

Universität  
Basel

Swiss Nanoscience Institute



## SNI update December 2015

### Words from the Editor



Dear colleagues,

Another year is drawing to a close. 2015 was a successful year for the SNI. We once again welcomed new doctoral students to the SNI PhD School and recently approved five new Argovia projects for 2016. In September, we held

a stimulating Annual Meeting, which allowed us to establish and expand contacts with SNI members from the entire network and impressed us with the diverse and excellent research conducted at the SNI. Furthermore, 2015 saw SNI members publish numerous fascinating articles about this research in renowned journals. Many online portals and newspapers have published the corresponding releases composed by the communications team.

Back in summer 2015, we began to prepare for the Swiss NanoConvention 2016 (SNC 2016). The SNC 2016 will take place in Basel from June 30 to July 1, 2016 and is being organized by the SNI. The academic program has now been drawn up and the list of sponsors and exhibitors is growing every week, giving us plenty to look forward to.

Early this year, the SNI management team received a boost with the ap-

pointment of physicist Dr. Kerstin Beyer-Hans. This SNI update reports on some of her activities, through which the SNI aims to interest young people in the sciences. Professor Thomas Jung, who has been researching in the Department of Physics at the University of Basel and at the Paul Scherrer Institute for more than 15 years, is pursuing the same goal. Most SNI employees will probably know Thomas well already, but you might just learn something new about him in our portrait.

Acquaintances old and new will also play a role for the SNI in the coming year. The SNI will be ten years old in 2016, while the first SNI doctoral students will be completing their third year and starting to think about concluding their doctorates. As I have already mentioned, the first part of the year will be spent planning for the SNC 2016. As well as enjoying this important event, the SNI will also

be confronted with its first budget cut. Due to its difficult financial situation, the Canton of Aargau has reduced its support by 10% for the next three years. Despite this, I am certain that we will succeed in maintaining the high quality of our research.

I am already looking forward to continuing inspiring collaborations with colleagues old and new from the entire SNI network and would like to thank you all from the bottom of my heart for the positive and constructive collaboration of the past year and your many contributions, large and small, in 2015. I wish you all a relaxing, peaceful festive season with your friends and families and a healthy and successful 2016!

With best regards



Director Swiss Nanoscience  
Institute, University of Basel

## Cover story

### Focusing on children and young people

For many years, the SNI communications team has been striving to interest children and young people in the sciences. Science festivals, school visits to the laboratories, and open days offer the ideal conditions for providing an insight into the world of research and using experiments and presentations to show young people that science can be fun. Since joining the SNI in April 2015 as an outreach manager, Dr. Kerstin Beyer-Hans has immersed herself in this area, developed and implemented new concepts, and arranged many successful events.

#### Going strong after 15 years

Once again, the SNI was present at this year's Science Days at the end of October 2015. The three-day event, which marked the 15<sup>th</sup> birthday of the Science Days, drew around 20,000 visitors to the Europa-Park in Rust. Germany's oldest and largest science festival focused on experiments and shows related to the topic of light.

The SNI booth, which attracted a large crowd, looked at how light can be used to generate electricity. Around 500 pupils of all ages visited the stand over the three days to make small fans powered by solar cells. Kerstin Beyer-Hans and Sandra Hüni from the SNI were supported by six dedicated students in the building of these fans. The team also used a small exhibition to explain and show many more interested visitors what nanoscience actually is and where nanotechnology is used today.



During the Science Days, the SNI team supported 500 pupils to craft fans powered by solar cells.

### Mobile exhibition about nano in everyday life

Immediately on joining the SNI, Kerstin Beyer-Hans put together the small traveling exhibition about products made using nanotechnology or nanomaterials. From a tennis racquet with carbon nanotubes through to cleaning agents and cosmetics containing nanoparticles, the products demonstrate how nanotechnology has already become part of everyday life.



The small exhibition about nano products is often shown during SNI events.

In the new, pocket-sized brochure “What is nano?” Christel Möller from the SNI also describes where nano can be found – in nature and many of the products we regularly use. The booklet features a cartoon gecko who explains in simple language how the nano world can be investigated and provides examples of the wide-ranging research currently underway at the SNI.

