
In Summer 2018, NIM held the conference “The Future of Nanoscience” in Tutzing (see page 6

Nanosystems NEWS

Thank you for twelve years of NIM!

The funding of the Nanosystems Initiative Munich by the German Research Foundation (DFG) will terminate in October 2019. But with the new Munich Clusters of Excellence *e*-conversion, MCQST and ORIGINS something exciting started in January 2019.

In those new clusters, NIM scientists and other experts in the field will focus on specific research areas of NIM. The cluster *e*-conversion brings together researchers who plan to analyze in detail the mechanisms of energy conversion and develop strategies for optimization. MCQST provides the framework to gain a global understanding of quantum mechanical phenomena for new quantum technologies. The aim of ORIGINS is to explain the emergence of the universe, including the biophysical perspective.

In this issue, again we give insights into current research projects. We report about innovative approaches in nanomedicine and how solar energy could be used more effectively applying new semiconductor nanocrystals.

In the second part of the series “children & career”, we introduce a young groupleader who gets NIM support in form of a lab assistant. I will describe the situation in my own working group, which includes several young parents.

One highlight of the past months surely was the NIM conference “The Future of Nanoscience” at the Evangelische Akademie Tutzing. Numerous current and former NIM researchers enjoyed the opportunity to engage in vivid scientific discussions.

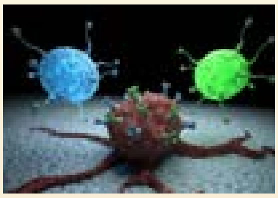
The last edition of our Summer Research Program (SRP) was a great success! Two of the international students returned to Munich to continue their SRP project during a PhD thesis project.

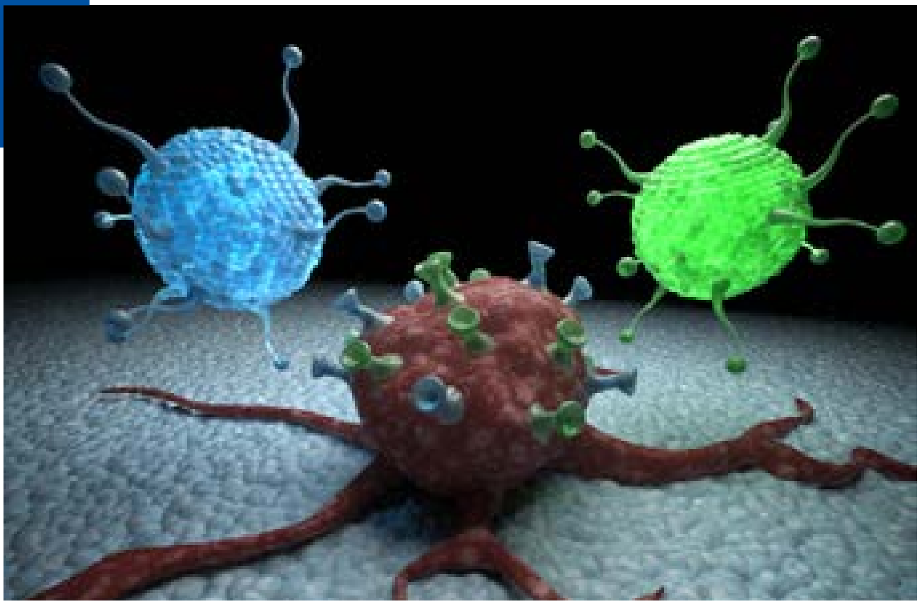
We are especially happy to introduce two scientists who accepted the call to Munich. They will support the Munich area’s research in the fields of experimental physics of functional spin systems and nanosystems in energy conversion.

As always: Enjoy reading!

Thomas Bein, NIM Coordinator

Content





Nanocarriers binding mannose surface receptors on cancer cells.

Targeting cancer cells with sugars

Functional nanocarriers for efficient therapy

Cancer is the second leading cause of death in the world, also because the efficiency of chemotherapeutics is inadequate due to poor delivery to the tumor.

Therefore, Professor Olivia Merkel and her team develop targeted nanocarrier systems specifically binding cancer cells to increase uptake rates of the therapeutic formulations. This helps to reduce both the amount of drug accumulation in non-target tissues and the drug-related side-effects in patients.

