A VERSATILE TOOLSET FOR NANOMETER SCALE RESEARCH IN LIFE SCIENCE

KADA Gerald, DUMAN Memed, HUBER Hans-Peter, ROTH Ilona, RANKL Christian,
HINTERDORFER Peter & KIENBERGER Ferry

Agilent Technologies

Abstract

This talk will focus on key Scanning Probe Microscopy (SPM) technology and introduce new and exciting developments for applications in the life sciences. Atomic Force Microscopy (AFM) has been widely used for imaging biological samples down to molecular and subunit resolution under physiological conditions. Moreover, a novel method has been developed for the localization of specific binding sites with nanometer positional accuracy by combining dynamic AFM with single molecule recognition force spectroscopy using functionalized tips, termed Topography and RECognition imaging (TREC).

In addition, optical imaging techniques enable the spectroscopic discrimination of different species in a biological sample. In particular, fluorescence microscopy has proven to be a powerful tool for selective and specific visualization of labeled molecules down to the single molecule level, rendering it possible to follow cellular processes and monitor the dynamics of living cell components. The advantages of AFM and fluorescence microscopy complement each other, and the combination of the two techniques allows a more detailed characterization of cellular structures and processes.

The ultimate level of measuring structure and organization of membrane receptor proteins can be achieved by combining topography measurements with biological recognition mapping (using TREC) AND recording fluorescence images of the very same area. A new way of designing an integrated device which can combine seamlessly all three techniques into a single unit will be discussed.

This talk will finish with an introduction of a new technique, called near field Scanning Microwave Microscopy (SMM), with its potential of measuring changes in capacitance and dielectric constant of biological matter, thereby visualizing structures from underneath the surface.

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