### Lively Future Day

The 16 children who attended the Future Day jointly run by the SNI and the Department of Physics on November 12 certainly gained an initial impression of how varied scientific research can be. Professor

Christian Schönenberger kicked things off with a show about light. The “Triple L – Lamps, Light, and Lasers” challenge offered by Kerstin Beyer-Hans (with support from the Department of Physics and nano students) took an even more practical approach. As at the previous Uni-Nacht, the laser labyrinth proved a big hit. The tricky puzzles relating to light were also a welcome challenge for the children. The young researchers used various microscopes to investigate the micro and nano worlds under the guidance of Dr. Monika Schönenberger and Dr. Anja Matthiä and joined Michael Steinacher’s team from the electronics workshop to show a steady hand in soldering a game.

### Which topics are particularly interesting?



Which topics are interesting for teachers and how can the SNI support their work – questions that were answered in October.

While events such as the Future Day mainly focus on showing that research can be fun, school visits to the SNI often aim to impart specific knowledge. It is not always clear what teachers expect from these visits and which topics are relevant for secondary-level pupils. To gain an even better insight into teachers’ wishes, Kerstin Beyer-Hans and her colleagues Anja Matthiä from the Department of Physics and Dr. Ina Emme-Papastavrou from the Department of Chemistry organized a teacher event on October 28, 2015. After briefly introducing the SNI and the Departments of Chemistry and Physics, Professor Dominik Zumbühl, Dr. Peter Rickhaus, Professor Catherine Housecroft, Professor Oliver Wenger, and Dr. Marija Plodinec gave short presentations on their respective fields of research. The 15 teachers in attendance welcomed the opportunity to learn more about current research and expressed the desire for further exchange. A similar event will therefore take place early next year.

School visits are now firmly established at the SNI. Kerstin compiles a program with 2–3 talks and laboratory tours tailored to the age and subject focus of the children in question. The pupils often conclude their visit with an interactive, hands-on session before a reception that is also attended by

students and doctoral students ready to answer questions and take part in discussions.

### Strong support from students

These various events would not be possible without major support from nano students and doctoral students. In addition to the activities mentioned, some nanostudies graduates also return to their former schools to present and raise awareness of the nano curriculum. To reward these dedicated students and doctoral students, Kerstin Beyer-Hans has launched an Outreach Award. Points are allocated to participants in the various events based on a defined system. The person who has gained the most points over the previous year receive an award at the SNI's next Annual Event.

We would like to thank all those who have supported the SNI's outreach events and continue to pass on their fascination for the nanosciences to children and young people.



Bachelor, Master and PhD students share their fascination for the natural sciences and support SNI activities.

## Award for the best Master's thesis of 2015

As in previous years, the SNI will be presenting an award for the best Master's thesis in the nanosciences in 2015. We ask all project managers to support students in submitting their Master's theses to the competition.

To enter, please send your Master's thesis in PDF format and a report from your supervisor to [jacqueline.isenburg@unibas.ch](mailto:jacqueline.isenburg@unibas.ch) by January 31, 2016.

## We introduce...

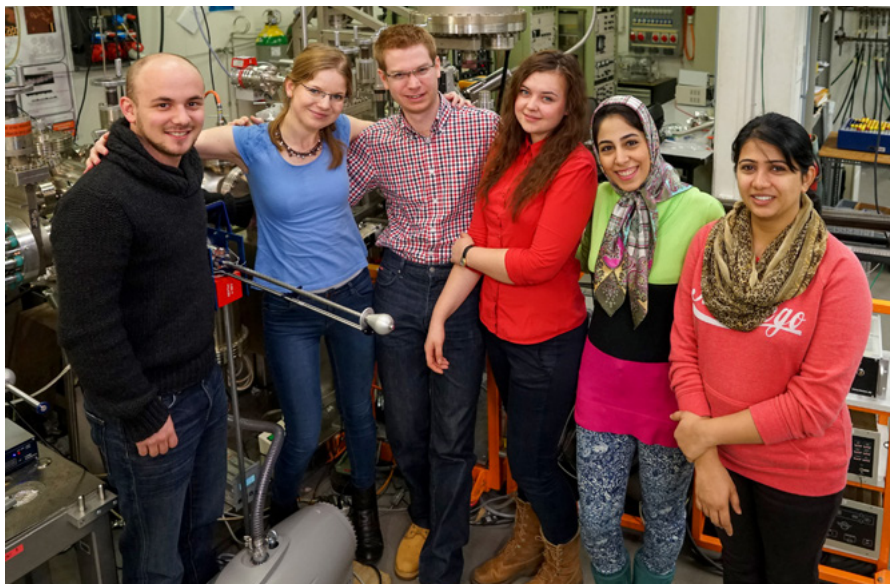
Professor Thomas Jung is a man of many talents. He is an honorary professor at the University of Basel and runs research groups at the Paul Scherrer Institute and the University of Basel. His research activities range from applied research commissioned by various companies, to working with the PSI's major research facilities, through to basic science. He is fascinated by the concept of making chemistry visible and presenting it in images. However, the 53-year-old physicist never overlooks the people behind all this work. It is his wish to convey the joy of the sciences, embody equal opportunities, and combine family and career to the best possible extent.

