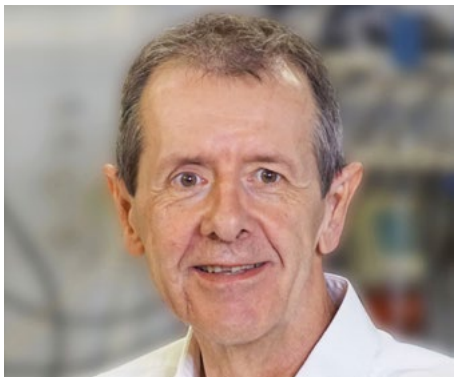
University of Basel

Swiss Nanoscience Institute

SNI SWISS NANOSCIENCE INSTITUTE

EINE INITIATIVE DER UNIVERSITÄT BASEL UND DES KANTONS AARGAU

SNI update July 2018



Dear colleagues,

It is summer in Basel. The streets are noticeably emptier, while more and more people are taking a swim in the Rhine. The relaxed holiday atmosphere can be particularly conducive to a nice glass of wine. However, the vast amount of fungicides that go into the production of a good wine is something that I only recently became aware of.

We learned all about it at a meeting of the Interreg project Vitifutur in June. One of the goals of this project is to come up with ways to reduce this massive use of fungicides. The event was hosted by the Nano Imaging Lab, which for some time now has proven to be a valuable asset to the SNI with its comprehensive range of imaging services. You can read about the problems facing regional winegrowers and potential sustainable solutions in the title story of this summer issue of *SNI update*.

Another notable event in June was the Swiss NanoConvention (SNC). In my role as director of the Swiss Micro & Nanotechnology Network, the originator of the SNC, I was delighted to have the privilege of awarding the first edition of the Startup Prize this year. The award went to the company Resistell AG for developing a device to detect antibiotic-resistant pathogenic bacteria.

I was also very happy to see that Daniel Riedel, an alumnus of the SNI's PhD School, received a PhD Prize for his excellent publication as lead author in the journal Physical Review X. Besides this award, which is sponsored by the Hightech Zentrum Argau, Daniel has received a number of other distinctions in recent months. We have therefore included a more in-depth look at his outstanding doctoral dissertation here.

In this issue of *SNI update* you can also read about two Nano Argovia projects and various SNI activities.

Please remember to submit your applications for the next Nano Argovia call and your pictures for this year's Nano Image Award, and don't miss the short video about the SNI's outreach activities.

I wish you all a wonderful summer, and look forward to our Annual Meeting in September.

Kind regards,

Christian Schönenberger

Prof. Christian Schönenberger
SNI Director

Transnational research for sustainable pest management in winegrowing

The Swiss Nanoscience Institute's Nano Imaging Lab is a partner in numerous research programs. Sustainable pest management in winegrowing is one of the fields in which the NI Lab's images are currently making a vital contribution. On June 11, 2018, the NI Lab hosted an event for the participants in the Interreg project Vitifutur in Basel. The Vitifutur project brings together leading Swiss, German and French research institutions to explore innovative strategies for sustainable pest management in winegrowing in the Upper Rhine region.

Markus Dürrenberger (NI Lab) welcomes the project partners of the Interreg project Vitifutur from Germany, France, and Switzerland.

Climate change, in conjunction with globalization and consumer demand for sustainably produced foodstuffs, is presenting winegrowers with new challenges. On one hand, they are faced with a succession of new pests that are brought in from other countries and are able to flourish as a result of the changing climate; on the other hand, consumers are increasingly concerned about the widespread use of fungicides and pesticides. To illustrate the scale of the problem, sixty percent of the fungicides in the EU are used in winegrowing, but these vineyards make up just five percent of the cultivated area. In the Interreg project Vitifutur, leading research institutions are searching for sustainable solutions to some of the most pressing problems in the Upper Rhine region.

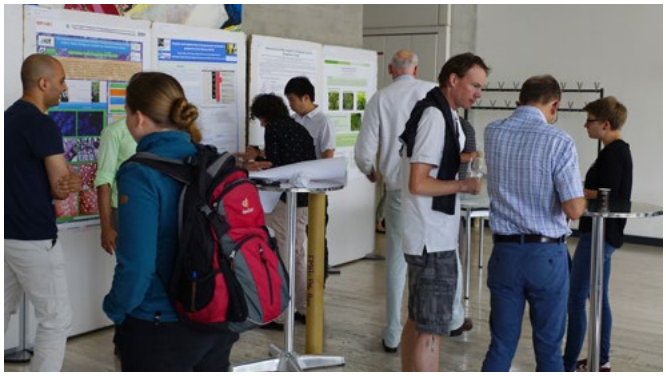
Resistant varieties can reduce the need for fungicides

At the symposium on June 11, the researchers presented some of the project's preliminary findings. Dr. Günther Buchholz of AlPlanta, in Neustadt an der Weinstrasse (Germany), reported that using resistant grape varieties can reduce the need for pest control treatments by up to 75 percent, depending on the variety and weather conditions. Over the last few years, Buchholz and his team have studied downy mildew infections in a number of grape varieties. Although even the fungus-resistant vines (known as PIWI vines) had to be treated with fungicides in years with extreme weather conditions to prevent infection, the amounts required were significantly lower.

Vines beleaguered by toxin-producing fungi

"Fungi are also responsible for the grapevine trunk disease Esca, which has spread considerably in recent decades," explained Dr. Hanns-Heinz Kassemeyer of the State Viticultural Institute in Freiburg im Breisgau (Germany). He described how this chronic disease can be identified externally on the basis of typical necrotic leaves and dried berries, even though no pests can be found in the leaves and berries themselves.

