Beyond Labels: Correlative 3D Imaging of Live Cells and Complex Models with Holotomography and Spinning Disk Confocal Microscopy

Talk: 09:00 – 09:25
IMB Seminar Room

Speaker: Dr Bruno Combettes

Understanding complex biological samples requires more than structural imaging or fluorescence labelling alone. Holotomography (HT) and spinning disk confocal microscopy (SDC) offer a complementary solution. HT provides label-free 3D visualisation and quantitative refractive index information from live specimens. In contrast, SDC enables optically sectioned fluorescence imaging for precise localisation of molecular targets, particularly in multicellular and optically complex samples.
In this talk, we will present HT-X1 Plus with SDC and show how this correlative imaging workflow connects 3D cellular architecture with molecular information in the same sample. By combining label-free structural context with targeted fluorescence information, researchers can interpret subcellular features more confidently, track phenotypic change over time, and examine organisation and variation within complex specimens. Representative applications include adherent cells, organoids, and iPSC-derived models. These examples illustrate how integrated HT and SDC support live-cell studies that benefit from both non-invasive 3D imaging and fluorescence-based specificity, including advanced in vitro models relevant to regenerative medicine. Overall, this presentation will highlight how correlative HT and SDC expand live-cell imaging from observation to deeper biological interpretation.

Keywords: Holotomography, Spinning Disk Confocal Microscopy, Correlative 3D Imaging, Live-cell Imaging, Organoids, iPSC-derived Models, Regenerative Medicine

Democratizing confocal imaging

Talk: 09:25 – 09:50
IMB Seminar Room

Speaker: Robert Kasper

Confocal microscopes are wide spread in many labs and imaging facilities and are used in a variety of research fields, either as entry level detection modality or high end research assisting tool. In this talk I will give you an overview of features we think as Evident will help researchers to have better control of the microscope including quality control tools and our new detectors and technological advances. I will talk about detector technology, microscope performance monitor, quality optics and fiber laser add on to our FV5000 confocal and explain how these tools can help to produce high quality quantitative data.

EVOS S1000 - New Tools to Tackle Multiplex Imaging Challenges in Spatial Proteomics

Talk: 09:50 – 10:15
IMB Seminar Room

Speaker: Dr Dominic Kamps

Spatial proteomics, selected as the 2024 Method of the Year by Nature Methods journal, is an emerging scientific discipline that focuses on studying proteins within their spatial contexts, providing comprehensive insights into cell types and their interactions within the native tissue microenvironment. Protein tissue mapping is crucial for understanding processes such as metastasis, immune evasion, malignant cell growth, angiogenesis, and therapeutic drug resistance in immunology and oncology research. Spectral imaging, a key technology in spatial proteomics, captures light emitted by several fluorophores in a single imaging round, allowing simultaneous visualization of multiple protein targets while preserving tissue integrity. However, spectral imaging currently faces challenges such as the cumbersome processing, known as unmixing, needed to resolve overlapping fluorescent signals, especially when detecting more than six protein targets. Unmixing often lacks transparency and is limited to certain proprietary dyes, significantly reducing the choices available to researchers. The Invitrogen EVOS S1000 Spatial Imaging System addresses these challenges by providing a simplified workflow that supports up to 9-plex imaging in a single round, with fast, integrated, automated unmixing. It is compatible with most commonly available labeling methods and dyes, and those can be easily selected by the user to configure acquisition protocols. Additionally, it offers an unmixing quality metric report that allows scientists to pre-assess the image quality of their 9-plex samples and gain confidence in the outcome of their results. This positions the EVOS S1000 as an attractive new tool for advancing research in spatial proteomics.

ZEISS Axioscan 7: Your key to upscaling spatial biology

Talk: 10:15 – 10:40
IMB Seminar Room

Speaker: Dr Kieren Sommer

The ZEISS Axioscan 7 spatial biology platform, combined with powerful multiplex immunofluorescence (mIF) solutions from partners like Revolune, Ultivue, Kromnigon and Cell Signaling, turns complex imaging into a smooth, automated experience. This integrated and carefully thought-out system takes the hassle out of mIF: Less hands-on time, fewer manual steps, and an easy, automated workflow that delivers consistent, high-quality images again and again. With AI-driven image analysis from our partner Mindpeak, you get faster results and sharper insights, so you can move from raw data to confident decisions in less time. Mindpeak's web-based image viewing and management portal makes your data instantly accessible and easy to share, helping teams collaborate, compare, and decide together. The Axioscan 7 spatial biology results in powerful end-to-end solution that unlocks deeper views into tissue, speeds up discovery, and lets you focus on the scientific questions that matter most.

