Thursday, Sept. 21: Special Topics

03:00-05:00pm **Technical Presentations by the members of the industry**

Location: Happus (LH1)

(03:00-03:15pm) **Talk 1**: Light sheet microscopy on the edge: high speed volume imaging for delicate samples, Jürgen Mayer, **Luxendo**

(03:15-03:30pm) **Talk 2**: New Stage Top Incubator STX series - Happiness for Cells, Success for Researchers, Shinichiro Endo, **Tokai Hit**

(03:30-03:45pm) **Talk 3:** ZEISS Celldiscoverer 7, Your Automated Platform for Live Cell Imaging, Dr. Xianke Shi, **Carl Zeiss**

(03:45-04:00pm) **Talk 4:** Huygens Deconvolution, Visualization and Analysis to find the truth behind your blurry and noisy microscopic image, Drs. Gitta Hamel, **Huygens (SVI)**

(04:00-04:15pm) **Talk 5:** Infrared Photo-induced Force Microscopy (IR PiFM), Dr. Sung Park, **Icon Analytical**

(04:15-04:30pm) **Talk 6:** OLYMPUS MPE-RS: Live in-situ brain mapping and optogenetics Multiphoton Microscopes with dedicated MPE Objectives. Ganesh Kadasoor, Ph.D., **Olympus**

(04:30-04:45pm) **Talk 7:** Flexibility of Super Resolution imaging with Nikon platform, Dr. Nabanita Chatterjee, **Nikon**

(04:45-05:00pm) **Talk 8:** New DMi8 S – Cutting Edge Live Cell Imaging Systems, Dr. Peter Laskey**, Leica Microsystems**

Jürgen Mayer
Luxendo

Abstract

Light sheet microscopy on the edge: high speed volume imaging for delicate samples

Light sheet microscopy has become the state of the art methodology to address a wide variety of biological questions. Key features of this technique are the extremely minimized phototoxicity, the high-speed image acquisition, and the large imaging depth. This allows long-term imaging of delicate samples in a volumetric manner. Fast subcellular processes and interactions can be observed in the comprehensive context of an organ, organoid, or entire specimen.

Different samples require different conditions, such that there are also various approaches how to image different samples with light sheet microscopy. Being a company that is dedicated 100% to light sheet microscopy, LUXENDO decided to reflect this fact by implementing specialized setups without losing general applicability for each of them.

Here, we will introduce the basic concepts of light-sheet microscopy, followed by different implementations. To highlight the advantages suited for specific samples, we will focus on our two recently introduced products: the multiple-view selective plane microscope (MuVi-SPIM) and the inverted view selective plane microscope (InVi-SPIM).

Dedicated to live imaging, the InVi-SPIM is a microscope that is optimized for long-term 3D fluorescence imaging of living specimens. Its maximized photon efficiency, and short illumination times enable long-term imaging under ideal environmental conditions. The optical performance combined with the fast acquisition speed makes the InVi-SPIM perfectly suited for in toto imaging of a large variety of specimens, especially if they are sensitive and need precisely controlled conditions.

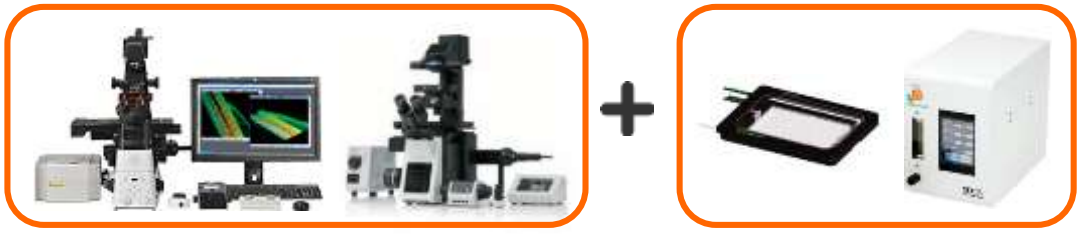
The MuVi-SPIM is a horizontal setup that is designed to image large volumes very fast. The 4-fold geometry with its two-sided illumination combined with the two-sided detection allows optimal signal detection from anywhere in the sample without the need for rotation.