### Fascinated by the transition between physics and chemistry

Thomas Jung is a scientist through and through. He is fascinated by topics that merge the disciplines of chemistry and physics. He is thrilled by the chance to watch molecules arrange themselves, join together, and condense. For a long time, however, he could not decide whether physics was the right choice for him. After his schooldays, Thomas Jung wavered between studying medicine, mechanical engineering, or physics. What he really wanted to do was research, a factor which fa-



Professor Thomas Jung also sees the people behind their achievements. In his teams, he tries to implement equal opportunities.



vored physics. He was initially a little too intimidated and so he enrolled at the Federal Institute of Technology (ETH) Zurich to study mechanical engineering. He switched subjects in the first semester and has remained loyal to physics ever since. Still, his studies did not completely eliminate his initial doubts. “It was a real stretch for me,” recalls Thomas Jung. He believes that, above all, he lacked something of the discipline required to study at the ETH. He was pleased that chemistry was also a mandatory subject and that he had the opportunity to study elective subjects such as biophysics, economics, literature, and history. Yet he didn’t always have the motivation for the things he was actually supposed to learn. This promptly changed when he began his Master’s thesis on photoemission in 1987. “That was the first time that I really enjoyed myself because I could create something new,” notes Thomas Jung.

### **New microscopes lead to Basel**

It was during this time that Thomas Jung first became aware of the newly developed scanning tunnel-

ing microscopes, something that interested him immediately. Professor Hans-Christian Siegmann, his supervisor at the ETH, recommended that he apply to Professor Güntherodt in Basel. Hans-Joachim Güntherodt found a doctoral position for Thomas Jung and presented him with the challenging task of developing a low-temperature atomic force microscope (AFM) that could be used to measure the Meissner effect<sup>1</sup>. Thomas Jung completed his dissertation in 1992. He had constructed a new AFM and laid the groundwork to a large extent. Still, it would be another three years before Professor Hans-Josef Hug was able to use the AFM to successfully measure the Meissner effect as part of his doctoral dissertation.

### **Measuring molecules for the first time**

With his doctoral dissertation, Thomas Jung took his first steps into the world of scanning probe microscopy. At what was then the Paul Scherrer Institute in Zurich (now the CSEM), he introduced colleagues to atomic force microscopy and wrote numerous publications. Doors were opened to various postdoc positions. With three different scholarships under his belt, he opted for the IBM T. J. Watson Research Laboratory in Yorktown Heights NY (USA). After two years in the USA, he moved to the IBM research laboratory in Rüschlikon. “That was the best time,” remembers Thomas Jung. “I measured molecules for the first time and made reactions in test tubes visible.” This allowed Thomas Jung to use his interest in biophysics and combine it with the new microscopy and experimentation technology. “My colleagues liked to joke about my little ‘pet’, the porphyrin,” says Jung with a smile. And he has never lost his passion for mapping chemical processes and examining them in great detail. At the start of the year, he and his team published a paper in “Nature Communications” in which the researchers used images to show how xenon atoms condense in quantum wells.

<sup>1</sup> The Meissner effect refers to the characteristic of superconductors to completely expel an externally applied magnetic field.

### Research in Basel and at the PSI

In 1997, Thomas Jung left IBM and began conducting research as a group leader at the Paul Scherrer Institute. He has also been managing the nanolab at the University of Basel since 1998. In 2009, he became an honorary professor at the University of Basel. He has research groups in both Villigen and Basel, each with around six colleagues. The PSI team mainly focuses on projects relating to the magnetism of molecules and uses the PSI's major research facilities in their work. The group in Basel examines the self-assembly of molecules and the condensation of atoms. The two groups often receive commissions from industrial companies. Surface analysis and coatings are the most common topics here. Thomas Jung is also regularly involved in Argovia projects and in the SNI PhD School as a Principle Investigator (PI) or Co-PI. When recruiting for new projects, Thomas Jung puts the person before their grades. "For me, brains count for more than grades," he comments. He therefore also strives to ensure that his colleagues enjoy their work and that the laboratory has a good atmosphere.

