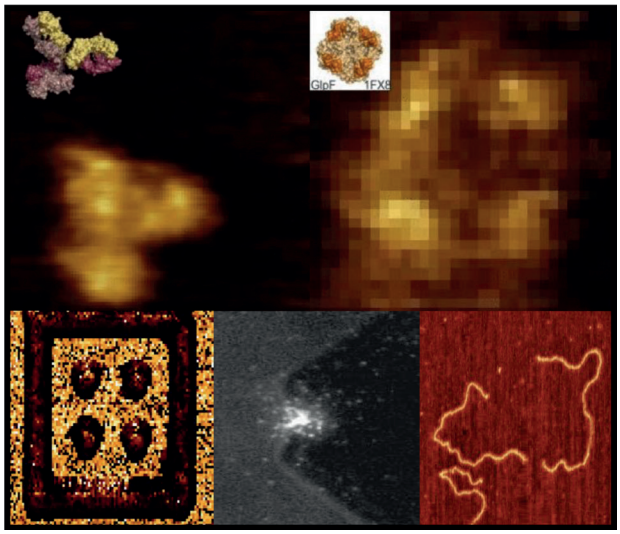
TIMed CENTER
Technological Innovation in Medicine

TIMED CENTER CORE FACILITIES

# DYNAMICS AND INTERACTIONS OF BIO-NANO-STRUCTURES




## Functions and Services

- Analysis of molecular interactions as well as physical surface properties by means of force spectroscopy, quartz crystal microbalance (QCM), surface plasmon resonance imaging (SPRi)
- Chemical rate constants and affinities, stoichiometry, multivalence, interaction forces and energies
- Direct and label-free visualization of biomolecules, interactions as well as conformational changes by means of high-speed atomic force microscopy; cellular interaction studies in high-resolution both in terms of time and space (characterization of active ingredients) (FM-AFM)
- Combination of results and model building, mathematical modelling and simulation

Molecular interactions of bio-nanostructures and the accompanying dynamics form the basis of all biological processes and are thus of great importance from a pharmaceutical and medical point of view. In order to understand these processes as well as their potential malfunction, it is necessary to examine and characterize their nanoscopic roots in detail. This is the task of the research group at the *FH Upper Austria, Linz Campus*.

For this purpose, the researchers employ **high-speed atomic force microscopy** (HS-AFM), a technique that allows the label-free examination of **protein dynamics**, **molecular interactions** and **conformational changes** under physiological conditions, in real-time and at sub-molecular resolution. The combination of **fluorescence and atomic force microscopy** (FM-AFM) further allows the manipulation of cells as well as the defined transport of bio-molecules (e.g. drugs) to a cell. At the same time, the uptake of molecules and the cellular response are re-corded. The imaging methods are further supplemented by **single molecule force spectroscopy**, which enables the determination of inter/intramo lecular forces in the pico-Newton range, binding energies and chemical rate constants, as well as phys ical surface properties (e.g. Elasticity). In addition to that, ensemble methods like the **quartz crystal microbalance** or **surface plasmon resonance imaging** are used to quantify intermolecular interactions and determine chemical rate constants. In combination with the dynamic-structural data collected by means of HS-AFM, a comprehensive model of a molecular process is generated, which e.g. can be used for the targeted development of drugs.

**nano@timed-center.at**

Bildungsland Oberösterreich