



SNI update June 2011

Words from the Director

Dear colleagues

SNI update - what's that? A newsletter from the Swiss Nanoscience Institute? Do we really need that? Our mailboxes and desks are full enough and we don't have time to read all our journals and newsletters. Perfectly right! However, I think with SNI update we fill a gap.

The 10th anniversary of the NCCR once again made clear that the NCCR Nanoscale Science is a phased-out model. In two years its third phase is coming to an end. Looking back, it becomes obvious that we have achieved a lot since the beginning in 2001. Together we have published more than 1500 papers, more than 3000 times we have presented our research at conferences and scientific meetings, and we have successfully supervised approximately 120 PhD students. But most importantly, we have built up an internationally recognized center for interdisciplinary research in Basel. Here biologists, chemists, physicists and medical doctors have learned

to collaborate and to appreciate these close interactions. We should continue and improve these interdisciplinary collaborations even after the NCCR has expired. Therefore it is important to share success stories from different working groups and disciplines and to keep internal communication alive. In the future, SNI update should be a tool to enhance this exchange. Every 2 – 3 months we will report on successful projects, people and events. Additionally, we will also use SNI update to announce dates for your calendars and announcements like the next Argovia call.

In this first issue we shortly describe the successful Argovia project D2Gel. We introduce Oren Knopfmacher, the winner of the first Science Slam in Basel, report on other awardees, remind you of the deadline for Argovia projects, and recollect some thoughts about the 10th anniversary of our NCCR.

A newsletter is only as good as its news! Therefore we depend on your support. Please share your success stories and news with the editorial team. Now



please enjoy the reading and I wish you a relaxing and restorative holiday time.

Yours

Director of the Swiss Nanoscience Institute, University of Basel

Cover Story: Calcium regulates release

A team under the leadership of professor Wolfgang Meier from the Swiss Nanoscience Institute at the University of Basel explores together with colleagues from the Fachhochschule Nordwestschweiz and Biocure (Rebstein, Switzerland), hydrogels with embedded vesicles. Within the Argovia project D2Gel they aim to use these vesicles as containers and transporters of drugs. By triggering specific ion concentrations in the surrounding medium the scientists plan to control the release of small molecular weight drugs. In recent studies they demonstrated that the vesicles are very well dispersed in the hydrogel matrix and that drug release can be successfully triggered by increased calcium concentrations. In cell toxicity assays with mammalian cell lines, the vesicles did not reduce viability of the cells. The studies so far suggest that vesicles hold promise as drug delivery systems for dispersion in hydrogels.



PhD student Etienne Cabane produces polymers for vesicles.

Controlled release is necessary

Hydrogels have unique mechanical and thermal properties. They are used to produce contact lenses and they make diapers absorptive. Another application that is currently being examined in laboratories worldwide is to better control the release of drugs. Water soluble drugs with small molecular weight are easily distributed in hydrogels. However, they rapidly diffuse out of the hydrogel network. For a targeted, medical treatment, a controlled release would be necessary. Therefore the team of Wolfgang Meier is analyzing drug-loaded polymeric vesicles, which are embedded in hydrogels. These vesicles serve as containers for drugs and also control drug release.

Sensitive against calcium

At the beginning of the project, scientists studied suitable block copolymers. They choose water soluble polyacrylic acid blocks (PAA) as they are known to be Ca^{2+} sensitive. PAA was mixed with different concentrations of polyethylenoxide block copolymers. After precise preparation the copolymers form the desired vesicles during a self-assembly process. Dependent on the amount of PAA their size ranges between 100 and 131 nm.

During the first experiments these vesicles were not loaded with drugs but with a fluorescent dye, as its distribution and behavior in the gel can be easily followed. It became obvious that fluorescein diffused from the vesicles into the surrounding medium. However, the amounts were much lower than without vesicles. By increasing the Ca^{2+} concentration, the release of fluorescein could be enhanced. These results are especially promising as the Ca^{2+} concentrations that were used to successfully trigger the release from the vesicles were in the range of physiological conditions.

Crucial for a possible application of these vesicles is their biocompatibility. Therefore, the interdisciplinary team of the Swiss Nanoscience Institute also studies their effect on mammalian cell lines. The tested vesicles did not significantly reduce the number of healthy cells, indicating no toxic effect.

