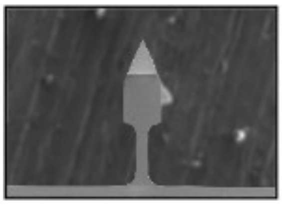
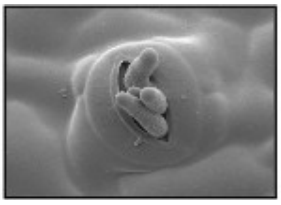
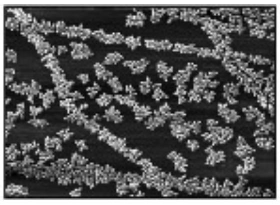
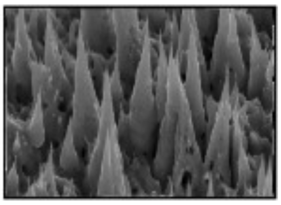
view in browser

University of Basel
Swiss Nanoscience Institute

SNI SWISS NANOSCIENCE INSTITUTE
EINE INITIATIVE DER UNIVERSITÄT BASEL UND DES KANTONS AARGAU

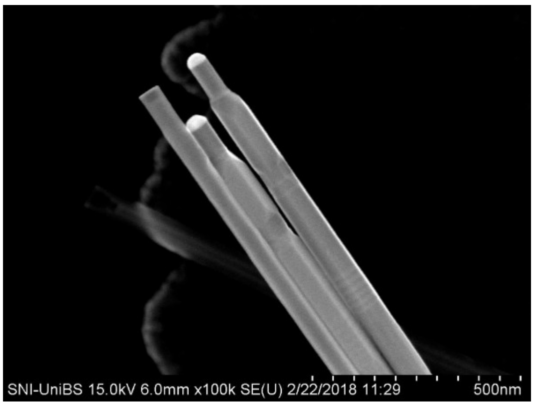
NANO IMAGING LAB

N e w s l e t t e r VOLUME II, April 9, 2018

What are Nanowires ?

Semiconducting nanowires are crystalline quasi-one-dimensional nanostructures with diameters on the scale of tens of nanometers and lengths up to several micrometers. Nanowires are a very versatile material system which can be used in a wide variety of applications ranging from nanoscale LEDs, sensors, lasers, transistors and quantum bits.



These nanostructures can be synthesized from many different materials such as Silicon, Germanium or Indium. One possible approach towards the bottom-up growth of semiconducting nanowires is the so called “metal-organic vapor phase epitaxy” (MOVPE), which allows the grower to control the properties of the nanowires on the atomic scale.

Recently, researchers from the group of Prof. K. Dick Thelander from the University of Lund have used this technique to control the crystal phases of Indium-Arsenide nanowires in order to create electronic single and multiple tunnel barriers [1]. By controlled growth of atomically sharp interfaces they are able to switch between Zinc blende (ZB) and Wurtzite (WZ) crystal phase which have a different band gap. Since the WZ phase has a larger bandgap, it can be used as a barrier for electrons in an otherwise ZB. - grown nanowire. Two barriers in sequence result in a quasi-zero-dimensional nanostructure, a so-called quantum dot. The quantum dot, also referred as an artificial atom (red) is formed in between two WZ segments (blue) which constitutes one of the most fundamental building blocks in nano and quantum electronics on which the number of electrons can be controlled exactly. This versatile platform can thus be used as a building block for quantum electronic devices

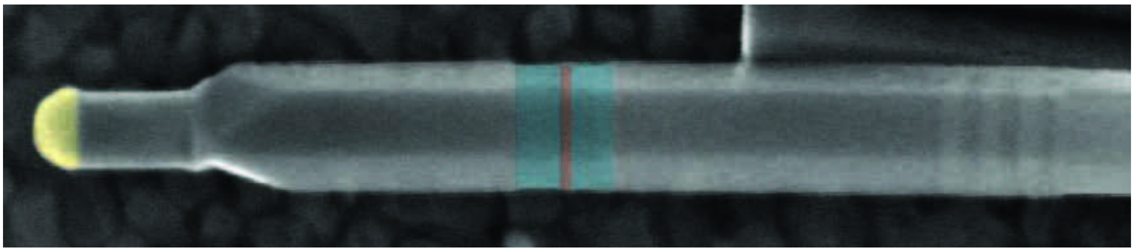
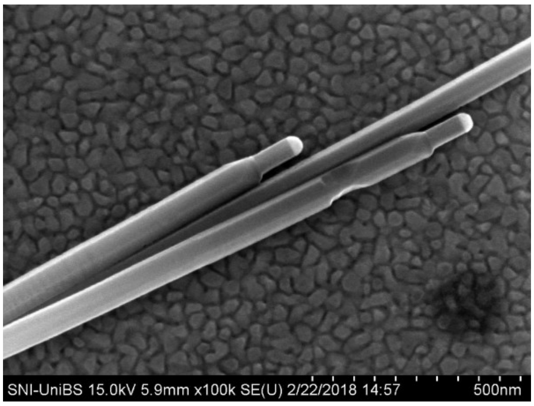


Figure1: Indium-Arsenide nanowire (Zinc blende crystal phase) with incorporated quantum dot (red) between Wurtzite (blue) crystal phase. On top of the nanowire, the gold catalyst seed particle is coloured in yellow.

