



SNI update December 2011



Words from the Editor

Dear colleagues

The weeks before the end of the year are normally quite hectic: the paper should be finalized before the holidays, forms for a grant have to be submitted, the strategy and planning for next year should be discussed with various colleagues, then there are some Christmas parties and maybe some private mailings that need to be done.

This year it was different for me as I was forced to wind down during the last weeks of the year. With a broken foot and crutches it is not ideal to run from appointment to appointment. As many other things in life such a com-

pulsory break also has its advantages. Suddenly, there is time to read, think and plan, and there is time to let the previous year pass by. And I have to say that in respect to the progress the SNI has made, this review looks very positive.

Especially, in the last weeks we have done a lot for the visibility and recognition of the SNI as an excellent research institution for nanoscale sciences. As the main sponsor, and in collaboration with the University of Basel and the University of Applied Sciences, we organized the first "Welltenreise". More than 400 guests from the Basel region came together at the Schauspielhaus and accompanied us during the trip from the cosmos to the nanoworld. During the same time, our communication experts Meret Hornstein and Tibor Gyalog represented the SNI and thus Swiss nanoresearch at the first Science Festival in Abu Dhabi. They both were invited by the crown prince of Abu Dhabi Sheik Mohammed Bin Zayed Al Nahyan to present science in a hands-on and exciting way to the public. We had a great media echo covering these activities

and therefore were able to positively advertise the engagement of the canton Aargau, the SNI research activities and the Nano Curriculum at the University of Basel.

This December issue of *SNI update* provides some background information on these and other success stories. Additionally, we introduce the Physicist Sylvia Jeney who has been involved in SNI research projects for many years. Recently, her research results on Brownian motion were published in *Nature*. For *SNI update* we interviewed Sylvia to learn more about her research activities and ideas.

Finally, I wish you a relaxing break for the end of the year and some nice hours with friends and family. The new year will hopefully start healthy and also for me in the speed I am used to.

With best regards

Director of the Swiss Nanoscience Institute, University of Basel

Cover Story

Invitation from the sheik

For Meret Hornstein und Tibor Gyalog science shows are by now routine. Several times a year, the two communication experts from the Swiss Nanoscience Institute at the University of Basel pack their boxes and head off to explain nanoscale science to kids and interested adults. For each event and for each specific audience they adjust their presentations and topics. However, they both have gained such experience that they are able to present their Nanorama ad-hoc.

In November 2011, this was all a bit different. Sheik Zayed, crown prince of Abu Dhabi, had invited some selected experts for science commu-



nication to his country to present the fascination of science to the open public and especially to the Arabic youth. So Tibor Gyalog, Meret Hornstein and Florian Dettwiler, all from the SNI, this year invested a lot of time to revamp the exhibition, to present current research at the SNI and mainly to present a number of hands-on experiments for children. Posters were newly designed, a course with experiments was built up, kids passports were



printed for awards and banners were drawn in Arabic. However, there was much more than the preparations in Basel. When the three arrived in Abu Dhabi they instructed Arabic students who translated all materials into Arabic and supported the SNI team during the exhibition.

Audience with the ambassador

After all these preparations, on 19th November the show started. At the first Abu Dhabi Science Festival Meret, Florian and Tibor presented their exhibition from Basel. The more than 1000 visitors were excited and could not get enough. They asked hundreds of questions and were keen to get everything explained in detail. Over a period of ten hours the team from Basel explained, demonstrated and instructed. Children as well as adults would have investigated even more if the day had been longer. Enthusiastic were also the Swiss journalist Michael Breu from the Basler Zeitung, who joined the SNI group and reported in two articles about the event, and the Swiss ambassador Wolfgang Amadeus Brühlhart. He invited the team to an audience. “The whole event was very exciting for us”, commented Meret Hornstein, who finalized her Master studies in Nanoscience two years ago at the University of Basel. “The United Arab Emirates are keen to become states of knowledge and invest a lot in scientific exchange.”