Shinichiro Endo
Tokai Hit Co., Ltd.

Abstract

New Stage Top Incubator STX series - Happiness for Cells, Success for Researchers

We would like to introduce our new Stage Top Incubator “STX series” at BMC. Our Stage Top Incubator maintains optimal cell-culture environment for live cell imaging on microscope stage. It has high flexibility and performance to keep cells happy on the stage from hours to days (more than 7 days) as well as conventional CO_2 incubator. It is widely used for short to long term imaging under fluorescence, wide-field, confocal, TIRF and super resolution microscopy. And they are used in Japan, China, Asia, USA, Europe, and of course India. They are used in well-known universities and facilities like NCBS.

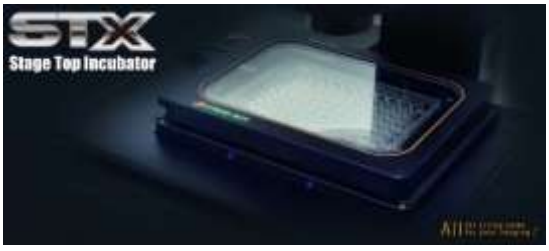


To support successful Live Cell Imaging, “STX” is our answer to the optimized incubating environment on the microscope stage.

1. A fail-proof Incubation: Provides accurate cellular environment with easy and clever operation.
2. Stress-Free Quality: Intuitive operation and varieties of new functions are included to support cell culturing without any stress.
3. Simple Selections: Easy add-on and expand the application. Now included common accessories as standard.

We are manufacturing our products internally and consistently from part production to product assembly, and providing our products to over 80 countries. We would like to contribute to the society by supporting you to achieve your successful experiments.

Please kindly share your time to see our technologies and passions!



Dr. Xianke Shi
Carl Zeiss

Abstract

ZEISS Celldiscoverer 7

Your Automated Platform for Live Cell Imaging

Observing live samples over a number of days or imaging lots of multiwell plates really puts your microscope through its paces. To get reproducible, unbiased data, you must control environmental conditions such as light, temperature, CO2 etc. That's why Celldiscoverer 7 brings you a unique combination of a stable box, darkroom and integrated inverted research microscope with optional incubation. It simplifies your laboratory setup and makes work more comfortable.

All Celldiscoverer 7 components are optimized for hassle-free automated imaging. New users and multi-user facilities especially will enjoy the in-built automation and usability features when setting up complex experiments. You'll systematically avoid accidental hardware changes that might lead to biased data or even damage your microscope. And Celldiscoverer 7 can make you more productive, too: expect better data in shorter times, with less training and maintenance. What's more, as your needs grow you can expand Celldiscoverer 7 with external cameras, deconvolution, additional environmental control, liquid handling, a robotic plate loader – whatever you need for the challenge of live cell observation.