Their new approach involves targeting of specific sugar receptors expressed on several cancer cells. The recent publication in *Advanced Healthcare Materials* provides a nice overview of the field and presents first results with this new targeting strategy.

Mannose for cancer-cell specific drug delivery

Every human cell has a cell type-specific repertoire of surface receptors to ensure the uptake of needed supplies. Due to their high demand for nutrients for rapid proliferation, cancer cells have a very high affinity for carbohydrate molecules in comparison to non-cancerous cells. Several tumor cells express, for example, mannose receptors and mannose-6-phosphate receptors for efficient endocytosis of these sugars, which are used for intracellular energy synthesis.

Hence, those sugars have high potential as cancer cell-specific ligands for the targeted delivery of therapeutic nanocarriers.

The "lock and key principle" describes best the binding of such functionalized nanocarriers to the tumor cells: the mannose or mannose-6-phosphate receptors on the cell surface present the lock and the sugar ligand on the nanocarrier the matching key. After binding, the whole complex gets endocytosed. That way, therapeutics encapsulated in the nanocarrier specifically get delivered into the cancer cells.

"In our experiments, we could show a significantly increased uptake of mannosylated carriers over nonmodified particles," Merkel explains.

Immunotherapy

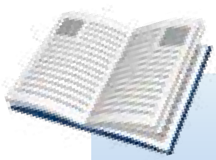
Antigen-presenting cells (APCs) are the immune cells inducing an immune response by activating the respective lymphocytes ("white blood cells").

The team is investigating approaches to express the mannose receptor on the surface of APCs for a direct attack of tumor cells by such activated lymphocytes. In addition, professional APCs, so called memory cells, develop for a long-lasting anti-cancer response, creating a "tumor vaccination".

Advantages of nanocarriers

The encapsulation into nanocarriers results in improved solubility, stability and shielding of several drugs. Hence, it significantly increases the bioavailability of the therapeutic compound due to extended blood circulation times compared to free drugs.

The active targeting via surface ligands increases the specificity towards cancer cells and the local delivery efficiency of active drug. Hence, functional therapeutic nanocarriers can provide several advantages over conventional drug preparations.



Publication

Mannose and mannose-6-phosphate receptor-targeted drug delivery systems and their application in cancer therapy

Vedove ED, Costabile E, Merkel OM.
Adv Health Mat 2018,
7(14):1701398
doi:10.1002/adhm.201701398.

Optical “overtones” for solar cells

More efficiency in energy conversion from sun light into electrical energy

Visualization of a "solar guitar".

Infrared light, which is normally lost in solar cell devices, could now be utilized and converted into electrical energy.

Analogous to a phenomenon known for musical instruments when overtones of two different fundamental notes get into resonance, Professor Jochen Feldmann and his team have found a new effect regarding the optical excitation of charge carriers in new solar semiconductors, perovskite nanocrystals, and introduced it in *Nature Communications*.

Efficient utilization of solar light

Semiconductors are nowadays the most prominent materials to convert solar light into usable electric energy, though that conversion is efficient in a limited light spectrum only.

The spectral position of this window of light is strongly related to a property of the semiconductor involved: its band-gap. This means that, if the semiconductor is designed to absorb yellow light, longer-wavelength light (such as red and infrared light), will pass through the material without producing currents. Shorter-wavelength light (green, blue and UV light), that is more energetic than yellow light, will loose its additional energy by converting into heat. Such losses may now be reduced.

Perovskite nanocrystals

Globally, photovoltaic plants are very popular for energy production. The International Energy Agency reported that half a million solar panels were installed every day last year.

“In analyzing multiple photon absorption in perovskite nanocrystals, surprisingly we observed that for specific excitation wavelengths with an energy lower than the semiconductor absorption window the efficiency of this process became drastically enhanced,” highlights PhD student Aurora Manzi.

These resonances occur when multiples of two distinct fundamental frequencies become equal, namely that of the frequency of the primary light oscillation and that of the frequency of the band gap or more precisely of the exciton at the band-gap.

When intense red light impinges on nano-structured perovskite nanocrystals, a process similar to the generation of overtones in a guitar string takes place. The fundamental light wavelength generates higher order optical harmonics, which are overtones whose frequencies are integer multiples of the primary light oscillation. When such a “light overtone” becomes resonant with an overtone of the excitonic band-gap, the energy exchange is enhanced leading to an increased generation of charge carriers or more precisely of multiple excitons at the band-gap.

