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Using Atomic Force Microscopy to Investigate Biomaterials: From the Topography and Mechanical Properties of Living Cells and Tissues to the Dynamic Processes of Single Molecules

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Atomic Force Microscopy (AFM) has emerged as a powerful tool for life science research. The nano-mechanical analysis of cells, tissues and biomaterials is gaining in importance in different fields of cell biology, e.g. cancer research and developmental biology [1-4].

AFM can be divided into two different worlds. On the one hand, force spectroscopy-based modes are used to characterize the nanomechanical properties of biomaterials. Innovative imaging modes like Quantitative Imaging (QI™) and PeakForce Tapping allow the fast and easy measurement of various sample properties such as topography, nanomechanics and adhesion on the nanometer scale. Revealing the nature of biological processes such as cell differentiation, biofilm formation, and morphogenesis etc. is the main purpose of these techniques [5-8].

On the other hand, investigating dynamic processes at high spatial resolution and fast imaging rates is demanding. Cutting edge electronics, high-end scanner technology and advanced algorithms have led to vastly improved imaging rates. Time-resolved processes such as the dynamics of single molecule binding behavior, two-dimensional protein assemblies, motor proteins and membrane trafficking are just some examples of what can now be investigated.

In this workshop, we will address both worlds and demonstrate two different systems:

- The acquisition of biomechanical data will be shown on a NanoWizard® 4XP system mounted on an inverted optical microscope.
- Highspeed imaging will be demonstrated with the NanoWizard® ULTRA Speed 2 on DNA Origami nanostructures.

Literature

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