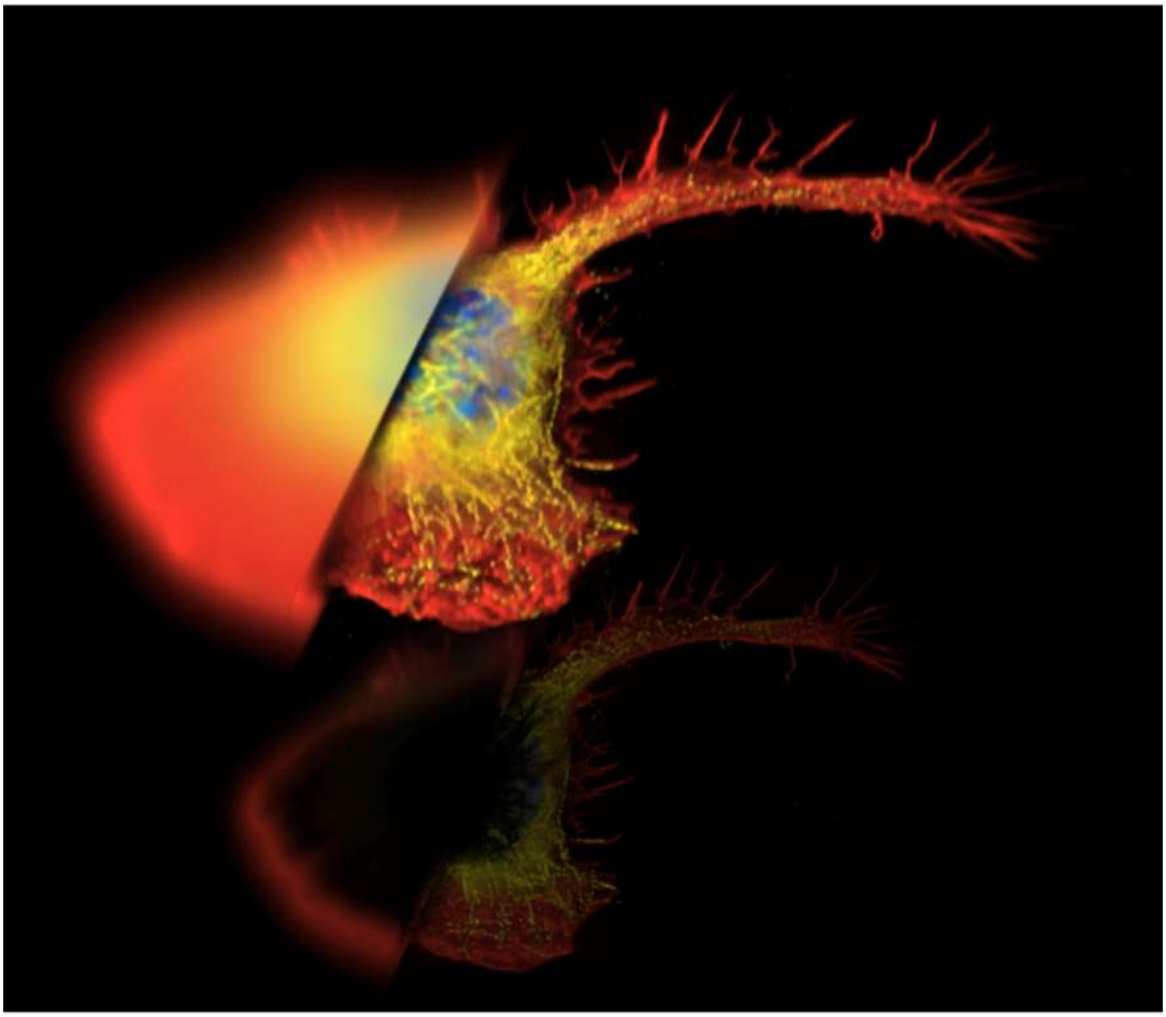
Celldiscoverer 7 is a fully integrated high-end imaging system. It comes with various incubation and detection options so you can tailor the system to your applications. Go for fast, sensitive sCMOS or EMCCD cameras when performing your most demanding live cell experiments and rapid time-lapse recordings. For screening applications with high throughput, choose a high dynamic range camera with a large field of view. To get better data from three-dimensional samples, simply add fast deconvolution. Get all these Benefits and more with the in-built flexibility of Celldiscoverer 7.

For demanding long-term, time-lapse imaging, Celldiscoverer 7 gives you the advantage of Autoimmersion and a hardware-based focus that finds and keeps the focus automatically after detecting the thickness and optical properties of the sample carrier. Autocorr objectives then correct spherical aberrations to deliver crisp contrast and high resolution every time. Get image quality like you've never seen before – no need to adjust manually. Keep your cells happy and they'll deliver unbiased data: Celldiscoverer 7 provides a range of integrated incubation options to create just the right environment. The improved optical design resolves more details in large fields of view.