Take Full Control of Your Sample Temperature with Vulcan

Talk: 11:00-11:25
IMB Seminar Room

Speakers: Dr Juan Iglesias & Dr Anatol Fritsch

Temperature is one of the most powerful and most underestimated variables in light microscopy. Whether studying membrane dynamics, protein phase separation, cytoskeletal remodeling, or cell behavior under thermal stress, precise temperature control is essential for reproducible and quantitatively meaningful data. Achieving this level of control, however, remains a practical challenge in many imaging setups, where temperature stability, response speed, and ease of integration are difficult to reconcile simultaneously.
This talk introduces Vulcan, a precision temperature control system developed by Blue Ice Labs. Vulcan delivers ±0.1°C precision across a range from -10 to 80°C, with rapid temperature transitions of up to 1.3°C/s. It is fully software controlled, allowing users to design and run complex experiment profiles. Data can be exported in publication-ready formats, significantly reducing the time between experiment and manuscript. Thanks to its 96-well plate form factor, Vulcan fits most microscope stages without any modifications, making it straightforward to integrate into existing workflows. We will showcase the science it enables, including inPhase, a microscopy-based method to build accurate phase diagrams of phase-separating proteins. We will also present its application in living C. elegans embryos, where temperature control revealed that P granule condensates form and dissolve reversibly with temperature, governed by local thermodynamic equilibrium.

Nikon BioImaging Lab, a quick introduction

Talk: 11:25 - 11:50
IMB Seminar Room

Speaker: Ivonne Wollenberg

The Nikon BioImaging Lab is your number 1 service provider when it comes to light microscopy associated services. On example projects with spheroids, lipid droplets and an Organ-on-Chip model I will illustrate what it means to do a project with us and how your research can benefit from access to Nikon's imaging expertise and the use of State-of-the-art microscopes like the Eclipse Ji.

Launchpad Talk:

Open Optics - How open source and modularity can open up new paths in education and research

Talk: 11:50 – 12:00
IMB Seminar Room

Speaker: Christine Aumüller

Introducing the company:
openUC2 aims to make optical components modular, affordable, and openly accessible. Built on open hardware and software principles, the platform is driven by a global community of researchers, educators, and developers.The system combines open source hard- and software. At its core sits the **UC2 Cube** - a modular element capable of holding optical and electronic components. These can be combined to create optical modules or entire assemblies from simple school microscopes to fully automated research systems that include open soft- and firmware. This way we want to create the **"Raspberry Pi for Optics"** and allow researchers to build the optical experiment setups they need without needing six to seven figure budgets.

Talk abstract:
Open experimental platforms are transforming how imaging and optical experiments are taught and conducted. But what exactly does "open" mean and how can we profit from it - be it in education or in research? In our presentation, we will demonstrate the advantages and challenges of open systems starting with elementary educational experiments and reaching fully automated microscopy solutions. To do so we share our own experiences and learnings. We will lead through three examples: Making optical experiments a hands-on experience, connecting education and research in quantum optics and building fully individualized research solutions that combine open hard- and software.

Launchpad Talk:

The DNA Curtains Flow Cell by 1NA: Where High-Throughput Meets Single-Molecule Precision on DNA

Talk: 12:00 – 12:10
IMB Seminar Room

Speaker: Dr Bärbel Lorenz

Introducing the company:

Have you ever wondered how to read out protein dynamics on DNA in real time without sacrificing spatial and temporal resolution, while still maximizing throughput?
1NA leverages single-molecule imaging of DNA-protein interactions in a high-throughput manner. Central to its technology is the DNA curtains flow cell chip, which uses nanofabricated structures within a microfluidic device to align thousands of DNA molecules within a single field of view, enabling high-resolution visualization of protein dynamics on DNA. This technology provides an unprecedented in vitro platform for probing the efficacy and mechanisms of action of new or existing drugs and has the potential to be the first single-molecule approach to significantly contribute to drug development. The device is small and compatible with objective TIRF setups. Looking forward to discussing your research question!

Talk abstract:

Would you like to read out protein dynamics on DNA in real time - without sacrificing spatial and temporal resolution, while still maximizing throughput? Then the DNA Curtains Flow Cell might be a great addition to your lab. The flow cell is a next-generation DNA curtains-based single-molecule imaging platform enabling high-throughput, real-time visualization of DNA–protein interactions. It bridges the gap between high-resolution but low-throughput single-molecule methods and ensemble assays that lack mechanistic detail by enabling simultaneous observation of hundreds of DNA molecules using your existing (objective) TIRF setup. The platform is built around a microfluidic flow cell with nanofabricated diffusion barriers that organize DNA substrates into aligned arrays (“curtains”) on a lipid bilayer surface. Hydrodynamic flow extends and aligns DNA while nanostructures define precise positioning, ensuring stable, reproducible imaging with minimal nonspecific surface interactions. The DNA Curtains Flow Cell enables investigation of DNA replication, repair, transcription, and chromatin-associated processes at the single-molecule level. It provides direct access to dynamic protein behaviour on DNA, including binding kinetics, diffusion, target search, and complex assembly or disassembly in real time. Its high-throughput architecture generates statistically robust datasets from hundreds to thousands of individual molecules per experiment, greatly enhancing data quality and experimental efficiency.