Excellent collaboration

Until now the teamwork between scientists from the University of Basel, the Fachhochschule Nordwestschweiz, and Biocure has been a success. Polymeric vesicles embedded in hydrogels seem to be a promising drug formulation that would require less amounts of active ingredients and would reduce negative side effects for patients. But it is still a long way to go before patients can benefit from these research activities. In coming studies the research team will further analyze the process of the calcium triggered release and the efficacy of this new formulation using active substances like Doxorubicin (cytostaticum used in chemotherapy).

We introduce...

Oren Knopfmacher is the winner of the first Science Slam of the University of Basel and the Fachhochschule Nordwestschweiz. Oren will finish his PhD in the team of professor Christian Schönenberger end of June 2011. He was born in Israel, moved to Germany when he was three years old and grew up very close to the Swiss border in Grenzach, Germany. In 2002 he passed the Abitur at the local Lise-Meitner-Gymnasium. Originally, Oren was planning to study Physics at the ETH in Zurich. However, as his certificates were not fully recognized he began his studies in Physics at the University of Basel in October 2002. He intended to change to the ETH at some point during his career. He was soon convinced, however, to have found the best conditions in Basel: "I had optimal supervision and support here in Basel. Professors and tutors here are very accessible. You can approach anybody and ask your questions. There was no reason for me to change my place of study!"

Use of the SNI logo

The canton Aargau and the University of Basel are the main sponsors of the Swiss Nanoscience Institute. We should show this engagement and use the logos of the university and the SNI in appropriate forms. The SNI logo recently has been modified to reflect the initiative of the canton Aargau and the University of Basel. Please name the funding of the SNI in your publications and use the new SNI logo.

Download at www.nanoscience.ch/Logo



PhD in his desired lab

In 2007 Oren received a Master of Sciences in Physics. It was a lucky chance to immediately get a PhD post in his desired lab with Christian Schönenberger. During the following years Oren worked within an Argovia project on chemical and biochemical nanosensors. These nanosensors are tiny nanowires with specifically functionalized surfaces. If, for example, they are used to detect heavy metals, scientists functionalize the surfaces with molecules that specifically bind to heavy metals. If there are heavy metals in a test solution they will bind to the nanosensor. The electric conductivity changes and this can be measured as a specific signal.

During his PhD Oren Knopfmacher developed, in close collaboration with colleagues from the Fachhochschule Nordwestschweiz, a nanosensor platform that can be used for pH measurements. Within a Nano-Tera project he additionally explored nanowires that can be applied as biochemical sensors. In this collaboration with researchers from the Pharmazentrum of the University of Basel, the surfaces are functionalized with carbohydrates that bind to specific lectins. These play an important role in different biological processes and offer new chances for innovative diagnosis and treatments of various diseases.

Next challenge in the US

Oren Knopfmacher will finish his PhD in June 2011. He will stay true to nanoscience and nanosensors. His next career step will be a PostDoc at Stanford University, USA, where he will work on spatially flexible nanosensors. In the long-term, Oren would like to come back to the region of Basel. Currently, it is an open question for him whether his ideal job is in academia or in industrial research. During his PhD at the Department of Physics in Basel, it was the collaboration with scientists from other disciplines that stimulated him most such that he would like to continue to look beyond his own field.

It's important to hang in there

Looking back to his time as a student he thinks that it is especially important to have stamina and enthusiasm for your work. "It is like doing sports", he answers a question about what recommendations he has for young students. "Once in a while, you will experience set-backs. But you only learn from these and you should not get demoralized and give up."

He himself followed this credo at the Science Slam. In the beginning it looked like he was not going to participate as all the spots were already taken when he applied. However, he learned from his sports career in Judo how much fun a contest can be and he really wanted to take part. So he did not give

up, he kept on asking, and finally was able to take the podium when somebody else dropped out. During his talk it was definitely helpful for Oren that he had a lot of experience communicating with experts from other disciplines. Additionally, his sensors were ideally tuned. He was able to optimally adjust himself to the audience and to fascinate everybody with speed, humor and enthusiasm on his exciting research. Congratulations to winning the first Science Slam in Basel!

Events

10th anniversary of the NCCR

On May 26th about 200 guests celebrated the 10th anniversary of the NCCR Nanoscale Science in a relaxed and unconstrained atmosphere. During the event that took place in the E-Hall in Basel the list of invitees was as diverse as the program.