Light and exciton “overtones” in resonance

“The resonances observed are analogous to the physical phenomena taking place in two different strings of a guitar,” explains Manzi. “If we associate the first string to the light excitation and the second string to the semiconductor excitonic band-gap, we know from acoustics that they will get into resonance if a certain harmonic of the first string will match another harmonic of the second string.”

“The observation of this novel resonance phenomenon for optical excitations in excitonic semiconductors could pave the way for solar cells to more efficiently convert long-wavelength light into usable electric power,” adds Feldmann. “This is an exciting new finding with a possible impact for future solar devices.” ■

Publication

Resonantly enhanced multiple exciton generation through below-band-gap multi-photon absorption in perovskite nanocrystals

Manzi A, Tong Y, Feucht J, Yao E-P, Polavarapu L, Urban AS, Feldmann J

Nat Commun 9, 2018; article #1518
doi: 10.1038/s41467-017-01158-3




Children & Career - No problem at NIM! - Part 2

In our two-part series we talk with a NIM-GP PhD student and group leaders what might change after having a child - and how NIM can support you.

Thomas Bein supports PhD students and PostDocs founding a familiy.

We can provide optimal conditions

Thomas Bein - Group leader

NIM coordinator Professor Thomas Bein is very happy about some of his group members having already a small family.

Notably, the attractive NIM family support program helps researchers to continue on their projects when having kids. NIM provides a laboratory assistance, scholarships for child care, and travel grants as well as financial support for child care during conference trips.

In addition, as PhD student it is possible to extend the doctorate by the time of the break. Thus, the parental leave can be spent with the child at home. Financial resources will be shifted to accommodate the needs of the young family. On the employers' side, the needed flexibility for example comes from the possibility to redistribute third party funding.

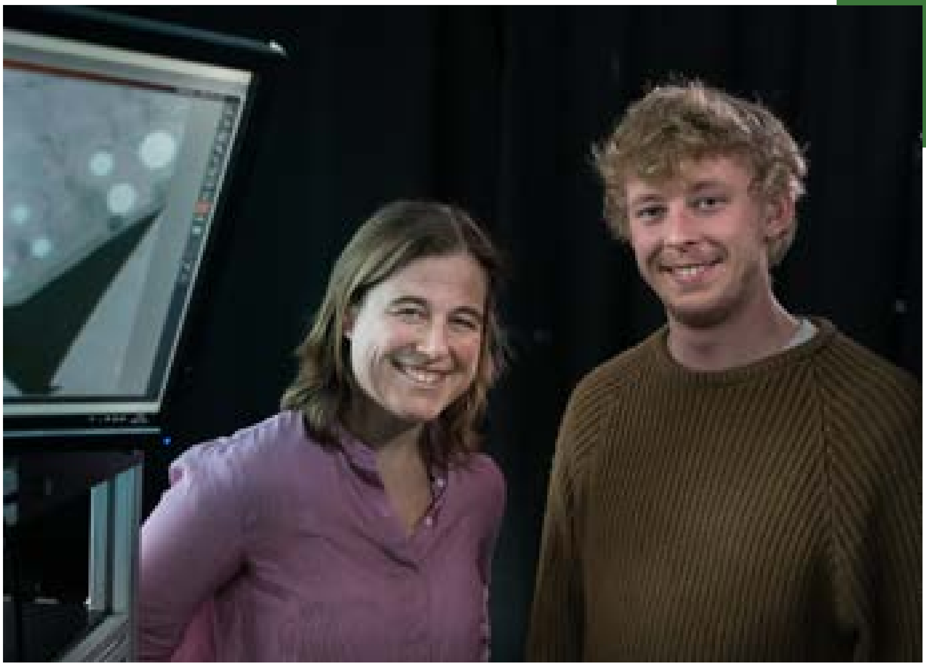
The group leader appreciates the new working time models and the general change in thinking away from the classical part-time towards 75 % working time jobs, "This model is ideally compatible with the care time in daycare centers as well as with the practical laboratory work. The overall time of the PhD training may extend somewhat, but with continuous progress of the project." *(see the article on Maria Lohse in Part 1)*

The new working time models in combination with the NIM family support program funding are practical and should be utilized. "These factors can really make a difference for young families," the chemist comments on the actual situation for founding a family in Germany in general and especially in Munich.