The system is compatible with standard commercial TIRF setups, allowing straightforward integration into existing microscopy infrastructure. By delivering a quantitative, parallelized view of molecular interactions on DNA, our flow cell expands the reach of single-molecule biophysics and enables scalable mechanistic studies across fundamental biology and translational research.

Expanding the boundaries of a live-cell imaging and analysis into advanced 3D cell models

Talk: 15:45 – 16:10
IMB Seminar Room

Speaker: Dr Elena Sigmund

The Incucyte® Live Cell Analysis System advances 2D and complex 3D in vitro research by enabling continuous, non-invasive imaging within a precisely controlled environment. Key innovations include AI-driven software modules for label-free cell and nuclear counting, segmentation, and live-dead discrimination in HD phase-contrast images, eliminating the need for fluorescent markers. To meet the demand for high-quality imaging in advanced 3D models, the new Incucyte® Live Cell Analysis System CX3 integrates multiplane fluorescent imaging across a confocal-like z-range using compact spinning-disk technology. This capability ensures detailed, continuous visualization of spheroids, organoids, and patient-derived cultures while minimizing photobleaching and phototoxicity. The combination of spinning-disk confocal fluorescence imaging with the environmentally controlled Incucyte® system allows researchers to obtain spatially resolved insights from complex 3D models that more accurately reflect antibody potency, (immune-)mechanisms of action, and the intricate biology of 3D microenvironments.

HAMAMATSU
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At the interface of light and data: Hamamatsu detectors for modern optical microscopy

Talk: 16:10 – 16:35
IMB Seminar Room

Speaker: Michael Kehr

Hamamatsu provides a comprehensive range of high-performance detectors—including PMTs, MPPCs, and state-of-the-art scientific cameras—that form the critical interface between optical microscope design and quantitative digital data. This talk highlights recent advances in sensitivity, speed, and photon-counting capabilities, and shows how detector choice directly influences resolution, signal-to-noise, and reproducibility in demanding imaging workflows.

Orbital-110 „IsoTIRF“ with Homogenizer Technology: Enabling Artifact-Free, Large-Field TIRF for High-Speed DNA-PAINT and Single-Molecule Tracking

Talk: 16:35 – 17:00

Speaker: Dr Marcel Dunkel

The Visitron IsoTIRF system, powered by our advanced Homogenizer technology, delivers highly uniform and large-area evanescent field illumination in TIRF mode while completely eliminating interference artifacts and intensity gradients. Combined with RASTA (Rapid Switching of TIRF Angle), the system allows precise and ultra-fast adjustment of the illumination angle, enabling optimal penetration depth control and seamless transitions between TIRF, HILO, and epi-illumination. ViRTEx (Visitron Realtime Experiment Control) further ensures synchronized, high-precision multi-color acquisition with sub-millisecond timing accuracy.
Thanks to this unique combination of homogeneous illumination, rapid angle switching, and real-time hardware control, the IsoTIRF platform is ideally suited for demanding single-molecule applications such as DNA-PAINT and single-molecule tracking, where uniform excitation across large fields of view, minimal background, and excellent temporal resolution are essential for reliable localization and quantitative imaging.

From 2D Cell Painting to 3D Organoid Screening: Advancing Biological Discovery through High-Content Analysis on the Opera Phenix Platform

Talk: 17:00 – 17:25
IMB Seminar Room

Speaker: Dr Achim Kirsch

The evolution from traditional microscopy to high-content screening opens new possibilities for quantitative biological research. This presentation demonstrates how the Opera Phenix platform enables researchers to extract rich quantitative data from both 2D and 3D cellular models, advancing biological discovery through systematic phenotypic analysis.
We begin by introducing Cell Painting, a morphological profiling technique that uses multiplexed fluorescent staining to capture comprehensive cellular phenotypes. Cell Painting generates unbiased phenotypic fingerprints that can identify relevant compounds and reveal mechanisms of action — without requiring prior knowledge of specific biological pathways.
The second application showcases massively parallel 3D organoid screening, enabling statistically robust analysis of effects in complex tissue models that cannot be recapitulated in traditional 2D cell culture, while maintaining the throughput necessary for systematic screening studies.
These applications show how high-content analysis extends microscopy workflows by adding the statistical power of large sample sizes to detailed morphological observations, using the same fundamental imaging principles for quantitative biological discovery.