From Nobel Prize winner Sir Harry Kroto to students, from scientists who were part of the NCCR at the start to those who only recently joined, from researchers from Basel to those who came from abroad – all of them enjoyed a nice evening. Besides an entertaining program with speeches, talks, acrobatics, and music, the event offered a perfect occasion to talk to colleagues and friends. Looking around it became obvious that during the 10 years of the NCCR an interdisciplinary community has grown. In his talk, Sir Harry Kroto chose the image of single paper rolls that are fragile if they stand alone but that develop an enormous strength when put closely together. This image can easily be applied to a research program like the NCCR. Through the close interdisciplinary collaborations, the NCCR became something special and developed its excellent reputation.



New Argovia projects in 2011

The Swiss Nanoscience Institute Basel (SNI) offers funding for projects in applied nanoscience and nanotechnology within the program "Nano-Argovia". Potential researchers are invited to submit project proposals before September 30th, 2011.

For Argovia projects, at least two academic partners (University of Basel, Fachhochschule Nordwestschweiz, Paul Scherrer Institut, CSEM Basel) collaborate with at least one Swiss company (preferably from the northwestern part of Switzerland). Projects will be funded initially for one year, with a possible prolongation for a second year. For detailed information regarding eligibility, rules and procedure, please visit: argovia.nanoscience.ch

A bit more ceremonial than was the festive dinner on 1st June. About 90 guests from the scientific and political community came together at the Trois Rois in Basel, to celebrate the NCCR's anniversary. During various short speeches, the speakers once again concluded that by founding the NCCR and its successor, the Swiss Nanoscience Institute, a unique interdisciplinary nanocentre has been built up that enjoys an excellent reputation worldwide. In particular, the merits and the engagement of professor Hans-Joachim Güntherodt were appreciated throughout the evening. It was his vision that made the foundation of the NCCR and SNI possible. It was also pointed out that the positive development of the NCCR and SNI continued under the leadership of professor Christian Schönenberger. As professor Antonio Loprieno, rector of the University of Basel, elaborated, the SNI is not only a member of the university but during the last years also became a partner.

NanoConvention

From 18th to 19th May 2011 the Swiss Nano Convention (SNC) took place for the first time at the Trafohalle in Baden. The SNC merges several existing local conferences to a unique national congress. The broad funding body consists of sixteen private and public research institutions including ETH, EPFL, Novartis and the SNI. The organizers came up with a selection of top-class speakers. Beside renowned researchers, representatives from multinational companies, i.e. IBM and BASF, presented their visions for the future of nanotechnology. Secretary of State Mauro Dell'Ambrogio outlined the goals of the Swiss research funding

strategy of the upcoming legislation. The symposia came along with two exhibitions. The Nanopubli exhibition took place in the public area of the Trafo building and attracted a lot of interested visitors. The business-to-business exhibition presented products and services related to nanotechnology from both, small and well-established enterprises. This small industrial exhibition will grow in the conferences to come.

The concept of the SNC was a complete success. The audience estimated the perfect blend of science, industry and politics. The next SNC will take place 2012 in Lausanne. The SNI will organize the SNC 2013 in Basel.



EMPA-Direktor Professor Gian-Luca Bona, Director of the EMPA, opens up the Swiss Nano Convention.

Festival of molecules

On June 17th and 18th, the University of Basel hosted the Festival of Molecules. Around 4000 visitors had the chance to experience chemistry through various experiments and lectures. The SNI participated under the topic of "Clever molecules reign the nanoworld" and gave insight into the fascinating world of nanochemistry to the predominantly young visitors.



The year 2011 is the International Year of Chemistry. To this special occasion the University of Basel and various chemical and life science companies from Basel organized the Festival of Molecules together with the cantons of Basel city and Basel country.

Awards

Young researcher from the SNI wins Science Slam

Oren Knopfmacher, PhD student at the Swiss Nanoscience Institute, won the first Science Slam in Basel that took place 29th April at the theatre in Basel. With a lot of speed, esprit and confidence he presented his work on silicon nanowires and depicted how his research can be applied to sensing systems.

Currently, Oren Knopfmacher is finishing his PhD at the Department of Physics at the University of Basel. His research is financially supported by the Argovia program, which has been implemented by the canton Aargau to promote applied nanoscience and nanotechnology.

Professor Christian Schönenberger, Oren Knopfmacher's PhD advisor and the director of the Swiss Nanoscience Institute, is proud of his successful

co-worker: “We should strive to present science with humor and enthusiasm to reach a broad audience and to let them participate in our fascinating research. I am very pleased that a young scientist from the SNI was able to convince the audience and to pass on the excitement of nanoscale sciences.”