### Sparking enthusiasm for physics

Thomas Jung's dedication to his laboratories unites many of his wide-ranging interests. He also feels a real need to teach effectively about physics and interest young people in the "difficult" sciences. During his term as President of the Swiss Physical Society (1999–2002), he co-initiated the Swiss Young Physics Tournament (SYPT), offering Swiss school pupils the opportunity to take part in the International Young Physics Tournament (IYPT). He was also involved when Switzerland hosted the IYPT for the first time in 2005, the "Year of Physics".

### Commitment to family

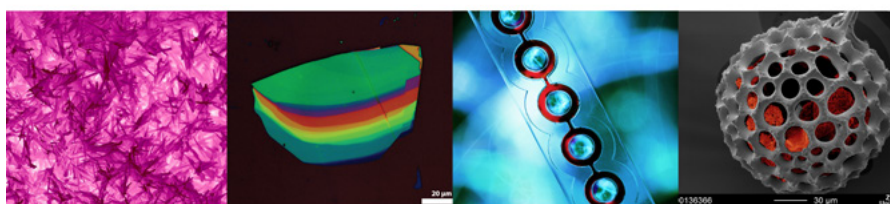
Thomas Jung's private life has also taught him how to deal with young people; he has four sons aged between 8 and 20. And because equal opportunities are not just restricted to the workplace, he often cooks for the whole family. He also looks after the two younger boys from late afternoon two days a week. Thomas Jung keeps fit mainly through cycling; it is important to him to occasionally spend an afternoon "popping up" a 3,000-meter mountain. He cycles to work from Thalwil at least once a week. And his family vacations are a little different to those of most other families. For example, he might go camping in Alaska with his parents-in-law, wife, and children, or travel with his family across Ladakh – perfectly combining his love of the mountains, his passion for new discoveries, and his precious, yet often scarce time with his family.

## Nano Image Award 2015

SNI members have submitted a colorful array of beautiful images to this year's competition depicting all forms of nano- and microstructures. The SNI management team had a difficult task selecting the most attractive entries. This year, the award was given to four photos, because two received an equal number of points.

The winners are:

Mohamed El Idrissi (PhD student, FHNW), Gulibusitan Abulizi (doctoral student in the Department of Physics), Elise Aeby (Master's student in the nanosciences), and Dr. Roché Walliser (postdoc in the Department of Chemistry at the University of Basel)



**Mohamed El Idrissi:**

Colored SEM micrograph of nanorods formed with pyrene derivative

**Gulibusitan Abulizi:**

A real-color optical microscope image of a hexagonal boron nitride flake on a silicon oxide substrate

**Elise Aeby:**

Droplets on a microfluidic device

**Roché Walliser**

Combination experiment with diatom and celite: hematite (inside the diatom) is used as photoanode material for solar cells

Thanks to everyone who entered and congratulations to the winners!

## Events

### The route to your dream job

The first “Meet & Connect – Career Nano – Now?!” workshop took place at midday on Wednesday, November 18, 2015. The workshop was arranged by nanostudies coordinator Dr. Katrein Spieler, Dr. Birgit Müller, head of the Career Service Center (CSC) at the University of Basel, and Dr. Ralf Dümpelmann, Manager Nanotechnology at i-net innovation networks to provide nanoscience students and doctoral students with a practical guide to successfully transitioning from higher education to a career.

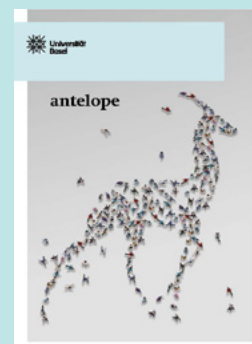


The Workshop “Meet & Connect – Career Nano – Now?!” provides practical support for the transition from university to a career.

Although it was lunchtime and there was wonderful wintery weather, around 30 students, doctoral students, and one postdoc filled the small lecture hall in the department of Physical Chemistry. The two speakers, Birgit Müller and Ralf Dümpelmann, provided practical tips on how to optimize interdisciplinary skills in a targeted manner during your studies and thus improve your prospects of securing a job. The discussion also included reports of personal experiences from the chemical industry, highly practical examples of job applications, the possibility of founding a start-up, and a checklist that will pave the way to the dream job from the very first day of your studies.

Following extremely positive feedback from the participants, more events of this type will be held in the future for nanoscience students and doctoral students.