There is also a growing interest among young fathers in leading positions to take parental leave, a recent example is Professor Tim Liedl *(see the article on Tim Liedl in Part 1)*. Members of Bein's group can expect full support if they ask for the possibility to spend time with their kids.

My lab assistant is a valuable support

Ursula Wurstbauer - Group leader and mother



Ursula Wurstbauer and her lab assistant Max - in the meantime, he started to work on his Master's project in her group.

Entering the office of Dr Ursula Wurstbauer, the portable child seat besides her desk attracts your attention. "My husband and myself take turns dropping and picking up our kids at the childcare institution, so the car seat also passes between us," explains the physicist and adds with a smile, "A little logistics is necessary to juggle kids and career."

Fortunately, in her team there are no problems to combine both, the PhD students work very independently and Professor Alexander Holleitner supports her.

Therefore, she could return to her full time job after the maternal leave. Her husband took parental leave and, if necessary, he and the kids visited her in the office. When the first conferences and the NIM Winter School came up shortly after birth, the kids and their father just came along.

"The lab assistant financed by the NIM family program additionally helps me to organize my work," says the scientist, happy about this opportunity of support. In case of arising questions or problems in the group, she is always reachable, and via Skype she is almost physically there.

"Everyone must find his or her own way," she stresses. For Ursula Wurstbauer it was the right decision to return to the job early after starting her family. The ability of both parents to work in their home office adds flexibility and helps them to balance the different aspects of work and life.

Info-Box

Support possibilities of NIM and the Universities in Munich and Augsburg at a glance:

NIM: NIM Family and Women Support Program

- Funding of a laboratory assistance
- Scholarship for child care
- Travel grants to attend conferences
- Regular "Elternstammtisch" meetings

Contact: silke.mayerl@lmu.de, +49 (0) 89 – 2180 3383
www.nano-initiative-munich.de/en/gender

LMU: Having children in academia

- Family service for LMU employees
- Help with child care
- Further information

www.frauenbeauftragte.uni-muenchen.de/kindwiss

TUM: TUM.Family – Familienservice

- TUM family service (Career and family, child care, holiday child care)

www.chancengleichheit.tum.de/en/family/

University of Augsburg: Family at Uni Augsburg

- Family service with collection of links

www.uni-augsburg.de/de/einrichtungen/frauenbeauftragte/Familie

Public panel discussion with experts from biophysics, chemistry, (astro) physics, science history and two funding members of NIM who acted as moderators.

The Future of Nanoscience

NIM Conference "The Future of Nanoscience", September 4-6, 2018, Evangelische Akademie Tutzing

The NIM Conference "The Future of Nanoscience" provided a platform for vivid discussions about the development and news in this exciting field during the past twelve years of NIM as well as the potential of nanotechnologies for the future.
The wonderful scenery at the Evangelische Akademie Tutzing directly at the shores of the Lake Starnberg added to the inspiring and stimulating atmosphere. The scientists were invited to have discussions while walking in the garden, sitting on comfortable deckchairs by the lake or after taking a refreshing swim. Culinary highlight was the conference dinner on a boat tour.

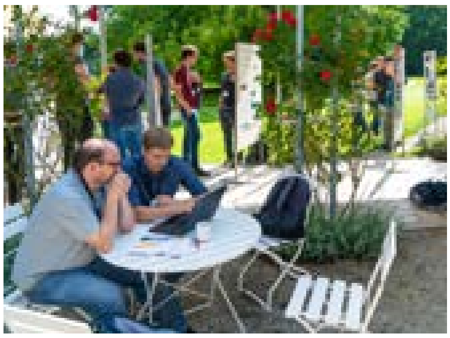
Old hands and greenhorns

Research topics of the participating scientists in the interdisciplinary field of nanoscience span from quantum nanophysics over nanosystems for energy conversion to biomolecular and biomedical nanotechnologies.
Among the 17 invited international speakers were many well-known faces who have often played an active role in shaping the Munich area's nano research in the past. Leading protagonists of all NIM research areas gave insights into their recent research as well as their plans for future achievements.
Former NIM members who are now professors at well-known universities worldwide clearly demonstrated with their talks how successful NIM has been in promoting young scientists.
During the poster session, 55 PhD students and PostDocs of NIM took the chance to present their recent results in the beautiful rose garden just outside of the conference hall. The best poster of each research area of NIM was awarded a Poster Prize.

