Microscopy Imaging Center (MIC)

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Science



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Structure



The MIC is the center of excellence for high-end microscopy in the life sciences at UNIBERN. Experts in microscopy from the Medical, Science and Vetsuisse Faculties of the Universities of Bern and Fribourg have joined forces to support high-end microscopy. A tight collaboration with Science IT support (ScITS) of UNIBERN ensures high quality support in data handling and image analysis. In 2020, the MIC Committee counted 23 voting and 10 advisory members. Amongst the 75 instruments registered at the MIC are 21 confocal light microscopes, 9 electron microscopes, two atomic force microscopy systems and one micro computed tomography (micro-CT) instrument. This equipment was used by 380 researchers in 2020.

Profile

- Mission: Provide and disseminate expert knowledge and technical support. Implementation of new technologies; Central access to high-end microscopy
- Teaching and events: Lecture series on Advanced Microscopy. MIC workshops; MIC trainings; PhD program Cutting Edge Microscopy (CEM). In 2020, the MIC organized a 1-day summer school and a 2-day visit of the Institute for Research in Biomedicine (IRB) in Bellinzona
- Portfolio: From live imaging of whole organisms to organs, cells and subcellular dynamics; from 2D to 4D; High throughput setups; Light microscopy, electron microscopy, micro computed tomography and atomic force microscopy
- Service: Image analysis; Handling and processing of large data sets; Sample preparation; Training; Newsletter
- Internal activities: The MIC Committee convened at four regular meetings •
- External partners: Swiss Society for Optics and Microscopy (SSOM); Life Sciences Switzerland (LS2), Intersection Microscopy; Scientific Volume Imaging b.v. (SVI); Swiss Microscopy and Imaging Core Facility Network; Science IT Support Unit of the University of Bern

Grants, received as center/platform

- SNSF Sinergia CRSII5 198543 to the MIC committee member Prof. Volker Heussler Institute of Cell Biology, Science Faculty, with Prof. Deborah Stroka, Medical Faculty, and Prof. Sven Rottenberg, Vetsuisse Faculty
- SNSF R'Equip 316030 198524/1 to the MIC committee members Prof. Wanda Kukulski, Institute of Biochemistry and Molecular Medicine, and Prof. Benoît Zuber, Institute of Anatomy

8th Swiss Microscopy Core Facility Day

On September 2, 2020, the MIC organised the Swiss microscopy core facility day as a hybrid-meeting with 40 attendees present in Bern and 30 attendees joining via ZOOM. Topics were "Challenges in managing and financing an imaging facility" and "Sample preparation as service in imaging facility".

8th Swiss Microscopy Core Facility Day





Highlights Science Faculty

Using "expansion microscopy", the cellular ultrastructure of the parasite T. brucei is seen at a resolution previously only achievable by electron microscopy. Ana Kalichava, Ochsenreiter laboratory. JCS, 10.1242/jcs.254300.

Infected cells use different ways to eliminate intracellular liver stage malaria parasites. Annina Bindschedler, Heussler laboratory. Cellular Microbiology, 10.1111/ cmi.13271. In vivo microscopy validated a molecular footprinting technique to determine expressed genes in single cell types of the C. elegans without cell sorting. Meister and Glauser (UniFr) laboratories, Genetics, 10.1534/genetics.120.303774.

Top: T. brucei. Middle: Plasmodium parasites infecting host cells. Bottom: heads of C. elegans. Bars 10 μm

Highlight Vetsuisse Faculty

Exosomes are small vesicles secreted by many cells. Could they be used for targeted delivery of therapeutics? This question was investigated in vitro in relation to Ocular toxoplasmosis. Primary pigment epithelial cells of the retina (A) and stem cell-derived pigment epithelial cells (B) were infected with the parasite T. gondii (green). The parasites form intracellular cysts (arrows). Exosomes were labeled with a green fluorescent dye and presented to the infected cells. The exosomes were taken up and were located very close to the parasites (C and D, arrows). International Journal of Molecular Science, DOI: 10.3390/ijms21113799.



Functionalized exosomes as targeted delivery vehicles



Highlight Medical Faculty

In May 2020, Wanda Kukulski relocated to the Institute of Biochemistry and Molecular Medicine of the University of Bern. The Kukulski group is interested in the architecture and function of cellular membranes. The group's particular expertise is in correlative light and electron microscopy and cellular electron cryo-tomography. The interactive and fostering environment of the MIC will permit building up a strong and sustainable pool of expertise in cutting-edge cryo-electron microscopy methods for cell and structural biology.

Slice through an electron cryo-tomogram of a HeLa cell, revealing its molecular landscape. Scale bar 50 nm