See What You Are Missing:
Bruker Microscopes Fill the Gap Between Traditional Fluorescence and Electron Microscopy

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The imaging and characterization of biological structures and processes have moved beyond the capabilities, resolution and speed of conventional fluorescence and electron microscopes. Eukaryotic cells consist of organelles and other subcellular structures so small they can only be resolved in detail with super-resolution methods. Such cells have membranes with mechanical properties best investigated at the nanoscale using atomic force microscopy. Neurons form circuits in the brain so far from the surface only two-photon microscopy can reach them. To visualize individual cells, neurons or even molecules in the context of an entire living organism requires light-sheet microscopy.

Bruker has developed a suite of such advanced microscopes that collect information from cells, complex organ/tumor/tissue models or entire organisms in-vivo; information not accessible with traditional fluorescence or electron microscopy. In this webinar, experts from Bruker discuss the technology behind atomic force, super-resolution, two-photon, and light-sheet microscopy. We will highlight applications in which these technologies are essential to solving biological mysteries.

Bruker's Webinar Speakers

Romina Macco, Ph.D.
EMEA Sales Applications and Customer Service Manager
Bruker

Torsten Mueller, Ph.D.
Project Manager
Bruker

Lina Streich, Ph.D.
Marketing and Application Specialist
Bruker

Winfried Wiegraebe, Ph.D.
Vutara Super Resolution Microscopy Product Manager
Bruker

See What You Are Missing:
Presentation Abstracts

Light-Sheet Microscopy

Light-sheet microscopy is the coming-of-age gentle, high-resolution and fast, full 3D volume fluorescence imaging technique in fields as diverse as cell and developmental biology, neuroscience, oncology, plant research or biophysics.

With a strong focus on applications Bruker Luxendo SPIM Light-Sheet configurations enable imaging of developing embryos or 2D and 3D culture systems like cell lines and organoids, in multi-position experiments and under full environmental control allowing imaging over extended periods of time, even up to days. Furthermore, photomanipulation can be added to any of our SPIM system to support tissue photoablation, photobleaching, FRAP or optogenetic experiments.

In combination with tissue optical clearing techniques Bruker Luxendo SPIMs allow the in toto recording of very large specimens up to entire adult mice in a non-destructive fashion within minutes. Luxendo SPIMs are thus ideal for studying the brain or the central nervous system, for analyzing organ development or for investigating tumor structure and genesis in oncology.

Presenter: Lina Streich, Ph.D., Bruker

Two-Photon Microscopy

Multiphoton microscopy is a great approach for the investigation of cells, organoids, tissue slices, and organs in living animals due to the high penetration performance, better resolution along the Z dimension and limited sample heating and damage. This powerful technique is optimal to study the physiology and pathology of the brain in neuroscience, as well as to elucidate biological aspects of life sciences in a broad range of other biomedical applications including immunology and oncology.

Thanks to the high-level engineering design, the Bruker Ultima 2Pplus allows to image and investigate a wider portion of the biological sample, offering a larger Field Of View with respect to traditional multiphoton microscopes, without sacrificing signal uniformity, collection efficiency, resolution and speed.

In addition to being a powerful imaging platform for both in vitro and in vivo studies, the Ultima 2Pplus is characterized by extraordinary photostimulation performances, thanks to the Spatial Light Modulator and the Electrically Tunable Lens modules. The combination of the two technologies results in holographic photoactivation of dozens of cells simultaneously and with high precision in the X, Y, and Z dimensions while performing fast 3D imaging.

Presenter: Romina Macco, Ph.D., Bruker

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Single-Molecule Localization for Advanced Biological and Genomic Imaging: The Bruker Vutara VXL

Most subcellular structures are smaller than 300 nm. Because the size of these structures is below the classical resolution limit for fluorescence microscopy, one cannot use the specificity of this powerful technology to resolve them. The single-molecule localization microscopy (SMLM) technology implemented in the Bruker Vutara VXL overcomes this limitation. With an optical lateral resolution of 20 nm, SMLM is uniquely qualified to address biological mysteries that require specific labeling as used in fluorescence microscopy, but with higher resolution than can be achieved with diffraction-limited microscopy. In addition to SMLM, the Vutara VXL implements imaging workflows for multiplexed chromatin tracing and smFISH applications. Thus. the system allows imaging, resolving, and quantifying cellular structures, molecular machines, proteins, RNA, and chromosomal structures.

Presenter: Winfried Wiegraebe, Ph.D., Bruker

Atomic Force Microscopy

In the past decades, atomic force microscopy (AFM) has become standard in the high resolution structural analysis of samples ranging from single molecules to complex macromolecular systems. Unlike other high resolution imaging techniques, it does not require any specific sample modification (except for surface deposition), the risk, therefore, of introducing artefacts through sample preparation is reduced. In recent years, there has been an increased demand for the application of novel developments featuring high speed AFM imaging (>10 framse/sec), quantitavtive nanomechanical characterization of samples, and advanced feedback imaging modes that tweak the maximum attainable resolution. Furthermore, the examination of specific molecules or features carrying immunochemical information has been made possible by combining AFM with recent developments in optical/fluorescence microscopy, therefore complementing the advantages of both techniques and enabling true correlative microscopy.

Presenter: Torsten Mueller, Ph.D., Bruker