Drs. Gitta Hamel
Huygens (SVI)

Abstract

Huygens Deconvolution, Visualization and Analysis.
to find the truth (right) behind your blurry & noisy microscopic image (left)



Dr. Sung Park
Icon Analytical

Abstract

Infrared Photo-induced Force Microscopy (IR PiFM)

Infrared Photo-induced Force Microscopy (IR PiFM) is based on an atomic force microscopy (AFM) platform that is coupled to a widely tunable mid-IR laser. PiFM measures the dipole induced at or near the surface of a sample by an excitation light source by detecting the dipole-dipole force that exists between the induced dipole in the sample and the mirror image dipole in the metallic AFM tip. This interaction is strongly affected by the optical absorption spectrum of the sample, thereby providing a significant spectral contrast mechanism which can be used to differentiate between chemical species. Due to its AFM heritage, PiFM acquires both the topography and spectral images concurrently and naturally provides information on the relationship between local chemistry and topology with sub 10 nm spatial resolution on a variety of samples. PiFM spectral images surpass spectral images that are generated via other techniques such as scanning transmission X-ray microscopy (based on synchrotron source), micro confocal Raman microscopy, and electron microscopes, both in spatial resolution and chemical specificity. The breadth of the capabilities of PiFM will be highlighted by presenting data on various material systems (organics, inorganics, 1D/2D, bio-molecules, and nano-photonic materials). By enabling imaging at the nm-scale with chemical specificity, PiFM provides a powerful new analytical method for deepening our understanding of nanomaterials and facilitating technological applications of such materials.

Dr. Nabanita Chatterjee
Nikon

Abstract

Flexibility of Super Resolution imaging with Nikon platform

With newly developed illumination and optics systems Nikon N-STORM 4.0 offers excellent "Localization Precision". High speed live cell imaging is now possible with fast image acquisition rate of up to 500 fps. Additionally, the new "3D Stack functions" can capture super resolution images of 5µm thick biological samples. Wide field of view (80µm x 80µm) image capture; multipoint STORM acquisition with tiling and confocal overlay are now possible on new "N-STORM 4.0 System".

On the same platform, N-SIM System provides the gentlest super resolution for live cell imaging with an industry leading time resolution of 0.6sec/frame. It is possible to do TIRF-SIM, 2D-SIM, 3D-SIM in slice and stack mode. 5 laser multicolor Super Resolution imaging and simultaneous 2 color Super Resolution imaging is possible on Nikon's platform.

Nikon provides dedicated "Auto Correction Collar Super Resolution Objectives and have recently launched Silicone objectives with Nikon's silicone oil with superior optics and high laser power durability that can be used with both Super Resolution and Confocal imaging for Long term time lapse and deepest acquisition.

Ganesh Kadasoor, Ph.D.,
Olympus

Abstract

OLYMPUS MPE-RS: Live in-situ brain mapping and optogenetics Multiphoton Microscopes with dedicated MPE Objectives.

Fluoview FVMPE-RS is designed for live deep in-situ brain mapping and optogenetics with new optics featuring a hybrid resonant scanner and a coating technology for 400-1600 nm wavelengths.

With its high speed and precision performance, the Olympus FluoView FVMPE-RS is a dedicated resonant scanning upright multiphoton microscope system designed for electrophysiology and optogenetics studies. It is also a good match for applications such as high-speed calcium and in vivo imaging, peristalsis and blood flow studies, mosaic imaging, connectomics and functional brain imaging, stem cell research, and any field that requires precise colocalization, uncaging, simultaneous imaging/stimulation, extensive real-time signal processing, or multipoint mapping. Its design offers ready adaptability for researchers who design their own custom-built optical delivery as well.

