed Angelika Vollmar. "At that time, a paradigm shift took place and the focus of pharmaceutical biology was on the molecular pharmacological aspects of biogenic drugs," she remembers.

Fight cancer by all available means

One of the substances she and her work group are currently investigating is archazolid, a complex organic molecule isolated of myxobacteria. It inhibits a proton pump which is overactive in tumor cells. The scientists are also searching for so-called chemosensitizers, substances which make resistant types of cancer again sensitive to the effects of chemotherapy. Another approach to fighting cancerous cells is to prevent the formation of new blood vessels in the tumor tissue. This ensures that new cells are not supplied anymore and die. For this purpose, the Munich-based pharmacists also rely on natural products.

Crucial for all projects are highly sensitive screening methods allowing the scientists to observe how cells grow, how they divide, how they move and whether metabolic products change. One of the strong points of the chair of Angelika Vollmar is a method called high-content screening, which allows the researchers to investigate several of these parameters simultaneously in only one living cell.

Reaching the destination in nanoparticles

Together with NIM colleagues, Angelika Vollmar is also working on a method for directing substances to damaged tissue in a targeted manner. To this end, they are wrapped in nanoparticles which are solely able to penetrate tumor cells. If the overall development is successful, much lower dosages will be necessary and the side effects for cancer patients could be considerably reduced. ■

Outlook

February 19, 2014

Winter Meeting of the NIM Graduate Program

Farewell and welcome: The members of the Student Board 2013 will present their work of the past year. Subsequently, the new PhD Student Representatives will be elected.

LMU München, Professor-Huber-Platz 2, Room W401 (6 p.m.)

July 4 – August 29, 2014

Summer Research Program

Twelve master students from all over the world will be guests at NIM work groups for eight weeks. They will gain an insight into current research projects opening a potential possibility to return to NIM as a PhD student. Applications under: www.nano-initiative-munich.de/summer/application

LMU München / Technische Universität München / University of Augsburg

November 2014

NIM NanoDay

Another two years have passed: After a very successful NanoDay in summer 2012, the next event of the series will be held in fall 2014, offering a stage program, lectures, numerous information stands and the possibility to participate in hands-on experiments.

Deutsches Museum, Munich

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 keystone 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- and biotechnology, as well as in the efficient use of solar energy.

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