Nevertheless, infection of the trunk by various fungal species can lead to the death of the vine under certain circumstances. Interestingly, the fungal population of an infected plant does not differ significantly from that of a healthy one. Dr. Peter Nick of the Karlsruhe Institute of Technology postulates that it is only when the plant releases a specific signal, which he calls signal of capitulation, that the delicate balance between host and fungi is disturbed. The fungi then begin to produce toxins, damaging the plant further and ultimately killing it. In the lab, Nick's team treated one of the fungi isolated from the vine trunk with different substances obtained from the grapevine, and identified a candidate substance



Participants of the Vitifutur symposium discussed plenty of topics during the postersession and the lab tour.

for the capitulation signal. “It would be of great practical benefit to treat vines in such a way as to prevent accumulation of this substance,” Nick concluded.

Viruses harm grapevines too

Fungal infections are not the only threat faced by grapevines: diseases can also be caused by viruses. To date, 75 species of virus from 30 different genera are known to infect vines.

Dr. Christophe Ritzenthaler of the Centre National de la Recherche Scientifique in Strasburg (France) showed how the grapevine fanleaf virus – the most devastating viral disease affecting grapevines, spread by nematodes – can cause huge economic damage. As no virus-resistant variety has yet been found anywhere in the world, the only option left to winegrowers is managing the disease.

Before they can do this, however, the infection must first be detected. Ritzenthaler’s team, working in collaboration with project partner Bioreba AG based in Reinach, has developed a detection method using antibodies. The procedure relies on particular components of antibodies known as nanobodies to identify different viruses.

Nano Imaging Lab proves its worth as a project partner

After the three presentations, which covered the key topics explored in the Vitifutur project, the 30 participants in the symposium were given a tour of the installations of the Nano Imaging Lab (NI Lab) at the Swiss Nanoscience Institute. “The NI Lab provides high-resolution, detailed images of surfaces for several project partners, thereby making a decisive contribution to our understanding of the various diseases and the search for sustainable solutions,” said Dr. Markus Dürrenberger of his team’s role in the project, speaking as the event’s host. Even project partners that had not yet collaborated with the NI Lab were impressed by the achievements of the five-person team, and expressed an interest in conducting joint studies.

Vitifutur

The Vitifutur project runs from February 2017 to December 2019. The project is overseen by the State Viticultural Institute Baden-Württemberg in Freiburg im Breisgau, and has a budget of around 4 million euros. It is funded under Interreg V – a community initiative of the European Regional Development Fund (ERDF). This program, devoted to funding transnational cooperations, provides around half of the project’s funding together with the Swiss cantons of Aargau, Basel-Landschaft and Basel-Stadt and the Swiss government as part of its New Regional Policy. The other half comes from the research institutions themselves. Besides the SNI, Swiss involvement in the project also includes the company Bioreba AG in Reinach as an associate partner. Practical orientation is provided by the Aargau Winegrowing Association and the Ebenrain Agricultural Center in Sissach.

More information:

Vitifutur: www.vitifutur.net

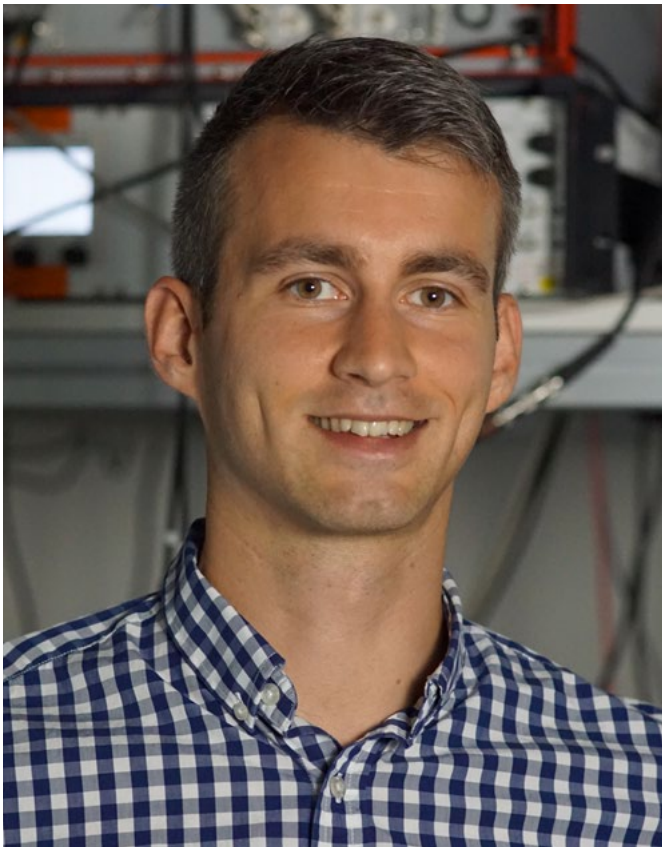
Interreg Upper Rhine region:
http://www.interreg-oberrhein.eu/page-daccueil

Regio Basiliensis Inter-Cantonal Coordination Office (IKRB), which advises Swiss candidate projects on funding applications and represents the Swiss government and the cantons in the program:
https://www.regbas.ch/de/foerderprogramme/interreg/

Nano Imaging Lab at the University of Basel’s Swiss Nanoscience Institute:
https://nanoscience.ch/de/services/nano-imaging-lab/

Daniel Riedel: An award-winning scientist from the SNI PhD School

Dr. Daniel Riedel, a postdoc jointly in the groups of Professor Richard Warburton and Professor Patrick Maletinsky, is currently receiving one prize after the other for his doctoral thesis and an ensuing publication. As part of his doctoral dissertation, this former SNI PhD student drastically improved the quality of individual photons generated by a quantum system, successfully putting a 10-year-old theoretical calculation into practice.