## antelope – Apply now for 2016



antelope is a career program of the University of Basel that supports highly qualified female scientists to systematically plan and promote their careers and prepares them for future leadership and management assignments. All interested PhD students and postdocs can apply until 3<sup>rd</sup> January 2016.

For more information please visit:  
[www.unibas.ch/antelope](http://www.unibas.ch/antelope).

## Science Slam in Basel

The 5<sup>th</sup> Science Slam Basel will place on December 16, 2015 in the Theater Basel (Kleine Bühne).

The Science Slam Basel is an initiative of the nanoscience students at the University of Basel. Academics from a wide range of disciplines present their research to the audience in an entertaining and understandable format.

For more information, visit  
<https://scienceslam.unibas.ch>

## Alumni Nano launched

An alumni association was launched in 2015 for Basel's nanostudies graduates. The platform aims to network former nano students around the world and enable them to revive old contacts. The first step was taken on October 24 with a kick-off event attended by around 25 former students.



Tobias Appenzeller, President of Alumni Nano, opened the festive event that was sponsored by the SNI and Alumni Basel. After short presentations by Dr. Roland Bühlmann, President of Alumni Basel, and Dr. Katrein Spieler, Coordinator of the Nanostudy Program, all participants began to refresh memories. The delighted expressions of all those present reaffirmed the outstanding solidarity among nano students – even once their studies are complete.

For more information, visit: [www.alumnibas.ch/mitgliedschaft/alumni-nano/](http://www.alumnibas.ch/mitgliedschaft/alumni-nano/)

## Media releases and uni news from SNI members

### University of Basel, 07 December 2015. European Funding for Three Investigators from the University of Basel

Three researchers from the University of Basel have successfully applied for a starting grant of the European Research Council (ERC): Biomedical specialist Dr. Nicola Aceto, mathematician Professor Gianluca Crippa and physicist Professor Philipp Treutlein will receive funding of up to 1.7 million Euros over the next five years. In addition, the Swiss National Science Foundation will compensate neurophysiologist Professor Tania Rinaldi Barkat for the ERC Starting Grant which she was not able to transfer to the University of Basel, due to Switzerland's temporary third country status.

## What is nano?

Would you like to help school pupils understand the nanosciences and provide simple explanations of nanoscience and how research into the nano world is conducted, and details of the topics that are studied at the SNI?



In the last month, the SNI has produced a pocket-sized brochure entitled "What is nano?" in which a little gecko explores the world of the nanometer and answers many questions.

You can download the brochure at: [www.nanoscience.ch/nccr/media/brochure](http://www.nanoscience.ch/nccr/media/brochure)

If you would like to have printed copies, please let us know ([c.moeller@unibas.ch](mailto:c.moeller@unibas.ch)).

### University of Basel, 17 November 2015. Electrons Always Find a (Quantum) Way

Scientists from the Swiss Nanoscience Institute and the Department of Physics at the University of Basel have demonstrated for the first time how electrons are transported from a superconductor through a quantum dot into a metal with normal



conductivity. This transport process through a quantum dot had already been calculated theoretically in the nineties, but scientists at the University of Basel have now succeeded in proving the theory with measurements. They report on their findings in the scientific journal “Physical Review Letters”.

**University of Basel, 10 November 2015. Microwave Field Imaging Using Diamond and Vapor Cells**

Microwave field imaging is becoming increasingly important, as microwaves play an essential role in modern communications technology and can also be used in medical diagnostics. Researchers from the Swiss Nanoscience Institute and the Department of Physics at the University of Basel have now independently developed two new methods for imaging microwave fields. Both methods exploit the change in spin states induced by an applied microwave field, as reported by the researchers in the “New Journal of Physics”. *lern der Universität Basel gelungen,*

**University of Basel, 14 October 2015. 3D Structure of a Protein Complex Important for Immune Response**

Our innate immune system rapidly eliminates invading pathogens. When a pathogen is detected in the body, the “inflammasome” protein complex initiates the defense response of the immune cells. By combining two high-resolution methods, researchers from the University of Basel’s Biozentrum have now determined the atomic structure of an important part of the inflammasome. The study, recently published in the scientific journal “PNAS”, provides new insights into the mode of action of the protein complex.

All media releases can be found at: [www.nanoscience.ch/nccr/media/recent\\_press\\_releases](http://www.nanoscience.ch/nccr/media/recent_press_releases)

## Please provide feedback

Please send information and feedback to [c.moeller@unibas.ch](mailto:c.moeller@unibas.ch).