"Quo vadis Nanoscience?"

A public panel discussion titled "Quo vadis Nanoscience" shed light on the future of nanotechnology from different perspectives. The main focus was on the most prominent scientific visions of NIM: quantum computing, nano foundry, artificial photosynthesis, artificial cells and smart nanocarriers for drug delivery.
The panel combined the expertise of the science historian Christian Kehrt, the astrophysicist, philosopher and science journalist Harald Lesch, the chemist Robert Schlögl, the biophysicist Petra Schwille, as well as of Gerhard Abstreiter and Jörg P. Kotthaus moderating the discussion, both being physicists and founding coordinators of NIM.
"Ois is nano!" ("Everything is nano!") This quote from biophysicist Hermann Gaub was the starting point of the discussion, and extending it a little, Abstreiter added: "Almost everything is nano – or not?"

All six scientists introduced their ideas on the future development of nanosciences and nanotechnologies. Those are fundamental to almost all processes of life and have been in the focus of research and technology even before the term "nano" came up. The topics of the following discussion ranged from quantum computing and artificial intelligence over the climate change and the CO_2 issue, sustainable energy sources, and the appearance of micro plastics in nature to nano therapies and diagnostics in medicine.
One of the NIM PhD students in the audience started a discussion about the best strategy to become "nano-



Vivid discussions during the poster session.

About 150 scientists met for inspiring discussions on the future of nanoscience.

scientist." Interestingly, all panel members gave a clear recommendation to study physics or chemistry in order to build a strong foundation, and to specialize in nanoscience only afterwards.

NIM - a cradle of fantastic ideas

Over the years, several former NIM scientists transferred their scientific work into their own spin-off companies.

In the Technology Transfer Session five of those successful NIM alumni gave exciting insights in the development of their ideas towards the founding of the company, and in the growth from small firms to big players in the global market.

Some, like GNA Biosolutions, ibidi, Nanion and NanoTemper are still independent companies. Others got part of even bigger enterprises, like attocube systems, now being a part of Wittenstein SE. Nevertheless, all of them still have their headquarters in Munich and are in close contact to the NIM community, as members of the NIM Spin-off Club.

A great success

Since its start in 2006, NIM has actively brought together research groups at LMU, TUM and Augsburg University, covering the fields of physics, biophysics, physical chemistry, biochemistry, biology, electrical engineering, and medicine. The overall aim has been to create a well-known hub for nanosciences in Germany.

The coordinators of the five research areas of NIM presented the success of those efforts in their talks in the special session "Highlights of NIM".

This session as well as the others at the conference clearly demonstrated the great achievements of NIM, showing that the cluster of excellence has been able to establish and strengthen a vivid research community and environment in the Munich area within the past twelve years.

It very much looks like this community and the international network around NIM will further grow and prosper in the future. ■

Summer Research Program 2018

Successful last round of the NIM Summer University

In 2018, NIM could offer the eleventh and final edition of the Summer Research Program (SRP).

As in the previous editions, numerous excellent students from all over the world applied for the exciting two-month-projects in one of the research labs in Munich, Garching or Augsburg. In the end, eleven of them were invited to Munich.

Exciting science...

In their projects, the international participants worked on different semiconductor materials, water splitting with surface acoustic waves, magnetic properties of layered structures, 3D-printing of cellular structures, treatment of cancer cells, and methods to overcome the blood-brain-barrier.

Different lab tours, seminars and scientific discussions allowed the students to greatly expand their perspective.

... and beautiful impressions

Besides the research projects, the attendees could get an impression of Germany and its culture.

Opportunities included sight-seeing tours in Munich, trips to Augsburg, Nuremberg and Germany's capital Berlin, a daytrip to the fairytale castle of Neuschwanstein and the picturesque Wieskirche, and a visit of the Deutsches Museum with its Open Research Laboratory. Of course the students got a detailed guided tour through the nano-exhibition.

Sharmistha Paul from India was delighted by the excursions arranged as part of the program, "Those tours gave my first visit to Europe cultural spotlights, too."

Further highlights were the Munich International Summer University's (MISU) summer party and a good-bye lunch with the supervisors and Silke Mayerl-Kink, who again organized the complete program.