Long-standing experience

For Tibor Gyalog, who himself has a PhD in Physics and is now fully committed to science communication, this invitation to Abu Dhabi is a nice step into the right direction. His goal is to show the fascination of nanosciences to the wide public. Already in 2001 he started to get involved while creating within the project Nano-World together with colleagues an online learning program. Tibor participated in the first Science Festival in the Europa Park in 2001. In 2006 he designed the exhibition Nanorama and took part in the development of the Mobile exhibition “Size Matters”, that toured around big shopping centers in the eastern part of Switzerland. Together with Meret he set up an exhibition

for the Daejeon Science Festival 2007 in South Korea that was presented by Meret and Florian. Tibor and Meret have taken an active role during the Swiss Tecdays for many years. Within this initiative that was founded by the Swiss Academy for Technical Sciences (SATW), high school students are invited about five times a year to focus on one specific topic from natural sciences. During these Tecdays, the module Nanomedicine offered by the SNI is very popular, especially among young women. In 2010, it was one of the most visited and best rated modules of the TecDays.

Target group is the key

“We have successfully organized various exhibitions and events”, Tibor describes the SNI activities. “It is essential for us to adapt our activities to the respective target groups and to visit places where people go anyway – department stores, promenades, adventure parks, and schools.” For the future he and Meret are dreaming about a “Science Center Basel”. Together with colleagues from the University they are brainstorming over various scenarios. But until this dream comes true they plan and improve the current mobile Nano exhibition. The sheik of Abu Dhabi has not yet invited them again, however, science festivals in Harvard and Peking have already inquired.



Nanoscience in the Snow



The 7th edition of the “Nanoscience in the Snow” meeting organized in the framework of the Swiss NCCR “Nanoscale Science” will take place at the Art Furrer Resort in Riederalp from Wednesday, 25 January through to Friday, 27 January 2012.

More at:

www.nanoscience.ch/nis2012

Nano-Tera projects

The call for proposals for Nano-Tera projects is now open. Until 31st January 2012, proposals covering topics out of the three main research areas “wearable and implantable systems, ambient and environment systems, and energy systems” can be submitted.

More information at:

<http://nano-tera.ch/proposals.html>

or at audrey.fischer@unibas.ch.

We introduce ...

Sylvia Jeney

In this December issue of *SNI update* we introduce the young and successful scientist Dr. Sylvia Jeney. She is employed at the Swiss Federal Institute of Technology in Lausanne (EPFL) and is leading a research project on nanospectroscopic methods in living systems at the Swiss Nanoscience Institute. Her research attracted specific interest this year as she published her work in *Nature* and *Nature Physics*.

Sylvia Jeney was born in October 1971 in Colmar, France, and also grew up there in the border triangle. Already during her school years she was fascinated by physics and maths. During the interview, she explained that in France there are apparently less gender specific differences in the choice of subjects than for example in Switzerland and Germany. Among her female colleagues in school, there were several who decided to study maths or physics. Sylvia herself hovered between physics and medicine. In the end, she decided to go for physics because this structured and concrete discipline has always attracted her and resembles her way of thinking. For Sylvia Jeney, it was clear from the beginning that she would visit a university somewhere abroad. Kings College in London was one opportunity but also the University of Bayreuth in Germany, which she finally chose. Germany was attractive for her as the studies left enough freedom and scope for individual development. Sylvia stayed in Bayreuth for three years. Then she moved to the European Molecular Biology Laboratory (EMBL) in Heidelberg (Germany)



Sylvia working with her microscope that she uses to picture tiny particles in three dimensions.

to be closer to molecular biology and medicine. Here she finished her diploma in Physics and subsequently received an EMBL grant for her PhD. At the same time she studied medicine for two years. According to her, she especially enjoyed the diversity of medicine during this time. From anatomy to cytology, from neurology to physiology – her curiosity let her discover all disciplines enthusiastically.

At the interface between physics and medicine

During our interview it became clear that Sylvia has found her position at the interface between physics and medicine. Already during college, she imagined to combine both interests and to develop devices for medicinal applications. This is exactly what she does today! Together with her team, she develops a new type of microscope that can be used to picture tiny particles in three dimensions. Her latest results were published in *Nature* and attracted a lot of interest. In these studies, Sylvia together with her small team proved in experiments that tiny particles suspended in water move abruptly and randomly in their medium because of collisions with water molecules. Albert Einstein had, in his PhD thesis, already theoretically described this phenomenon known as Brownian motion. Sylvia was now able to hold one single suspended particle by using an optical trap. The particle, which functions as a probing tip, is connected to a miniscule spring. Interactions with the surrounding water molecules let the particle move and extend the spring. This can be measured and analyzed. Using such optical tweezers, Sylvia Jeney recently discovered that Einstein's formula describing Brownian motion needs slight adaptations. She found out that for the movement of suspended particles, not only collisions with water molecules have to be taken into account but also vortices, which arise as the particle moves and displaces the surrounding fluid. This backflow is

