Multimodal Characterization of liposomes and cells: Combining AFM with Confocal Microscopy

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Atomic Force Microscopy (AFM) traditionally offers high-resolution characterization of surfaces. Scanning the sample with a sharp tip in a piezo-electric controlled manner allows us to reconstruct the morphology of small macromolecules up to whole cells and tissues in a nano-meter scale. The force between the sample and the tip can be finely controlled, and resulting force-distance curves can be used to determine the elastic and viscoelastic properties of the sample. AFM used for studying biological samples are often coupled with optical or confocal microscopes, enhancing the range of imaging modalities. The presented poster will describe basic concepts in AFM technique and mechanical properties, together with real applications of this technique coupled with confocal microscopy. Viewers will see the results of dynamic changes of liposomes stiffness within a cytosol-imitating buffer, a morphological analysis of cells treated with a membrane-intercalating substance, and a mechanical mapping of cells undergoing mitochondrial clustering, confirmed by confocal imaging.

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Figure

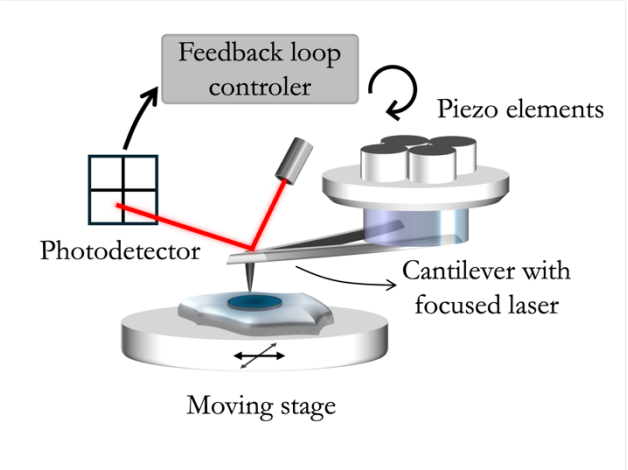

Figure 1. Schematic illustration of AFM. The cantilever bends due to interaction with the surface and this bending is detected by a laser, which is reflected from the back of the cantilever to a four-segment photodetector. The deflection is converted into an electrical signal by a controller. Constant force between the probe and the sample (setpoint) is maintained by a feedback system. The probe (or sample stage) is equipped with ceramic piezo elements, that can move the glass block with cantilever in the xyz axis with high sensitivity. Sample is placed on a stage that can be moved in the xy coordinates.