The new system offers unmatched speed. The FVMPE-RS captures 438 frames per second (fps) at 512x32, the fastest rate commercially available. It also captures full-frame, 512x512 images at 30 fps without any reduction of the field of view, a critical feature for many functional imaging studies. Its scanner unit combines a newly designed resonant scanner with a galvanometer scanner to provide both speed and excellent definition. The resonant scanner offers an exclusive non-linear sampling method for smooth imaging without intensity variation or image distortion, and greatly minimizes line jitter at any zoom factor. An optional third galvanometer scanner is also available for simultaneous imaging with 3D stimulation or uncaging in a given optical section. The system's multipoint mapping capability allows ultra-high-speed stimulation along with measurement of rapid fluctuations in groups of cells for functional imaging studies, 3D intensity measurement or mapping with high signal-to-noise performance.

In addition to speed, the FVMPE-RS offers optimal performance when imaging live cells and tissues. It provides multicolor, multiphoton excitation and imaging with a choice of lasers, along with a four-axis auto- alignment capability for precise colocalization and coalignment without pixel shift. With its

multiple-laser-line performance, researchers can image with two colors at optimal wavelength excitation simultaneously while stimulating the sample with visible light, or image with one infrared (IR) laser while simultaneously stimulating with IR and/or visible light. The system delivers sharp images with clear separation of fluorescence proteins for analysis.

The high-sensitivity system offers excellent throughput from 400 nm to 1600 nm. New 1600 coating technology provides broadband transmission without sacrificing the ability to stimulate at lower wavelengths (such as 405 nm for glutamate uncaging or 458 nm for channelrhodopsin stimulation). The new coating allows the system to support the latest InSight lasers from Spectra-Physics, providing researchers with the ability to image near-IR dyes such as Cy5 and Cy7. The Olympus line of 25x multiphoton optimized objectives also feature this new coating, and offer working distances of 2, 4 or 8mm to deliver super-deep imaging. Light collection efficiency is further improved by the FVMPE-RS system's optimized light path. In Deep Focus Mode, researchers can adjust laser properties precisely to account for tissue scattering, helping optimize deep-tissue imaging by achieving signal improvements of 20 percent or more over comparable systems. An optional high-sensitivity cooled gallium arsenide phosphide (GaAsP) detector unit further enhances sensitivity while minimizing electrical noise, making the most out of the system's high-speed capabilities.

The system's precision timing allows for microsecond repeatability and control of multiple imaging and stimulation protocols, as well as millisecond repeatability over days of time-lapse imaging. Complex multi-position imaging or optogenetic stimulation protocols can be accomplished using the advanced stage control and sequence manager. The new system's multichannel analog box for triggering, synchronization and signal input provides additional support for advanced electrophysiology studies and other applications requiring external device triggering. The advanced optional nosepiece piezo drive provides greater rigidity and faster z-plane stabilization to ensure accurate and repeatable high-speed focus performance.

The FVMPE-RS is designed to be simple to use and require minimal alignment, thanks to its robust auto-alignment system and easy touch-panel control. Enhanced temperature stability and a highly rigid frame make it an ideal foundation for live cell experiments. A dedicated multiphoton system, the FVMPE-RS is compatible with Olympus' range of multiphoton specialty objectives, including the 4 mm and 8 mm SCALEVIEW objectives and Olympus' high-performance, 25x dedicated multiphoton objectives.

Dr. Peter Laskey
Leica Microsystems

Abstract

New DMi8 S – Cutting Edge Live Cell Imaging Systems

Introducing the new widefield DMi8 S system, an advanced live cell imaging solution that combines both hardware and software into a total system solution for advanced imaging. Enhance your multi-well imaging and add powerful sample overview capabilities with Leica LAS X Navigator. Maximize the speed of every motorized component in your entire system with the integrated real-time DMi8 Synapse controller. Find out how to activate, ablate, and bleach within one experiment with the Infinity Scanner photomanipulation module. Achieve simultaneous multi-color TIRF images with the fully automated Infinity TIRF module. The Leica DMi8 S is the next chapter in widefield live cell imaging, built onto the flexibly configurable Leica DMi8 system and fully enabled to help you see more, see faster, and find the hidden data in your living cells.