dependent on the size of the particle. It also differs between various surrounding media. Einstein had neglected these vortices to keep the equations simple. However, as researchers now plan to use the method to image tiny structures in three dimensions, the measurable backflow becomes an important parameter. One of their goals is to study Brownian motion at the interface between different media. Herewith scientists around Sylvia Jeney foresee to obtain new information on membrane transport processes. They also would like to examine viscoelastic structures such as human cells applying the new technique. Sylvia is envisioning a simple and quick diagnostic tool to identify modified tissues (e.g. cancerous cells). It will take a lot more work to routinely apply this new microscope. Currently, it is mostly software development and data analysis that researchers need to focus on. Sylvia expects that in 1 - 2 years it is ready to analyze different model systems with a smaller effort than today and then verify the method.

Free research would be ideal

Sylvia will be able to pursue this project at least two more years. Then her fixed-term contract as Senior Scientist at the EPFL in Lausanne ends. While this uncertainty with fixed-term contracts can be wearing for many other researchers it looks like that for Sylvia curiosity and enjoyment in doing research outweigh this uncertainty. After being asked how her scientific future should ideally look like she replies: "I would always like to do my research like now – with a lot of freedom and minimal administrative burden." In any case Sylvia would like to stay in academia. Straight after her PhD she

got to know applied contract research at the CSEM in Neuchatel and soon realized that this is not her vocation.

Mediator between disciplines

In addition to research, curiosity about new things and teamwork in interdisciplinary teams are the pillars for Sylvia's scientific activities. When she answers the question who and what has influenced her most, this becomes obvious: "I think it is mostly those people who gave me freedom to follow my path. Additionally, exchange with my co-workers and experts from different disciplines is very important for me." She likes to play the role of the "translator" or "mediator" between different disciplines. Looking at her diverse education and her calm and sober-minded character, this is easy to imagine.

Sylvia does not find a lot of female colleagues among the physicists. Why this is the case, she does not really know. In school she had excellent physics teachers and therefore was always fascinated about the topic. But during the time at university she, as a woman belonged to a minority. "At university women sometimes were missing that an overview was given, that crosslink thinking was demanded. Because mostly individual topics were presented without showing the connection to other areas", she describes her physics studies. "That is really a pity, because physics offers so much and there are connections to so many other disciplines."

Sylvia in any case has succeeded to create for herself an area where connections and interdisciplinarity are possible and successful. It is obvious

that she is fully merged in her activities. When asked about her hobbies, she replies: "I do a lot of sports – running, skiing and swimming. That helps me a lot to think and to be creative." Thinking and being creative? "In research, of course!"

Intermediate report

Recently, Audrey Fischer has sent out templates for the intermediate report to all module leaders. Like in previous years we have to submit two separate reports for Argovia projects and the NCCR program. Deadline for both programmes is 13th January 2012.

For questions please contact Audrey Fischer (audrey.fischer@unibas.ch).

New brochures for the Nano Curriculum

The Swiss Nanoscience Institute has recently produced a new brochure and a new small flyer about the Nano Curriculum. The flyer points out that studying Nanoscience might be an attractive alternative to disciplines like physics, chemistry or biology for students with a broad interest in natural sciences. The new brochure gives detailed information about the bachelor and the master studies in nanoscience at the University in Basel.

Download at: nanoscience.ch/nccr/study/allabout/broschuere

Events

Journey to other worlds – a success story

To join a researcher on a trip to different worlds - this was the reason for more than 400 interested visitors to come to visit the sold out Schauspielhaus in Basel on the 18th of November. A diverse audience between 10 and more than 80 years old used the unique opportunity to witness this first trip through other worlds from the cosmos to the nanoworld.



Ready for the rush, that came soon after.

Most visitors judged the event very positively. They were fascinated by the spectacular pictures that Professor Friedrich-Karl Thielemann showed from the universe. For most guests, it was new information that almost everything that is needed to form life can be found in huge dust clouds in space. With the fact that even buckyballs can be detected in space, Professor John Paul Maier surprised even some experts among the visitors.

The trip that at first had catapulted the audience from Earth into space went back to our world after an informative break. After a closer look into the origin and development of life, Professor Anna Spang took the travellers into cells of higher organisms. She illustrated how membranes made the development of life on Earth possible and how these structures fulfill their different duties in our bodies. That nature can be used as a role model for scientists was demonstrated by Professor Wolfgang Meier, who talked about artificial membranes and nanocontainers. Professor Jörg Huwyler afterwards showed how these nanocontainers can be used in the future as transporters for drugs to specifically treat diverse diseases.