Next step: PhD in Munich

We are particularly happy that two students of this years' program have returned to Munich for their PhD. "Even before I applied for the Summer Research Program, I wanted to pursuit my PhD study in Munich," explains Lucas Siow, "The SRP provided a platform to make direct connections with supervisors and professors and to make myself visible in the pool of applicants."

Interesting research

"During my stay in the laboratory of Professor Jochen Feldmann I had the opportunity to gain a lot of knowledge regarding perovskite nanocrystals," reports Sharmistha, "Taking part in this program allowed me to organize my PhD in Munich. I will continue with my SRP project - the perfect basis for my future research career."

Lucas is very happy about his position as PhD student in the lab of Professor Angelika Vollmar: "There is this thrilling topic and the modern facilities on the one hand, and the great atmosphere in my group on the other. Everybody is very nice and willing to help each other."

Ideal conditions

"In addition, the tuition fee in Munich is waived and PhD students get payment each month," smiles Lucas, "A great chance for highly motivated students coming from low-income families." This enables him to take care of his living expenses without financial aid from his family back in Malaysia.

Both are very excited to start a new chapter of their lives in Munich! ■

Hello, Goodbye

NIM welcomes as new PIs:

Prof. Dr. Christian Back
(Experimental Physics of Functional Spin Systems, Physics Department, TUM)
see page 10

Prof. Dr. Emiliano Cortés
(Photon-assisted Energy Conversion, Nanoplasmonics Research Group, Faculty of Physics, LMU)

Appointments:

Prof. Dr. Alexander Högele
(Solid State Physics, Nanophotonics Group, Faculty of Physics, LMU)

Prof. Dr. Alexander Urban
(Photonics and Optoelectronics, Nanospectroscopy Group, Faculty of Physics, LMU)

Farewells:

The NIM scientist Markus-Christian Amann, who retired in April 2018, unexpectedly deceased in November 2018. We would like to convey our sincere condolences to the family. (see page 12 for an obituary)

Ursula Wurstbauer has accepted a call to the University of Münster by January 1, 2019. We wish her all the best!

Honored!

Dieter Braun (LMU) examines the molecular evolution in the new Collaborative Research Centre TRR 235 “Emergence of life: Exploring mechanisms with cross-disciplinary experiments”, funded by the German Research Foundation (DFG).

Thomas Carell (LMU) receives funding of 1.1 million euros over the next five years from the Volkswagenstiftung to elucidate the origin of life. He aims to identify the processes during the chemical evolution.

Peter Hänggi (University of Augsburg) was honored with the Smoluchowski Warburg Prize 2019 of the German Physical Society (DPG). Additionally, he was appointed Honorary Professor of the Huaqiao University in China.

Alexander Högele (LMU) receives a Proof of Concept Grant of the European Research Council (ERC) for the development of a “cavity-enhanced optical microscope”.

Tim Liedl (LMU) receives an ERC Consolidator Grant for his project “DNA-based functional lattices”.

With ”Phactory“, the second time in a row a project team under the guidance of Friedrich Simmel (TUM) won the second prize at the Giant Jamboree of the International Genetically Engineered Machine (iGEM) Foundation in 2018.

In January 2019, the new Clusters of Excellence of the German Research Foundation (DFG) *e*-conversion, the Munich Center for Quantum Science and Technology (MCQST) and ORIGINS started in Munich. LMU und TUM are joint applicants of all clusters and are supported by the Deutsches Museum, the Leibniz Supercomputing Center, several Max Planck Institutes, and the Walther Meißner Institute.
The cluster *e*-conversion will explore new strategies for energy conversion technologies. The objective of the MCQST is to further the scientific understanding of quantum mechanical phenomena for new quantum technologies. ORIGINS aims to explain the creation of the universe. Thomas Bein (LMU), Ulrich Heiz (TUM) and Karsten Reuter (TUM) are spokespersons of *e*-conversion, Immanuel Bloch (LMU, MPQ), Ignacio Cirac (MPQ) und Rudolf Gross (TUM, WMI) of the MCQST, and Andreas Burkert (LMU) und Stephan Paul (TUM) of ORIGINS.