In collaboration with the group of C. Thelander from the University of Lund, scientists of the group of C. Schönenberger from the University of Basel investigated this unique nanowire platform in ongoing experiments. The nano-imaging lab supported them with detailed scanning electron micrograph



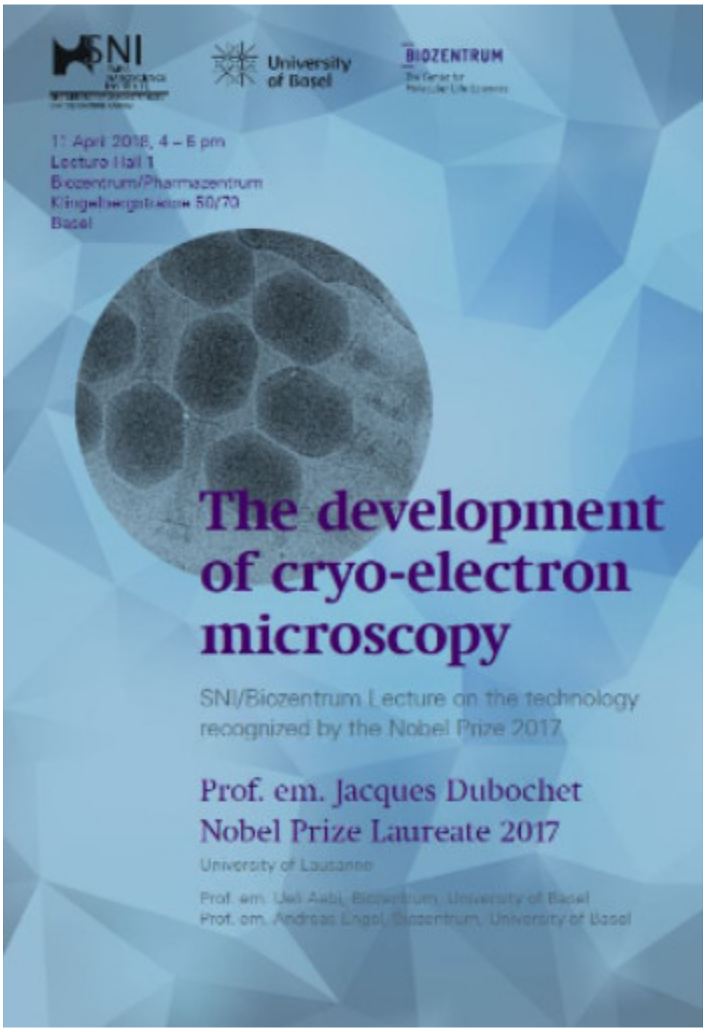
images of these NWs, in order to locate the exact position of the WZ segments and therefore the quantum dot, which is crucial for their experiments.

All above SEM pictures were taken by Evi Bieler.

[1] M. Nilsson et al., Physical Review B **93**, 195422 (2016)

Noble Laureate visiting the SNI

Come and honor with us the last years winner of the noble price in Chemistry, Professor em. Jacques Dubochet (flyer).


University of Basel
BIOZENTRUM
11 April 2018, 4 – 6 pm
Lecture Hall 1
Biozentrum/Pharmazentrum
Klingelbergstrasse 50/70
Basel
The development of cryo-electron microscopy
SNI/Biozentrum Lecture on the technology recognized by the Nobel Prize 2017
Prof. em. Jacques Dubochet
Nobel Prize Laureate 2017
University of Lausanne
Prof. em. Ueli Aebi, Biozentrum, University of Basel
Prof. em. Andreas Engel, Biozentrum, University of Basel

Program

04.00	Welcome address Prof. Christian Schönenberger, Swiss Nanoscience Institute, University of Basel
04.10	Swiss efforts into cryo-electron microscopy Prof. em. Ueli Aebi, Biozentrum, University of Basel
04.30	The science that got me the Nobel Prize, and the science that didn't. Prof. em. Jacques Dubochet, University of Lausanne
05.10	Structural Biology goes from x-rays to electrons Prof. em. Andreas Engel, Biozentrum, University of Basel
05.40	Closing remarks Prof. Christian Schönenberger
05.50	Apéro