The variety of topics and the special appeal of the different dimensions from the unimaginably huge universe to the tiny nano objects inspired all visitors. The journey through different worlds, jointly organized by the Swiss Nanoscience Institute, the University of Basel and the University of Applied Sciences (FHNW), succeeded in making a connection between processes that happened billions of years ago to an outlook into the future.



In addition to the presentations, an info market took place in the foyer of the Schauspielhaus. Interested visitors could inform themselves about the Nano Curriculum at the University of Basel and about nanoscale sciences in general. Numerous nanostudents from Basel became the travel guides for this part of the journey and introduced the audience into the secrets of different aspects of nanosciences.

Abu Dhabi Science Festival

Meret Hornstein, Florian Dettwiler, and Tibor Gyalog represented the Swiss Nanoscience Institute at the first Abu Dhabi Science Festival and demonstrated the fascination of nanoscience to a broad audience. More than 1000 enthusiastic children and adults visited the exhibition, listened to detailed explanations, built backyballs, and became researchers. Michael Breu from the Basler Zeitung joined the SNI team and wrote two illustrative reports about the event and the engagement of the SNI communication team.

Download under:

nanoscience.ch/nccr/media/in_the_media



Nano in Abu Dhabi – Adults and kids were all fascinated.

Awards

Christoph Gerber received Scientific Excellence Award



On 27th October 2011, Professor Dr. Christoph Gerber from the Swiss Nanoscience Institute (SNI) at the University of Basel received the Scientific Excellence Award from the Alliance of NanoHealth (ANH). He was awarded for his outstanding scientific contribution in nanotechnology, nanobiotechnology and nanomedicine. The ANH especially recognized Christoph Gerber's significant contribution to the development of the first scanning probe microscopes that made the entry into the nanoworld possible.

The Alliance of NanoHealth was founded 2004 and is with 100'000 scientists and physicians the largest Nano-Bio-Med-Consortium worldwide. It comprises eight world-class research and clinical institutions located within the world's largest collection of healthcare facilities, namely the Texas Medical Center and the greater Houston region. The ANH is the first

multi-disciplinary, multi-institutional collaborative research endeavor aimed solely at using nanotechnology to bridge the gaps between medicine, biology, materials science, computer technology and public policy. With unified forces and an annual budget of more than 1 billion US Dollars, scientists of the consortium investigate in multiple interdisciplinary projects the molecular causes of different diseases and strive to develop novel nanotechnology based diagnosis, treatment and prevention methods.

Many scientists within the consortium regularly use the atomic force microscopes for their research. Christoph Gerber is one of the pioneers who developed these microscopes with which single molecules and atoms can be imaged in their natural environment e.g. the living cell. With his team at the SNI Christoph Gerber developed the technique even further into biosensors that are now applied in diagnostics. These research activities that Gerber presented during his plenary talk raised enormous interest and appealed to the audience. For Christoph Gerber and the University of Basel it is a special honour to receive the Scientific Excellence Award from the worldwide Center of NanoHealth.

Member institutions of the ANH include the Baylor College of Medicine, The University of Texas M.D. Anderson Cancer Center, Rice University, the University of Houston, The University of Texas Health Science Center at Houston, Texas A&M Health Science Center, University of Texas Medical Branch and The Methodist Hospital Research Institute. More information at: nanohealthalliance.org/.

Recent press releases

Ultracold atoms coupled to nano membranes

Basel, 22.11.2011. Tiny mechanical oscillators are interesting objects for studying the frontiers between classical and quantum physics. Researchers from the University of Basel recently succeeded to couple a 50 nanometer thick membrane with ultracold atoms. Additionally, they were able to investigate the properties of the membrane and demonstrate the limits of its mechanical qualities. Results of these studies were published in *Physical Review Letters* and *Applied Physics Letters*.

Einstein's formula for describing the movement of small particles in water needs adaptation

Basel, 10.10.2011. Einstein's formula to predict motion of tiny particles suspended in water needs slight adaptations. This is the conclusion of a study from the EPFL Lausanne that was carried out with support of the Swiss Nanoscience Institute at the University of Basel. The research results of this study were published in the renowned science journal *Nature*.

Full press release in German at: nanoscience.ch/nccr/media/recent_press_releases



Please contribute

We are looking forward to your feedback, ideas, success stories and news that might be of interest for the SNI community.

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