During the Science Slam employees of the University of Basel and the Fachhochschule Nordwestschweiz presented their studies in an informal, entertaining way to a mixed audience. The Science Slam originated from an initiative of the Department of Chemistry. It is mutually carried out by the University of Basel, the Fachhochschule Nordwestschweiz, and the theatre of Basel. NZZ Campus acts as media partner.

Christoph Gerber receives Lifetime Achievement Award

Professor Christoph Gerber, member of the Executive Board of the Swiss Nanoscience Institute and group leader at the Department of Physics at the University of Basel, will be honored with the Lifetime Achievement Award. He will receive his award during the Miami Winter Symposium 2012 – a conference organized by Nature.



New brochure ready for download

The new image brochure “Nanowissenschaften - Was geht mich das an?” is now available on the Internet and can be downloaded and ordered at:



www.nanoscience.ch/nccr/media/brochure.

Christoph Gerber is recognized for his outstanding contributions in the area of nanotechnology in biomedicine. He significantly contributed to the invention of the scanning tunneling and the scanning force microscopes. His pioneering work has been cited more

than 20'000 times. Thereby Christoph Gerber is among the hundred most cited physicists in the world.

Gerber was born 1942 in Basel and worked from 1966 to 2004 at the IBM Research Laboratory in Rüschlikon. In 1987 he received an honorary doctorate of the University of Basel.

Ed Constable receives Sustainable Energy Award

Professor Ed Constable, Project leader and Member of the SNI Management Board, professor at the Department of Chemistry and Vice-rector at the University of Basel, will receive the “Sustainable Energy Award” by the “Royal Chemical Society” for his innovative research.



Since 1993 Constable has worked as a full professor for chemistry at the University of Basel. His research group, which he jointly leads with his wife professor Catherine Housecraft, focuses on, among other topics, the development of sustainable materials that can be used for technologies like efficient illumination and solar energy. Constable is well respected among the international

community as an expert and pioneer in the growing field of metal-organic complexes and supra-molecules. His research is creative and significantly above the current state of the art.

Recent press releases

Breast cancer: Nanotechnology enables faster diagnosis

Basel, 26th May, 2011. A new type of scanning force microscope that was successfully used for soil analysis on Mars 2008, could revolutionize medical tissue diagnosis in breast cancer and osteoarthritis. Researchers from the SNI and Biocentre at the University of Basel further developed the device and named it “Artidis”. Thanks to its nanomechanical sensitivity “Artidis” is now capable of differentiating within minutes between various disease stages in different types of tissues. With this capability to analyze modified tissues at a very early stage of a disease, “Artidis” has the potential to become a standard instrument in medical diagnosis.

10 years of nanoresearch at the University of Basel – a success story

Basel, 1st June, 2011. Ten years ago, on the 1st June 2001, the National Center of Competence in Research Nanoscale Science (NCCR Nano) started as one of the first National Centers of Competence in Switzerland. The NCCR was initiated and funded by the Swiss National Science Foundation. It links different research organizations in the area of nanoscale sciences in Switzerland under the coordinative leadership of the University of Basel. The aim of the research network is a long-term support in the field of nanosciences.

Since the beginning, researchers have aimed to provide new impact and ideas to the life sciences, to the sustainable use of resources and to information and communication technologies. Thanks to intensive collaborations between scientists of different disciplines like physics, chemistry, biology, and medicine, the University of Basel has laid a foundation for successful nanoresearch in Switzerland and has reached a position of international leadership.

Peptid vesicles: Breakthrough of nanocarriers for drugs

Basel, 9th June, 2011. Researchers from the University of Basel have created an intelligent nano-carrier system on the basis of peptides. Due to their special structures, peptides self-assemble in water to form hollow bodies of nanometer dimensions called vesicles. A prerequisite for the process is the formation of a membrane. For the first time researchers have now succeeded in building this membrane out of pure peptides. The new nano-carrier system can be used for the transport and protection of different molecules including, for example, drug molecules. By using peptides, the whole carrier system is fully metabolized after application. The described research is published in the current issue of the scientific journal “Small”.

The full German version of all press releases can be found at: www.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 to the editorial team:

Dr. Christel Möller (c.moeller@unibas.ch)

Dr. Tibor Gyalog (tibor.gyalog@unibas.ch)