Daniel Riedel is receiving one prize after the other for his doctoral thesis.

Turning a hobby into a profession

Daniel Riedel began his doctoral dissertation at the SNI PhD School in June 2013. He was instantly attracted to the topic for a PhD position advertised by physics professors Richard Warburton and Patrick Maletinsky, which was intended to study particles of light (photons) emitted by nitrogen-vacancy centers (NV centers) in diamonds.

These NV centers are formed when two carbon atoms in the diamond lattice are replaced with a nitrogen atom and an adjacent vacancy. Due to the extremely high purity of the diamonds used, the electrons trapped in the vacancy behave like those of isolated atoms and can therefore be used for quantum information processing.

As Daniel Riedel had previously worked on vacancies in silicon carbide, their manipulation and use, as part of his degree dissertation at the University of Würzburg, applying to Basel seemed the obvious thing to do. “Accepting a position here was an easy decision,” he recalls. “I was quickly won over by the infrastructure and environment on offer in Basel, and I never regretted the decision. After all, my thesis felt more like a hobby to me than work,” he adds.

Greater light yield needed

His aim was to boost the photon yield of these NV centers without impairing their other positive properties in the nanofabrication process. The need for an improved photon yield stems from the large differences in refractive index between diamond and air, which causes most of the light emitted by the NV centers to be reflected at the interface. This light then remains inside the diamond, and only a small part of the emitted light reaches the outside.

Daniel Riedel began by considering the entire spectral region of the emitted light. Using a dielectric optical antenna, he was able to concentrate the photons in a specific direction and thus to capture them using a conventional lens. The antenna consists of a diamond membrane with a thickness of several hundred nanometers and containing individual NV centers. When this membrane is applied to the semiconductor material gallium phosphide (GaP), the boundary layer between the air, diamond, and GaP acts as an optical antenna. The reason why GaP is so well suited as a material is that it has a larger refractive index than diamond and is transparent in the spectral region where the NV center emits light.

Daniel Riedel studied the antenna’s radiation pattern for various layer thicknesses of the diamond membrane and found that it agreed excellently with an analytical model he had developed. “For very thin diamond layers,

I was able to isolate individual NV centers and improve their light yield by an order of magnitude," he explains.

Other problems in the pipeline

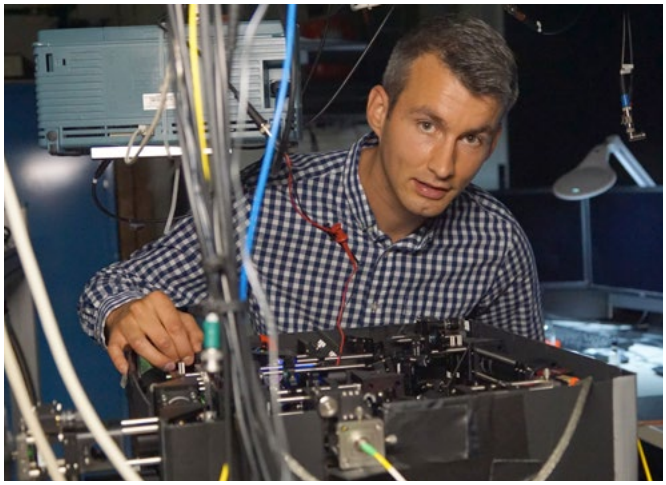
After this first part of the project, however, Riedel still had to deal with the poor quality of the photons. Only some three percent of all emitted photons had the necessary properties to establish quantum mechanical entanglement between two NV centers over large distances and therefore to use them to transmit information. In the last three years of his doctoral dissertation, Riedel turned his attention to solving this problem. "Progress wasn't always fast," he says. "At times, it took a great deal of stamina to keep on working with the same momentum."

In the end, it was worth it. In his recent publication in Physical Review X, Daniel Riedel describes how he succeeded in raising the yield of suitable photons from three to almost 50 percent. He achieved this significant improvement by using an optical microresonator to boost the emission rate in a narrow frequency range. For this, Riedel placed a diamond membrane with a thickness of approximately 800 nanometers on a planar mirror that can be positioned with nanometer precision below a second mirror with curved depressions. Ten years earlier, a theoretical description had predicted that positioning NV centers in a resonator of this kind should increase the yield of photons. By precisely controlling the distance between the two mirrors, Daniel was able to couple various NV centers to the resonator in an optimum fashion, thereby increasing the emission rate of the desired photons so that they now make up almost 50 percent of the total emission.

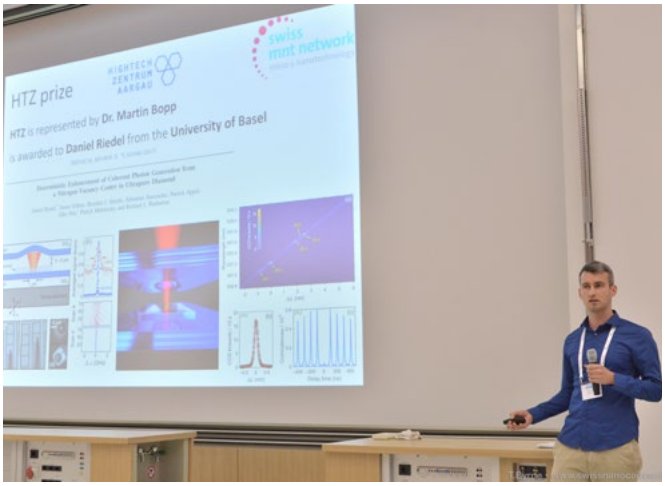
A successful year

At the Swiss Nano Convention in June 2018, Daniel Riedel was presented with one of the Swiss Micro & Nanotechnology Network's PhD Awards, which is sponsored by the Hightech Zentrum Aargau, for his publication in Physical Review X.