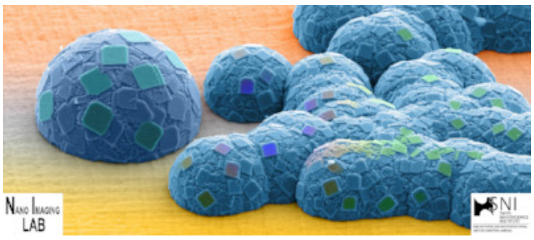
Professor emeritus Jacques Dubochet was awarded the Nobel Prize in Chemistry 2017 for the joint development of cryo-electron microscopy together with Professor Joachim Frank and Professor Richard Henderson. Their invention has revolutionized biochemistry and has enabled scientists worldwide to capture every corner of a cell in atomic detail.

Jacques Dubochet and his long-time colleagues Andreas Engel and Ueli Aebi have shaped structural biology at the Biozentrum of the University of Basel for many years through the Maurice E. Müller Institute, paving the way to the establishment of the Swiss Nanoscience Institute at the University of Basel. They will share their insights into the fascinating world of electron microscopy with us.

New Nano Imaging Lab Cups available

Our new Nano Imaging Lab cups with SEM-motives are out ! The popular and long desired cups are now available with 6 different new designs:

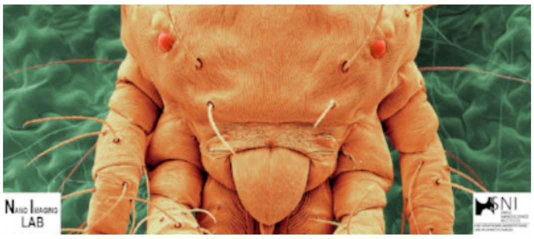
Wing Scales of Butterfly



Synthetic Diamond

Many types of butterflies use light-interacting structures on their wing scales to produce color. The cuticle on the scales of these butterflies' wings is composed of nano- and microscale, transparent, chitin-and-air layered structures. Rather than absorb and reflect certain light wavelengths as pigments and dyes do, these multi scale structures cause light that hits the surface of the wing to diffract and interfere.

Carbon in its purest form is diamond produced in an artificial process, as opposed to natural diamonds, which are created by geological processes. There are two common ways of production: the high-pressure high-temperature method and chemical vapor deposition crystal formation method.

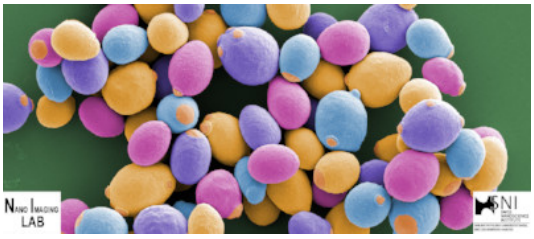


Spider Mite on Bean Leaf

Spider mites are members of the Acari (mite) family, which is a subclass of the Arachnida (spider) and includes about 1,200 species. They generally live on the undersides of plant leaves, where they may spin protective silk webs, and they can cause damage by puncturing the plant cells to feed. Spider mites are known to feed on several hundred species of plants.

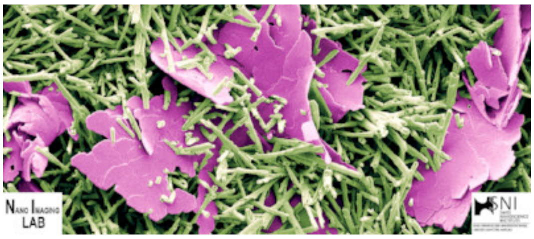
Forsythia Pollen

As one of the first plants the border forsythia brings some colour to the garden in spring. The ornamental shrubs are very popular with their yellow flowers, which are formed in abundance on the branches already in April. It decorates many gardens, mostly as a robust hedge plant.



Brewing Yeast plays colorful !

The most important ingredient in brewing was the last one discovered, because yeast is a single-celled organism that is invisible to the naked eye. Still, brewers have long known that some unseen agent turned a sweet liquid into beer. Long ago, the action of yeast was such a blessing, yet so mysterious, that English brewers called it “Godisgood”.



Wax Structure of Hosta Plant Leaf

With its crazy architecture and ultrahydrophobic properties the hosta plant leave shows the so called lotus effect. The name refers to self-cleaning properties as observed on the leaves of the lotus flower. Dirt particles are picked up by water droplets due to the micro- and nanoscopic architecture on the surface, which minimizes the droplet's adhesion to that surface.

If you would like to purchase one of these unique artifacts for 15,- CHF, please come to our offices: Kragenbau level EG rooms 0056, 0057 and 0058.