Empa – Materials and Technologies for a Sustainable Future

As an interdisciplinary research institute of the ETH Domain, Empa, the Swiss Federal Laboratories for Materials Science and Technology, conducts cutting-edge materials and technology research. Empa's R&D activities focus on meeting the requirements of industry and the needs of society, and thus link applications-oriented research to the practical implementation of new ideas. As a result, Empa is capable of providing its partners with customized solutions that not only enhance their innovative edge and competitiveness, but also help to improve the quality of life for the public at large, true to its mission statement: "Empa – The Place where Innovation Starts". As part of the ETH Domain, Empa is committed to excellence in all its activities.

GENERAL INFORMATION

Location Empa
Lerchenfeldstrasse 5
9014 St. Gallen

Costs Free of charge

Registration For registration please refer to
www.empa-akademie.ch/bio-afm

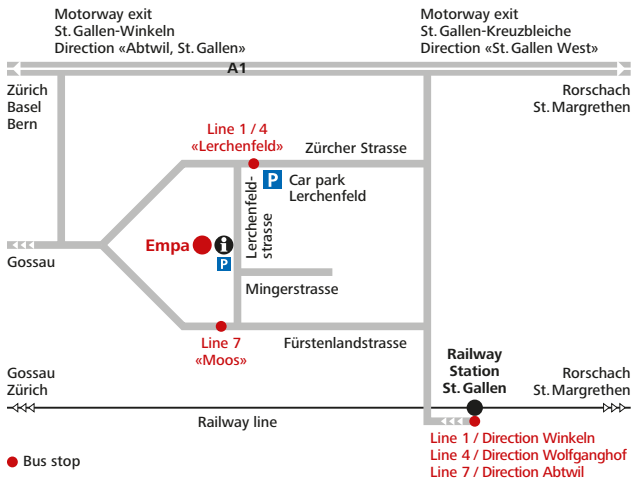
You will receive a confirmation by e-mail.

Deadline September 20, 2018

Contact Empa
Prof. Dr Hans J. Hug
Laboratory for Nanoscale Materials Science
Phone +41 58 765 41 25
hans-josef.hug@empa.ch
www.empa.ch/web/empa/nanoscale-materials-science

How to get here Please do use public transport.
There is only very limited parking available.

DIRECTIONS



Empa
Akademie

WORKSHOP

BIO-AFM: AFM and related Techniques for Biological Research

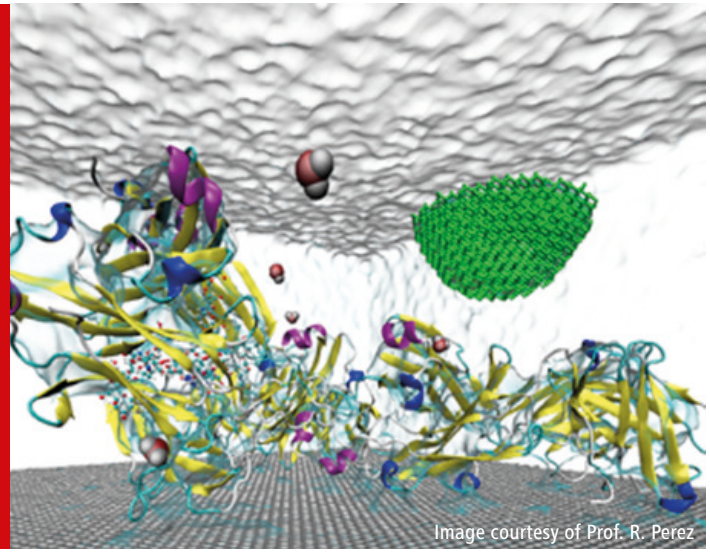


Image courtesy of Prof. R. Perez

Empa, Lerchenfeldstrasse 5, St. Gallen
September 27, 2018

Online registration:
www.empa-akademie.ch/bio-afm

TOPIC

The Atomic Force Microscope (AFM) allows the study of biological materials in their native, liquid environment. Atomic resolution in liquids can routinely be obtained, and the ordering of water close to the surface can be observed. Moreover, forces between the tip and biomolecules, and their dependence on distance can be measured with pico-Newton and sub-nanometer precision, respectively. Self-assembly processes, fluctuations, and entropically or chemically powered changes of the shape of biomolecules are ingredients of fundamental importance for their biological function. High-speed AFM allows the detection of such processes and bio-molecules in action with sub-molecular spatial resolution. The more rapid internal dynamics of bio-molecules however remains difficult to assess. Here, theoretical work gives insight and allows the calculation of the time-averaged molecule-tip interactions that can then be compared to experimental data. Apart from imaging, AFM technology can for example also be used to measure changes of cell mass with time or for the manipulation of matter at the nanometer scale. The availability of an AFM using cantilevers with built-in channels added another experimental dimension, for example allowing the non-destructive extraction of molecules from single cells.

The BIO-AFM focuses on the application of AFM for imaging biomolecules and cells at work in their native environment, and understanding fundamental aspects of the mechanisms behind. Experts will review different experimental techniques of AFM relevant for biological research, and discuss some seminal work performed in this field.

TARGET AUDIENCE

This 1-day workshop is targeted at all members of research groups from academia and industry who are interested in the application of AFM and related techniques for the study of biological materials.

PROGRAM

09:00 **Welcome and introduction to scanning force microscopy for materials science**
Prof. Dr Hans J. Hug
Laboratory for Nanoscale Materials Science, Empa

09:15 **Invited talk:**
Frontiers in nanoscience: A force microscope perspective on ions, proteins and cells
Prof. Dr Ricardo García
Advanced Force Microscopy and Nanolithograpy Lab (ForceTool), Instituto de Ciencia de Materiales de Madrid (CSIC)

10:15 **Coffee break**

10:45 **Invited talk:**
Understanding the mechanical properties of biomolecules in liquids with large-scale atomistic molecular dynamics simulations
Prof. Dr Rubén Pérez
Departamento de Fisica Teorica de la Materia Condensada, Universidad Autónoma de Madrid

11:30 **Invited talk:**
High-speed AFM and SCIM:
watching biological samples in dynamic action
Prof. Dr Toshio Ando
Nano Life Science Institute (WPI NanoL SI), Kanazawa University

12:15 **Lunch break**

13:45 **Invited talk:**
Challenges and opportunities of time resolved AFM imaging in biology
Prof. Dr Georg Fantner
Laboratory for Bio- and Nano-Instrumentation, EPFL

14:30 **Invited talk:**
Tracking a cell's mass:
A new tool for cell physiology
Dr David Martín Martínez
Department of Biosystems Science and Engineering, ETH Zurich

15:15 **Coffee break**

15:45 **Invited talk:**
Integrating fluidics with AFM:
New avenues for single cell analysis
Dr Orane Guillaume-Gentil
Department of Biology, Institute of Microbiology, ETH Zurich

16:30 **Closing address**
Prof. Dr Alex Dommann
Department Materials meet Life, Empa

Apéro