In March 2018, his overall doctoral dissertation had already earned him second place in the "dissertations" category of the Quantum Future Award from the Federal Ministry of Education and Research in Germany (BMBF) and the Center for Integrated Quantum Science and Technology (IQST). In his home town of Dinkelsbühl, Germany, he was also awarded the 2018 sponsorship prize by the Willi Dauberschmidt Foundation. Yet another recent addition to his list of awards, was the Early Postdoc.Mobility Fellowship from the Swiss National Science Foundation. The latter will enable him to embark on the next step in his career as a postdoc at the California Institute of Technology in Pasadena (USA).



Daniel Riedel drastically improved the quality of individual photons generated by a quantum system.

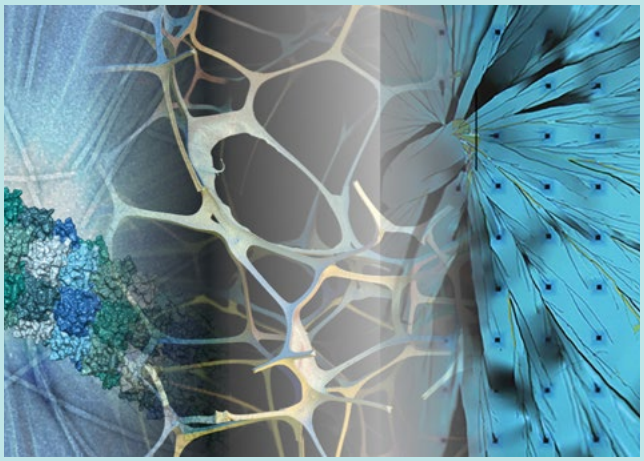


Daniel Riedel presented his work during the SNC 2018. (Image: Edward Byrne)

The SNI is delighted for Daniel Riedel and would like to take this opportunity to congratulate him on these successes. For Daniel, the awards mark the successful completion of his prosperous and enjoyable time as a doctoral student at the SNI.

"I received excellent supervision from both of my supervisors, Richard Warburton and Patrick Maletinsky, and really enjoyed the close collaboration with both research groups. The workshops organized by the SNI Network and the NCCR QSIT were also real highlights for me and taught me to look beyond the boundaries of my own research."

Nano Image Award



Each fall, the SNI seeks to collect – and award prizes for – the best images from the nano world, and this year is no exception.

Please send your photos of nano and micro structures, stating the title, description and scale, by October 15, 2018 to c.moeller@unibas.ch.

The SNI management team will choose the three best photos, which will each be awarded CHF 300.

We look forward to receiving your images and will announce the winners of this year's Nano Image Award in *SNI update* and on our webpage.

Nano Argovia projects

We continue to provide short descriptions of the new Nano Argovia projects to give an insights into the applied research activities at the SNI.

Using gratings to boost contrast – The Nano Argovia project "NANO-CREATE" aids the optimization of diagnostic images

In the Nano-Argovia project "NANOCREATE", scientists from the Paul Scherrer Institute (PSI), in collaboration with the University of Applied Sciences (FHNW) and GratXray AG (Villigen, AG), are developing a cost-effective fabrication method for optical X-ray gratings. These gratings are used in a computed tomography (CT) scanner developed by GratXray that allows for high-resolution, high-contrast imaging of low absorbing tissues, such as the female breast.

Decisive advantages

In classic X-ray imaging, contrast between different tissue types get better the lower the X-ray energy. However, the lower the X-ray energy, the higher the radiation dose that is deposited in the patient. Therefore, classical X-ray imaging is physically limited by the image contrast that can be reached. This limitation can partially be overcome with grating interferometry, where not only the absorption, but also the refraction and scatter of X-ray can be measured. These additional signals are much stronger in soft tissue and thus, allow to significantly improve image contrast under dose control. Integrated in a dedicated breast CT, this technique allows for retrieving unprecedented image quality in 3D, ultimately leading to a more accurate diagnosis of breast cancer.

New fabrication method

Grating interferometry for medical diagnostics has been developed extensively in recent years, but the high pro-

duction costs of specialized gratings remains a limiting factor for the technique's broad application.

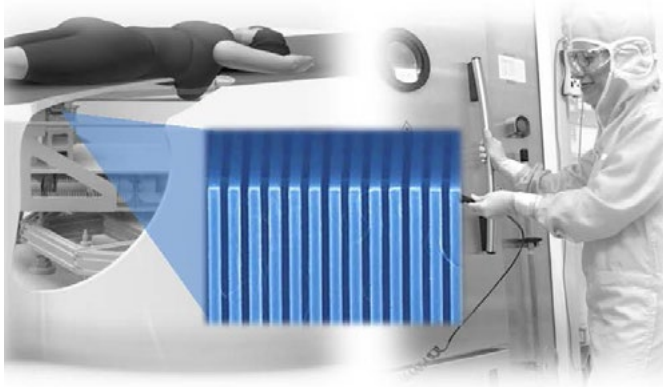
The team behind the Nano Argovia project "NANOCREATE", led by Dr. Konstantins Jefimovs (PSI), is therefore focusing on the development of alternative manufacturing method, to lower fabrication cost so that gratings can be produced on larger area and in higher volumes.

The scientists at PSI are developing a method based on metal assisted chemical etching to produce silicon structures of high aspect ratio, larger area and lower costs. These structures, which have low X-ray absorbance, are then filled with gold, strongly absorbing X-ray. They want to produce and test the grating performance manufactured by this new method on a lab CT-system.

