BNMI 2025 pre-symposium workshops

Smart Microscopy

Discover how automation is revolutionizing microscopy in our Smart Microscopy workshop. This state-of-the-art approach combines on-the-fly image analysis with fully motorized, computer-controlled microscopes to create adaptive, real-time imaging workflows. By enabling dynamic adjustments to microscope parameters during experiments, Smart Microscopy minimizes human intervention, allowing researchers to efficiently capture rare events, study complex biological systems, and acquire statistically meaningful data.

Over one and a half days, participants will delve into the principles and practices of Smart Microscopy, using both commercial and open-source tools. Hands-on sessions will cover target identification, adaptive feedback loops, and integration with external hardware and software for advanced automation. The workshop emphasizes transferable strategies, ensuring participants can develop adaptive workflows tailored to their specific instruments. Join us to explore how Smart Microscopy can enhance your experimental efficiency and data reproducibility.

The workshop will be divided into 4 sessions:

- ZEISS - Smart Imaging Workflows for Scalable, Automated Acquisition.
- Nikon – Experience Smart Microscopy with BergmanLabora & Nikon
- Leica - SpectraPlex for STELLARIS: 3D High-Multiplex Imaging for Spatial Discoveries
- Webknossos - Visualize, share, and annotate your large 3D images online

Location: Centre for Cellular Imaging, Medicinaregatan 5A-7A, 413 90 Gothenburg

Time: Monday, 18 August (09:00–17:00) – Tuesday, 19 August (09:00–12:00)

Workshop schedule:

18th of August:

09.00 – 09.30   Welcome – Room 2158

09.30 - 12.00   Round 1 – Microscopy Parallel sessions

12.00 - 13.00   Lunch break

13.00 - 14.00   Webknossos Session 1

14.00 – 16:30   Round 2 – Microscopy Parallel sessions

16:30 – 17:00   Q & A (Optional)

19th of August:

09.00 - 11.30   Round 3 – Microscopy Parallel sessions

11.30 - 12.30   Webknossos Session 2

All participants will be divided into three different groups for the parallel sessions. Microscopy sessions will take place at the Centre for Cellular Imaging. Participants will be guided to the facility during the introduction. Please be on time as access is restricted and you will need assistance of the CCI staff. All relevant information will be provided during the 1st day introduction.

Meet point:

18th of August, 9:00:

> **Meet point:**   Computer room at Medicinarelängan
>
> **Location:**   Room 2158, Medicinaregatan 5A, Göteborg
>
> **Map:**   Link to map of the campus

SMART Microscopy Workshop, Göteborg 2025

Soren Prag & Philipp Seidel, ZEISS Research Microscopy Solutions

Advanced imaging techniques have become crucial tools in biomedical research, enabling scientists to explore and document intricate biological structures and their dynamics across scales, from single biomolecules to entire animals.

Image acquisition workflows include positioning of the sample inside the microscope, finding the imaging target and setting the acquisition parameters. Traditionally, these routine steps are often performed manually. While manual operation gives experimenters control over the acquisition process, this limits applicability and scalability.

Smart Imaging approaches circumvent these limitations, by combining imaging with on-the-fly processing of acquired data to trigger changes in the imaging settings. Using live data to steer the acquisition or sample perturbation broadens the capabilities of microscopes to new types of experiments. For example, high-resolution imaging of a specific (rare) phenotypes becomes accessible when identifying the object of interest in a low-resolution overview beforehand, followed by switching to a high-resolution imaging modality only for the relevant field-of-view determined by image analysis. Live measurements via photobleaching, FCS or opto-genetics can be scaled by automating the detection of relevant target regions for photomanipulation. Or automated photo-activation may be used to identify and select certain cellular phenotypes for downstream analysis.

ZEN provides multiple tools to approach Smart Imaging workflows. First, GUI-based procedures are available for typical event- or phenotype-driven high-resolution imaging (tool: Guided Acquisition) or site-specific sample actuation (tool: Automated Photomanipulation). Second, a number of tools allow custom Smart Imaging approaches by providing APIs for scripting (Experiment Feedback, OAD macros, ZEN API).

In this workshop we aim to introduce these tools and showcase their practical application. We will use Guided Acquisition to detect Histon2B-mcherry, Microtubule-GFP transfected cells in early mitosis and create high-resolution time-lapse recordings of the mitoses. For optimal mitosis detection, modern Deep Learning models will be integrated into the analysis. The attendees will learn how to configure such workflows, and scale them to automatically apply them to multi-well plate setups.