No more commuting - Christian Back finally a "fulltime" Munich resident

"Spintronics" – For a better future

Christian Back – Specialist for time- and spatially-resolved microscopy

With the appointment as Professor for Experimental Physics of Functional Spin Systems at the TUM in March 2018, for Christian Back the 17 years of commuting between his family in Munich and his chair in Regensburg have finally ended.
"The scientific environment here in Munich is ideal and was a key aspect when I applied for the professorship," the physicist explains with a smile.

Academia and industry

Christian Back was born in Munich and more or less accidentally started his studies of physics at the TUM. The coincidence turned out as a stroke of luck for the course of his life.
His studies at the RWTH Aachen ignited his passion for solid state physics. A key person was his later PhD supervisor, whom he followed to the ETH Zurich.
After his PhD, Back moved to California (USA) for a PostDoc collaboration project together with the Research & Development Department of IBM at the Stanford Linear Accelerator Center. He stayed for another year at the IBM Storage Division where he built a time-resolved Kerr microscope.
From personal funds, he bought another microscope and set up a time-resolved microscope back at the ETH. This time the focus was not on industrial applications but on basic research.
That microscope was the first piece of equipment he brought along to equip his Chair in Regensburg.
Christian Back's relocation to the TUM was well organized. All PhD students in Regensburg had defended by the end of 2018, and in parallel, he started his new group in Garching with known colleagues and new faces.

Professor with heart and soul

After his brief "digression" into the corporate world, the physicist was sure to aim at an academic career. "One might work harder in academia but it is very satisfying to work on what you are really interested in," explains Back.
His special interest lies in magnetic systems, their fabrication, and in the structure and interactions at interfaces. Optimized storage devices are a future application of such "spintronic" technologies, which are based on the magnetic moment of electrons.
Christian Back utilizes time- and spatially-resolved microscopy technologies to examine nanostructures. He focusses especially on magnetization dynamics on picosecond timescales, and on the analysis of spin waves in hybrid layer structures.
A determining factor to choose this field of research was the close working relationship with Danilo Pescia. In the beginning, he was his only diploma and PhD student. The one-to-one counseling resulted in quick successes. "I will never forget the feeling when we were the first scientists to directly detect the phase transition process in a magnetic 2D system," recalls the physicist, "But even today I am still very excited every time we are the first ones to perform breakthrough experiments."
The basis of all decisions during his career was an intrinsic motivation for a specific topic. Such conviction, enthusiasm and dedication is the spirit he would like to pass on to the new generation of scientists.

There is still a lot more!

Christian Back already was an "old hand" when he started to build up and equip the laboratories of his new Chair at the TUM. "I had a lot more experience and confidence than when I moved to Regensburg as a complete 'greenhorn'," he admits.
Still there is a new challenge for him, as the main focus of his research will get a new orientation due to the new technical environment. Back has an exciting time ahead of him: in one project, for example, he plans to develop a totally new microscopy technique with his colleagues in Garching.

Plasmonics – marriage of photonics and nanotechnology

Stefan Maier – One of the founders of nanoplasmonics

The new Nano Institute of the LMU is almost ready to move into and Stefan Maier has also arrived in Munich. The physicist is holding the newly established Chair of Hybrid Nanosystems and was warmly welcomed as principal investigator in the Clusters of Excellence NIM and *e*-conversion.

On the cutting edge

After school, Stefan Maier started to study physics at the TU Munich.
To gain new experiences, after his intermediate diploma he planned to spend one year in the United States for a research project. This one year became six: Maier finished his studies of physics at the California Institute of Technology (Caltech) and stayed for his PhD and PostDoc, too, as he was among the first scientists working in the new field of "nanoplasmonics".
Eventually, a call from the University of Bath in Great Britain provided the opportunity to return to Europe. There he stayed for three years as lecturer and reader. At the Imperial College in London he was then appointed Chair of Nanophotonics in 2008 and was honored with the endowed Lee-Lucas Chair of Experimental Physics in 2016.