On the other hand, the team at FHNW is testing laser ablation as an alternative method to directly make the gratings from a metal foil. These techniques are now being examined in greater detail as part of the Nano Argovia project.

In addition to the project leader, Dr. Konstantins Jefimovs (PSI), the team consists of Professor Lucia Romano (PSI), Professor Ronald Holtz (FHNW), Dr. Bojan Resan (FHNW), as well as Dr. Martin Stauber and Dr. Zhentian Wang (both of GratXray AG).

"The Nano Argovia project "NANOCREATE" will help us in our efforts to make grating interferometry available for a broad range of applications," says Dr. Martin Stauber of GratXray, a spin-off company of PSI.



The Nano Argovia project "Nanocreate" develops critical components for the next generation of x-ray medical diagnostic machines. (Image: PSI and GratXray)

Lightweight and stable – The Nano Argovia project "NanoTough" is investigating new methods for improving the toughness of composite materials

In the Nano Argovia project "NanoTough", scientists from the University of Applied Sciences and Arts Northwestern Switzerland (FHNW), the University of Basel, and the company Huntsman Advanced Materials GmbH (Basel) are investigating the use of block copolymers in composite materials. The aim is to make composites tougher without impairing their workability.

Room for improvement

Plastics that have been reinforced with carbon fibers (fiber-reinforced composites) stand out for their combination of extraordinary mechanical properties and low weight. They are primarily used for building vehicles, aircraft, and ships but also play an increasingly important role in the manufacturing of wind turbines. Their range of applications could be expanded further if the materials were less brittle and if their toughness could be improved. This can already be achieved today by adding thermoplastic powders, but the use of such additives increases the materials' viscosity and therefore makes them harder to work.

Block copolymers as an additive

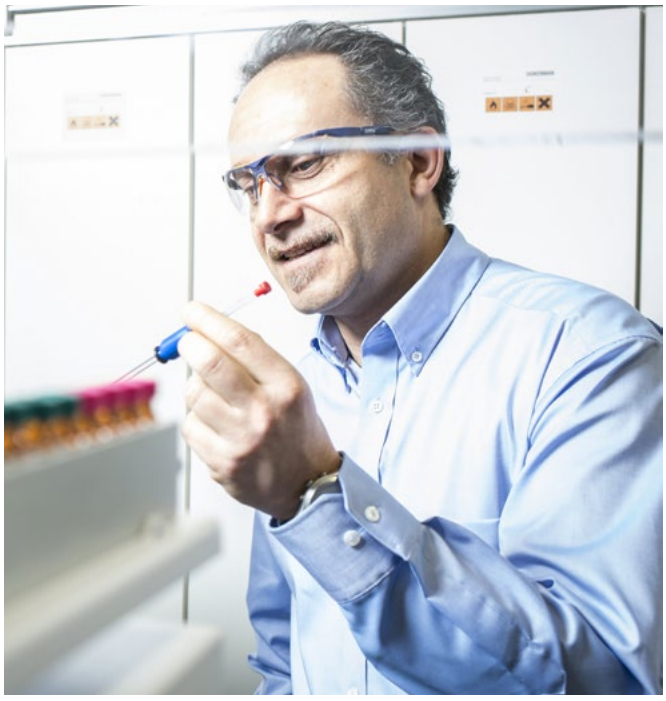
The teams of scientists working on the Nano Argovia project "NanoTough" begin by investigating the synthesis of various block copolymers, which they later add to an epoxy resin that acts as a matrix.

Block copolymers are polymers assembled from at least two different monomers, with single molecules of the monomers linking up in long chains to form the individual blocks (e.g. AAAAABBBBB). The group led by Professor Wolfgang Meier from the Department of Chemistry first synthesizes a variety of block copolymers (BCPs) with different compositions and masses and then studies how these affect the morphology of the resulting

nanostructures. In addition, the researchers attempt to simulate the conditions found in an epoxy resin system by selecting different solvents and temperatures.

Once the BCPs are synthesized and characterized, suitable candidates are selected and then tested in an epoxy resin system by the team working under project leader Dr. Sonja Neuhaus and Professor Clemens Dransfeld (FHNW School of Engineering, Windisch).

Key factors include not only the conditions during curing but also the morphology of the block copolymers in fully cured samples. A thermoplastic material is then added, and the morphological characteristics of the new composite material are analyzed. Lastly, partner company Huntsman works with the FHNW team to characterize the samples' mechanical properties and compare them with leading commercially available materials. This work centers around experiments to test the fracture properties and the determination of the glass transition temperature under a variety of conditions.



"By participating in the Nano Argovia project "Nano-Tough", we are expanding our knowledge of new composite materials and hope to further consolidate our leading position in this area," says Dr. Alessandro Napoli, Global Technology Manager at Huntsman, speaking about the company's involvement in the project. (Image: Huntsman Advanced Materials GmbH)

Call for Nano Argovia projects

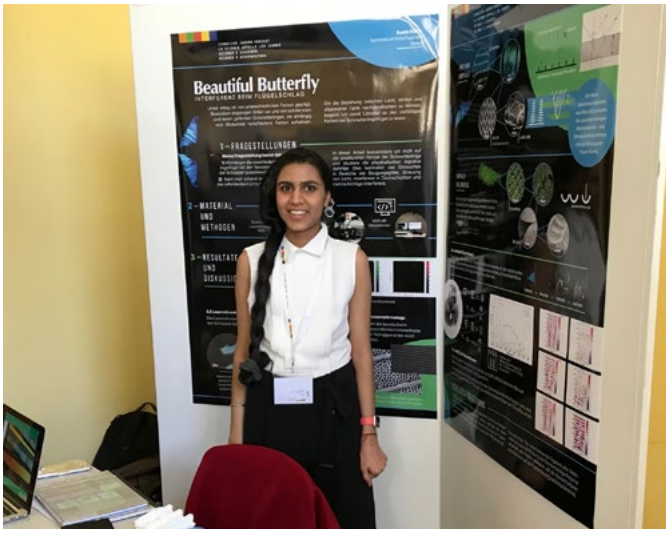
It's that time again. You can submit proposals for the SNI's Nano Argovia applied research program up until **September 30, 2018**.