Experience Smart Microscopy
With BergmanLabora & Nikon

Join us at BNMI 2025
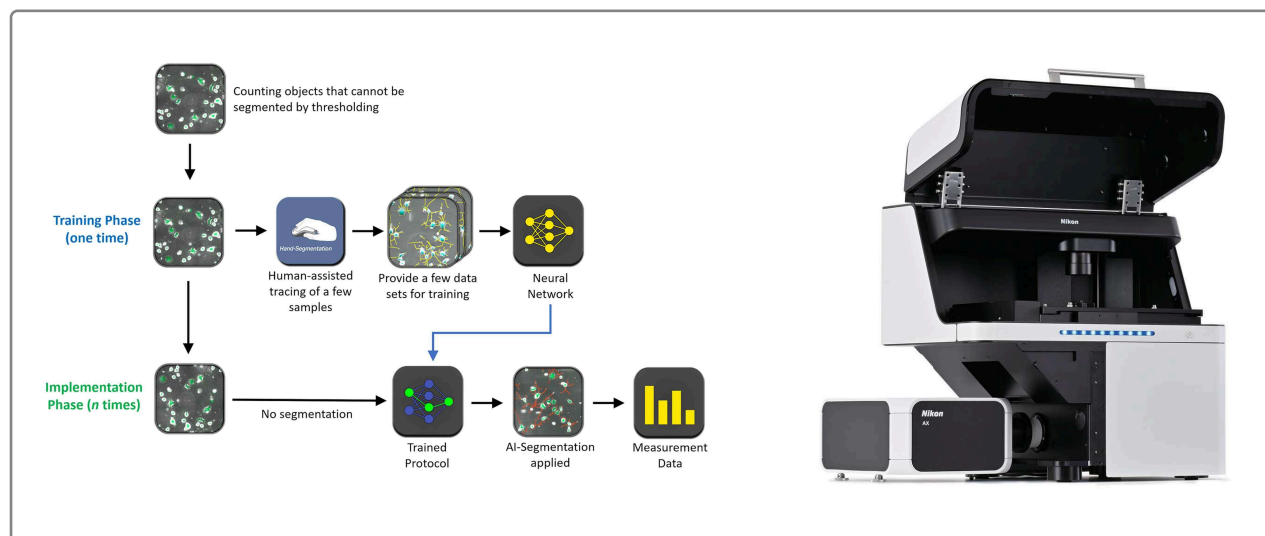
Revolutionize your imaging with automation and AI
Discover how automation is transforming microscopy in our hands-on Smart Microscopy workshop at BNMI 2025. Learn how to build adaptive, real-time imaging workflows by combining on-the-fly image analysis with fully motorized, computer-controlled microscope systems.

What to expect:
Over 1.5 days, you'll explore the principles of Smart Microscopy using both commercial and open-source tools. Hands-on sessions include:

- Target identification
- Adaptive feedback loops
- External hardware & software integration
- Transferable workflow design strategies

Whether you're working with Nikon systems or other platforms, this workshop will help you create smarter, more efficient experiments tailored to your lab's needs.

Time: August 18-19, 2025
Place: Centre for Cellular Imaging,
University of Gothenburg

Read more & Register here

If you are unable to attend the workshops but are interested in a demo, please contact Catherine Kitts at **catherine.kitts@bergmanlabora.se** *to arrange a time during the period of August 19 afternoon − August 22*

3D multiplexing imaging in cancer immunology. Leo Kunz, Dario Speziale, M. Julia Roberti, Susanne Holzmeister, Frank Hecht, Luis A. J. Alvarez, Irmtraud Steinmetz. Nat. Methods (2024).https://www.nature.com/articles/d42473-024-00260-7

Join our High-Multiplex Imaging Workshop Featuring SpectraPlex!

SpectraPlex for STELLARIS is a comprehensive solution for 3D high-multiplex imaging in spatial biology. It provides a streamlined workflow to simplify panel creation, automate acquisition settings, and acquire data through advanced unmixing algorithms. With SpectraPlex you can ensure data quality and reliability across scales. SpectraPlex facilitates new insights into cellular organization, interactions, and spatial phenotyping. Get the power to see more and the productivity to do more, whether in cancer research, immunology, or neuroscience.

STELLARIS FALCON (FAst Lifetime CONtrast) is the future of functional imaging. Harness the power of fluorescence lifetime to investigate cellular physiology and explore dynamics in living cells. STELLARIS FALCON is a fully integrated solution for Fluorescence Lifetime Imaging (FLIM) and enables video-rate lifetime imaging acquisition for rapid kinetic studies in live cells.