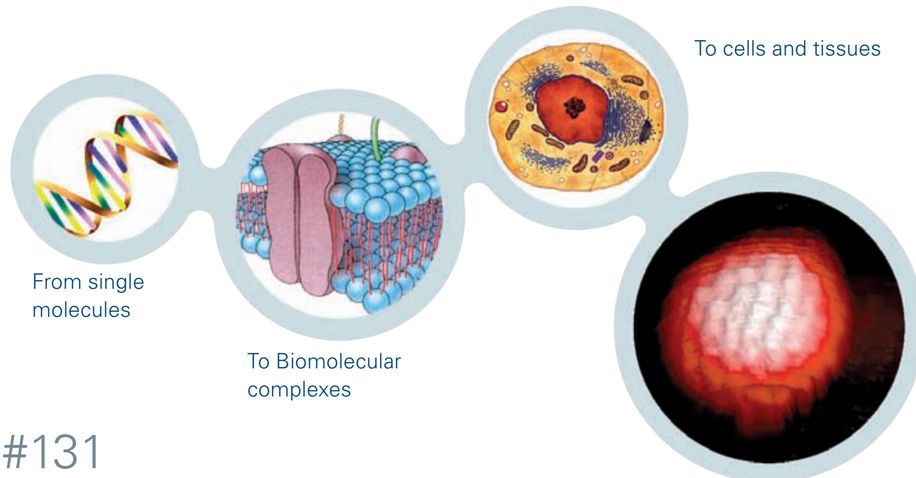

High-resolution imaging with the BioScope Catalyst across all biological size scales

Application Note #131

BioScope Catalyst: Accessing All Biological Size Scales with High-Resolution AFM Imaging

The BioScope™ Catalyst™ Atomic Force Microscope (AFM) operates under physiologically relevant conditions and integrates fully with optical microscopy techniques, providing life science researchers the ability to study biological species across a wide-range of size scales. With its superior engineering and mechanical stability, the Catalyst is ideally suited for obtaining high-resolution, three-dimensional images of individual biomolecules and small biomolecular complexes. From investigating nucleic acids and proteins to characterizing protein assemblies and membranes, high-resolution imaging conducted with the Catalyst offers scientists unique opportunities to research biomolecules and biomolecular processes at the single-molecule level.

Life Sciences Atomic Force Microscopy

Atomic force microscopy allows direct visualization of the three-dimensional structure of a sample surface with nanoscale resolution. Unlike many other high-resolution imaging techniques, AFM does not require staining or coating of the sample, leaving native surfaces unaltered. Together with the ability to operate in a fluid environment, this makes AFM an unparalleled technique for studying biomolecules and the dynamics of biological processes in situ and in real-time.

Biological research encompasses a wide-range of size scales and structural complexity, from single molecules to cells to tissues. As such, an instrument or technique capable of high-resolution imaging of single biomolecules, as well as larger biomolecular complexes, can provide biologists with unique research opportunities. The BioScope Catalyst AFM was specifically designed with this in mind. The system can be functionally integrated with various light microscopy techniques (brightfield, phase contrast, DIC, epi- and confocal fluorescence, etc.) to allow optically guided navigation of the AFM probe to regions of a sample for high-resolution AFM imaging and the production of correlated AFM and optical image datasets. With the industry's largest closed-loop, X-Y scan range of 150 microns, a Z range of ≥20 microns, and capability for environmental control, the Catalyst repeatedly has demonstrated its unmatched performance for combined AFM and optical microscopy studies of live cells (see figure 1).[1-4] However, the Catalyst is not just for live cell studies. The highest quality engineering and mechanical stability of the Catalyst AFM facilitates high-resolution imaging of smaller biomolecular species as well. Even when installed on an inverted optical microscope, the Catalyst's imaging performance is not compromised (see figure 2).