All of the necessary information can be found at:
www.nanoargovia.ch

Awards and honors

Successful support

Dr. Thilo Glatzel of the Department of Physics teamed up with the SNI's Nano Imaging Lab to help Aashi Kalra, a pupil from Kirschgarten high school, with a project for "Swiss Youth in Science". Aashi Kalra presented the project entitled "Beautiful Butterfly – Interferenz beim Flügelschlag" (Beautiful Butterfly – Interference in the Beating of Wings) at the "Swiss Youth in Science" competition in Neuchâtel in April 2018 and was awarded a grade of "excellent". Thanks to her impressive work, she will now represent Switzerland at the Taiwan National Science Fair. Congratulations!



Aashi Kalra presented her work on the interference of butterfly wings. (Image: Aashi Kalra)

Basel startup Qnami wins Venture Kick finals

The young startup from the Department of Physics and the Swiss Nanoscience Institute, Qnami, is the winner of the Venture Kick prize worth 130,000 Swiss francs. Qnami develops precise and highly sensitive quantum sensors that deliver images in nanometer resolution.

Complete article: https://nanoscience.ch/en/2018/06/15/basler-start-up-qnami-gewinnt-venture-kick-finale/

The winning team of Qnami: Patrick Maletinsky, Mathieu Munsch and Felipe Favaro. (Image: Venture Kick)

PhD Award for Daniel Riedel

Dr. Daniel Riedel, a postdoc in Professor Richard Warburton's and Professor Patrick Maletinsky's groups and until recently a doctoral student at the SNI PhD School, has won the Swiss Nanotechnology PhD Award 2018, which is sponsored by the Hightech Zentrum Aargau.

He received the award for his publication in Physical Review X on improving the quality of photons generated by a quantum system.

Christian Schönenberger, Daniel Riedel, and Martin Bopp (Director of the Hightech Zentrum Aargau) during the award ceremony of the Swiss Nanotechnology PhD Award (Image: Edward Byrne).

Events

Swiss NanoConvention 2018

This year's Swiss NanoConvention was held at ETH Zurich on June 6 and 7. As in previous years, Switzerland's key players in the field of nanosciences came together to learn about a variety of topics and exchange ideas in an interdisciplinary setting.

A novelty this year was the awarding of the first Nanotech Startup Prize, an initiative of the Swiss Micro & Nanotechnology Network. Eight startups were invited to pitch their innovative ideas to the SNC audience.

Dr. Danuta Cichocka, CEO of Resistell, won over the attendees with her presentation, securing the prize for her company. Resistell has designed a device able to detect antibiotic-resistant pathogenic bacteria. It works by analyzing the bacteria's minute movements, requires no elaborate and time-consuming cultivation, and quickly and reliably recommends an effective antibiotic.

Christian Schönenberger, Director of the Swiss MNT Network and the SNI, presents the first Startup Prize to Danuta Cichocka, CEO of Resistell (Image: Edward Byrne).

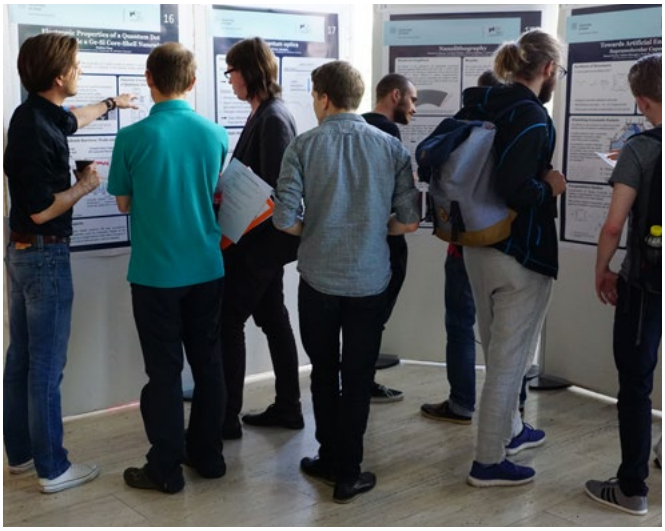
During the SNC, as in last year's edition, awards were presented to five junior researchers who distinguished themselves with outstanding publications as lead authors arising from their doctoral theses. The prize sponsored by the Hightech Zentrum Argau went to Dr. Daniel Riedel, an alumnus of the SNI PhD School and currently working as a postdoc at the University of Basel, for his paper in the journal Physical Review X on quality enhancement of photons generated by a quantum system (see portrait for more information).

The remaining PhD prizes, sponsored by the companies Carl Zeiss, BASF, Bühler and Sensirion were awarded to Dr. Rajib Schubert of the Friedrich Miescher Institute for Biomedical Research (FMI) in Basel, Dr. Celine Calvino of the Adolphe Merkle Institute (AMI) at the University of Fribourg, Dr. Gotthold Fläschner of the ETH Zurich, and Dr. Amir Ghadimi of the EPF Lausanne.