Overcoming limits

Conventional photonic materials are restricted by their diffraction limit. Below that length scale, light waves cannot be focused, as neighbouring light waves would interfer. This represents a big issue when aiming at minimizing the dimensions of photonic and optical devices.
In contrast, nanoplasmonics is based on surface plasmons, hybrid waves on the surface of metal nanostructures, partly electromagnetic waves, partly surface currents oscillating among the metal's free electrons. Plasmons are ultra-fast (sub-pico seconds) and can be focused far below the diffraction limit, even down to a few cubic nanometers.
In the last few years, the importance of nanoplasmonics grew rapidly in many fields dealing with the manipulation of light. Plasmonics provides a basis for the development of highly efficient biosensors and materials for photovoltaic applications. Hence, Maier's research focus shifted towards renewable energy.
"Our new nanostructured materials allow us to collect light more effectively in nanostructured light fields," he explains the goals of his work. "We are even able to focus light very precisely and convert it into chemical energy."

Concentrated expertise

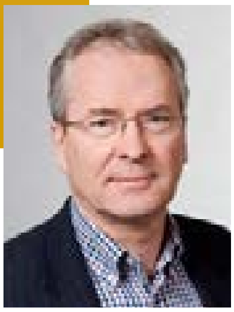
The most important factor in the development of nanoplasmonic research from pure optics towards energy conversion approaches is the interdisciplinary nature of the involved scientists. Maier's own group consists of materials scientists, engineers, physicists, chemists and mathematicians.
"Researchers always should be enthusiastic for their projects. But equally important is the desire to work in interdisciplinary teams," he stresses. "This is the only way to look at the subject of interest from all perspectives to identify new approaches and solutions."

A good team

"In my research group, we examine the physical aspects of nanoplasmonics. Emiliano Cortés adds the very exciting view of a chemist." Stefan Maier is happy that both of them move into the Nano Institute as professors, as they were already colleagues at the Imperial College in London after meeting in Buenos Aires during Maier's guest professorship there.

Optimal environment

"We plan to build up all the equipment needed for the nanofabrication and analysis of energy conversion processes in nanostructures," explains the physicist. "This, and the amazing scientific environment will allow us to work very interdisciplinary right from the beginning."



Obituary on Markus-Christian Amann

Markus-Christian Amann, emeritus professor for Semiconductor Technology at the TUM and Director of the Walter Schottky Institute, passed away unexpectedly on November 23, 2018 at the age of 67 years.

Markus-Christian Amann was a founding member of the Nanosystems Initiative Munich. Together with his team, he made important contributions to the success and worldwide recognition of our Cluster of Excellence.

After completing his studies at the Department of Electrical and Computer Engineering at TUM, Markus-Christian Amann joined the research laboratories of Siemens AG in Munich in 1981 where he remained until 1994, being promoted to lead the department for Semiconductor Research & Optoelectronics. Subsequently, he accepted a call to a Chair for Technical Electronics at the University of Kassel where he taught and researched until 1997. In 1997 he received a call to the TUM, where he held the Chair for Semiconductor Technology at the Walter Schottky Institute until his retirement in April 2018.

Amann was a very well-known and highly-respected figure in the international scientific community. He performed groundbreaking work in the field of III-V semiconductor optoelectronic devices, including vertical cavity surface emitting lasers - key components for high bandwidth optical data communication systems and optical metrology and sensing systems. His work is documented in more than 500 scientific publications, patents and conference proceedings that also formed the intellectual basis for the successful launch of several start-up companies.

Markus-Christian Amann received many prizes and honors for his scientific work. Specific examples include the Karl-Heinz-Beckurts prize in 2007 from the Foundation bearing the same name and a nomination to be Fellow of the IEEE Society in 2009.

Beyond his research, he made major contributions to scientific administration, being referee for many leading international scientific journals, as a committee member for the Germany Science Foundation, and as Vice Dean and Dean of the Department of Electrical and Computer Engineering.

Martin Stutzmann

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 existing and potential applications in areas such as information technology and biotechnology, as well as in diverse energy conversion strategies.

Picture Credits

Page 3 - "Solar guitar": PhOG (LMU)
Page 4 - Portrait Thomas Bein: Jan Greune (LMU)
Page 11 - Portrait Stefan Maier: Imperial College London

Imprint

Publisher

Nanosystems Initiative Munich (NIM)
Coordinator: Prof. Dr. Thomas Bein
Schellingstraße 4
D - 80799 München
Phone: +49 89 2180 5091
www.nano-initiative-munich.de

Editor

Isabella Almstätter (V.i.S.d.P.)
isabella.almstaetter@physik.uni-muenchen.de

Graphic Designer

Christoph Hohmann
christoph.hohmann@lmu.de