University of Basel
Swiss Nanoscience Institute

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

NANO IMAGING LAB

Newsletter

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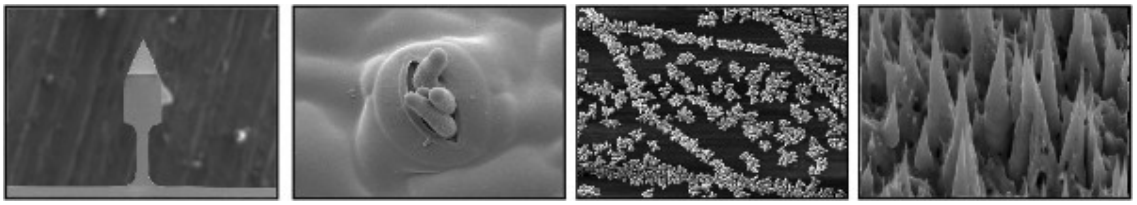
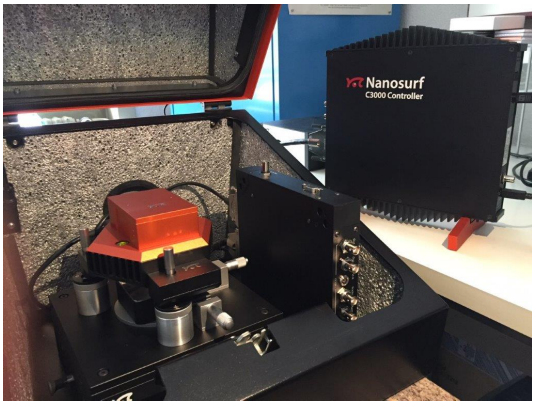


New C3000 controller for FLEX AFM system

In our AFM lab, located in the Physics Department, we have recently upgraded our FLEX system with a new C3000 controller. The system is equipped with two scan heads (10µm and 100µm) and a manual XY-stage with vibration isolation. A very sensitive 24-bit ADC/DACs electronic design allows precise zoom-in and data acquisition. The cantilever calibration option enables the evaluation of the spring constant by a contact-free internal thermal tuning module. If desired, the system can be controlled by other external software (e.g. LabView) due to the additional scripting interface option.



Upgrade advantages in brief:

- All-digital signal processing for maximum freedom of operations
- Very sensitive 24-bit ADC/DACs for zoom-in and precise data acquisition
- Differential signal pathways for highest quality signal handling and low noise

- Free resonance detection via thermal tuning
- Spring constant calibration and calculation by Sader method
- Q-Factor calculation
- Deflection sensitivity calibration
- FFT spectrum analyzer

Research without borders for sustainable viticulture

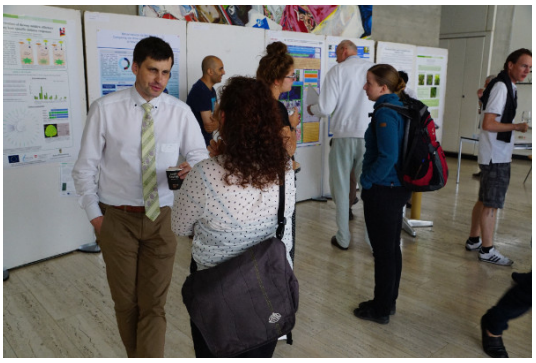
Vitifutur

The Nano Imaging Lab hosted a meeting of all project partners of the Interreg Project Vitifutur on Monday, June 11th 2018 at the University of Basel. Leading research institutions in the Oberrhein region presented their preliminary results about some of the most urgently problems :

Dr. Günther Buchholz from AlPlanta in Neustadt an der Weinstrasse (Germany) reported about funghi resistant grapes (called Piwi), that allow a reduction in the application of pesticides by up to 75 percent.
Since also viruses damage the grapes and lead to enormous economical losses, Dr. Christophe Rotzenthaler from CNRS in Strasbourg (France) developed an antibody-based analysis in collaboration with Bioreba AG in Reinach (Switzerland). The technique identifies viruses using a particular part of antibodies (Nanobody).

Toxin building funghi are responsible for the wood disease Esca in grape plants, which increased significantly during the past decades, Dr. Hanns-Heinz Kassemeyer from Staatliches Weinbau Institut in Freiburg (Germany) explained. He presented elaborately the course and the appearance of this chronic disease.

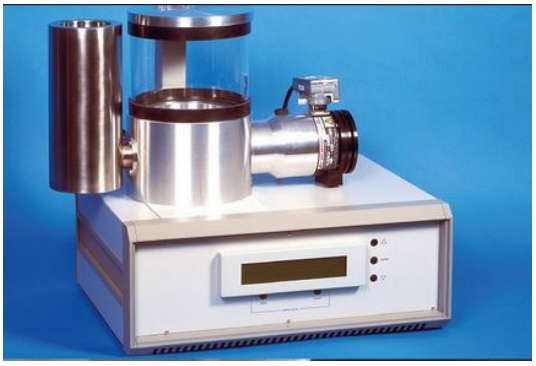
But the crucial factor in this sensitive balance between host and funghus, which is also present in healthy plants, was shown by Prof. Dr. Peter Nick from the Karlsruher Institut für Technologie (Germany). His group was able to identify a substance, named signal of capitulation, which is produced by the plant itself and triggers the killing of the host.



After the inspiring talks the 30 participants had the opportunity to discuss their work in a postersession and to visit the Nano Imaging Lab, which is a valuable partner in the Vitifutur project. The NI Lab delivers detailed high resolution images of surfaces to project partners, that contribute crucially to the understanding of the diseases, said Dr. Markus Dürrenberger, who hosted this very successful meeting in Basel.

Freeze Drying ... makes all the difference

Particles up to the size of bacteria are often prepared by ‘Negative Staining’, using heavy metal salts and air drying. Objects bigger than 30 nm start to suffer preparation artefacts, of which the worst is structural collapse by surface tension of a drying layer of water. Freeze drying takes objects out of life by ultra-rapidly freezing them down to liquid nitrogen temperature. The ultrastructure is stabilized by vitreous ice and nearly all objects are solids at this temperature. The following sublimation of ice under ultra-high vacuum conditions and temperatures of -100°C guarantee dehydration without artefact generation. The freeze dried sample can then be inspected at room temperature in a SEM, TEM or AFM.
Freeze drying tremendously improves the quality of imaging nanoparticles and vesicles.



This is why the NI Lab decided to invest in an **EMS 775 Turbo Freeze Dryer**.
It operates at temperatures down to -140°C and employs a Turbomolecular pumping unit, backed by a Rotary Vacuum pump. The lower temperatures are achieved by using a Liquid Nitrogen fed Cold Stage.

Samples prepared by Freeze Drying are usually unstained. For AFM inspection there is no need for any contrast enhancement. For SEM a sputter layer needs to be deposited to guarantee the electrical conductivity. TEM imaging can either be done under low contrast conditions or with the help of low angle shadowing with platinum-carbon. It is also feasible to add a positive stain to the sample before the ultra-rapid freezing process.

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http://nanoimaging.unibas.ch