Pictures and details of the SNC are available at
http://swissnanoconvention.ch/2018/

Valuable information at "SmallTalk"

For the second time, bachelors' students on the nanosciences program organized the day-long conference "SmallTalk" to tell each other and interested visitors about the block courses they completed last semester. In nineteen short presentations and posters, the students



During the student conference «SmallTalk», the block courses were presented and discussed.

provided background information on the research work of the various teams they became a part of for the duration of the one to three-week block courses. They also shared their own research results and personal experience working at Basel University's laboratories and the research institutions that are part of the SNI Network.

Both presentations and posters were assessed and graded by professors during the conference.

"This independently planned and executed conference is an excellent opportunity for young researchers to familiarize themselves with an additional aspect of scientific research," remarked the new coordinator of the nanosciences program, Dr. Anja Car.

The students had previously attended a seminar in which they received tips and tricks from experts on how to present scientific content and prepare informative posters. "This year's SmallTalk was flawlessly organized, and I was very impressed by the presentations, some of which were outstanding," commented program director Wolfgang Meier, one of the professors who had offered a block course and who was responsible for assessing the corresponding presentations.

Christian Schönenberger and Wolfgang Meier (left and right) awarded Fabian Oppliger for his excellent presentation on nanolithography.

Informative and entertaining

Do you know about the new newsletter from the Association of Nano Students? If not, it's well worth a read. You'll gain an insight into the students' lives, learn about exciting approaches to nanotechnology research, get to know various scientists, and undoubtedly enjoy a joke or two.

https://nanoblog.unibas.ch/wp-content/uploads/2018/06/nanoletter_20181_eversion-1.pdf

Nanosciences for the general public

Members of the public recently had a chance to learn more about the nanosciences and the activities of the SNI at two different events. The first consisted of an SNI stand at the May market in Lenzburg, offering visitors a wealth of information and activities. For the second, Dr. Kerstin Beyer-Hans put together a nanosciences program for the SamstagsUni course series offered by Volkshochschule beider Basel, involving numerous SNI members.

At the Lenzburg May market, a wheel of fortune and the chance to win a prize attracted countless visitors to the SNI stand, where they were given general information about the nanosciences, the Canton of Aargau's commitment to nanotechnology, and a selection of the SNI's research activities.

A puzzle requiring participants to match electron microscope images of pollen to the correct plant challenged visitors of all ages. Those with a little more time on their hands conducted a small experiment demonstrating how paper testing systems work.

"Which plants belong to the different pollen?" – this was one of the questions for visitors of the SNI stand at the May market.

"It was very satisfying for us to see how interested people are in the nanosciences, and to offer them a glimpse into the world we work with on a daily basis. After a long day in Lenzburg, a few more people had learned that a nanometer is a millionth of a millimeter," said Christian Schönenberger of his team's efforts.

For those with more of an appetite for in-depth science, eight professors from the SNI network spent four Saturdays lecturing on various areas of the nanosciences in Sissach as part of the SamstagsUni course series. Participants were given a sense of the true meaning of the term "nano", what innovations nanoscience will bring in areas such as medicine, biology, chemistry, material sciences, and IT, and how Switzerland is going about the task of regulating these new technologies to forestall any potential risks.

"What is my prize?" was a question that many visitors had at the SNI's wheel of fortune in Lenzburg.

During the SamstagsUni in Sissach, interested participants received a deeper insight into the exciting nanoworld.

Outreach activities

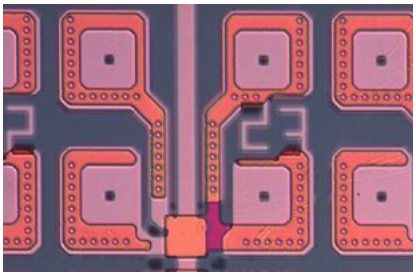
If you are interested in the activities of the SNI's outreach team, a short video shows how and where we are engaged.

https://nanoscience.ch/de/media-2/videos/

Uni news and media releases from the SNI network

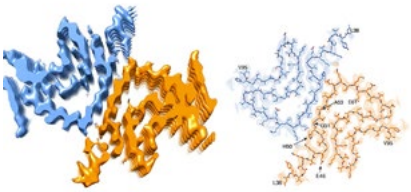
University of Basel, July 12, 2018. Electrical contact to molecules in semiconductor structures established for the first time

Electrical circuits are constantly being scaled down and extended with specific functions. A new method now allows electrical contact to be established with simple molecules on a conventional silicon chip. The technique promises to bring advances in sensor technology and medicine, as reported in the journal Nature by chemists from the University of Basel and researchers from IBM Research – Zurich in Rüschlikon.



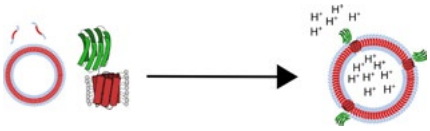
University of Basel, July 6, 2018. How does Parkinson's disease develop? Study raises doubts on a previous theory of Parkinson's disease

Parkinson's disease was first described by a British doctor more than 200 years ago. The exact causes of this neurodegenerative disease are still unknown. In a study recently published in eLife, a team of researchers led by Prof. Henning Stahlberg from the Biozentrum of the University of Basel has now questioned the previous understanding of this disease.



Swiss Nanoscience Institute, June 27, 2018. Motor for molecular factories up and running

An interdisciplinary team comprising members from the University of Basel, the University of Bern and the ETH Zurich has succeeded in inserting the proton pump proteorhodopsin into tiny vesicles enclosed in a synthetic polymer membrane for the first time. In doing so, the researchers created an efficient energy source for an artificial molecular factory. They supported their experiments by means of statistical experimental design for the first time, and created an excellent basis for further optimization and expansion of the concept by employing quantitative measurements, according to their report in the scientific journal Nature Communications Chemistry.

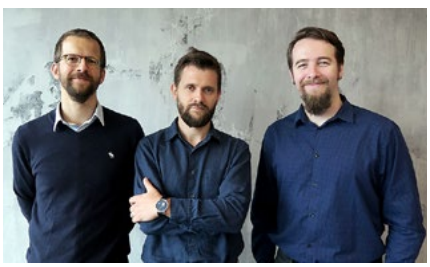


University of Basel, June 25, 2018. Teacher events: back to the lecture hall

Sitting in silence, listening, taking notes – commonplace activities in a university, you might think. Not so for the region's high school teachers, who once a year go back to being students at the University of Basel to refresh their scientific knowledge.

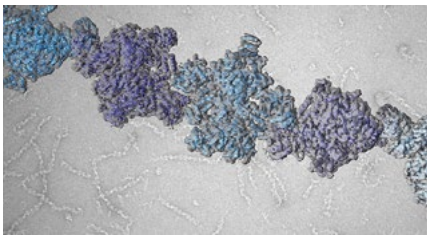
University of Basel, June 15, 2018. Startup from Basel Qnami wins Venture Kick finals

The young startup of the University of Basel, Qnami, is the winner of the Venture Kick prize worth 130'000 Swiss Francs. Qnami develops precise and highly sensitive quantum sensors that provide images in nanometer resolution.



University of Basel, June 14, 2018. Enigma of fatty acid metabolism solved: Enzyme shape controls its activity

Fats are essential for our body. The core components of all fats are fatty acids. Their production is initiated by the enzyme ACC. Researchers at the University of Basel's Biozentrum have now demonstrated how ACC assembles into distinct filaments. As the researchers report in "Nature," the type of filament formed controls the activity of the enzyme and thus fatty acid production.

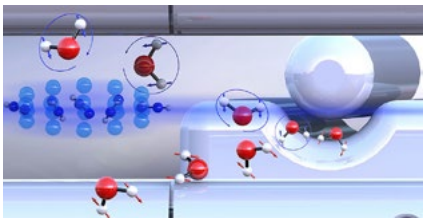


Swiss Nanoscience Institute, June 13, 2018. Transnational research for sustainable pest management in winegrowing

On Monday, June 11, 2018, the SNI's Nano Imaging Lab hosted a symposium for the participants in the Interreg project Vitifutur. The project brings together leading Swiss, German and French research institutions to research innovative strategies for sustainable pest management in winegrowing in the Upper Rhine region.

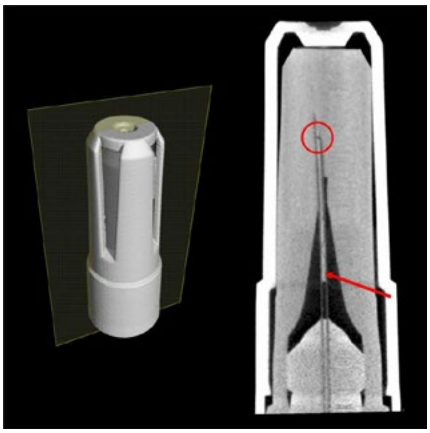
University of Basel, May 29, 2018. Water is not the same as water

Water molecules exist in two different forms with almost identical physical properties. For the first time, researchers have succeeded in separating the two forms to show that they can exhibit different chemical reactivities. These results were reported by researchers from the University of Basel and their colleagues in Hamburg in the scientific journal Nature Communications.



Paul Scherrer Institut, May 28, 2018. Imaging the inside of injection needles with neutrons – PSI researchers help to understand why in pre-filled syringes, liquid medication can enter the needle inadvertently

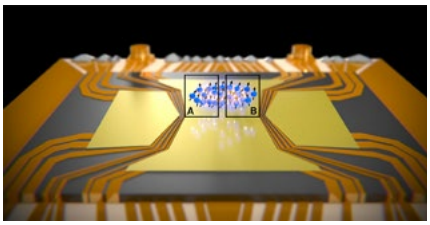
Researchers from the Paul Scherrer Institute PSI, the University of Basel and the company F. Hoffmann-La Roche have found out why proper storage is crucial for syringes which are pre-filled with a liquid medication. Thanks to the special, well established neutron imaging capability at PSI, it's clear: The liquid medication can inadvertently get from the syringe cylinder into the metal needle prior to administration when the pre-filled syringe is stored at adversely high temperatures. The research results have been published in the scientific journal European Journal of Pharmaceutics and Biopharmaceutics.



Swiss Nanoscience Institute, May 10, 2018. Nano researchers at the Lenzburg May market

Researchers are being told to leave their ivory tower and engage with the public face to face. Last Wednesday, SNI director Professor Christian Schönenberger and his team did just that at the May market in Lenzburg. The researchers of the Swiss Nanoscience Institute, which is supported by the Canton of Aargau and the University of Basel, spent the day at a market stand in Torgasse, offering visitors an insight into their nanoscience research with a range of activities.

University of Basel, April 27, 2018. Einstein-Podolsky-Rosen paradox observed in many-particle system for the first time



Physicists from the University of Basel have observed the quantum mechanical Einstein-Podolsky-Rosen paradox in a system of several hundred interacting atoms for the first time. The phenomenon dates back to a famous thought experiment from 1935. It allows measurement results to be predicted precisely and could be used in new types of sensors and imaging methods for electromagnetic fields. The findings were recently published in the journal Science.

Full media release can be found at:
https://nanoscience.ch

Your feedback is important!

Please send ideas, feedback and material for *SNI update* to Christel Möller (c.moeller@unibas.ch).
We are looking forward to your input.