

Microscopy Imaging Center (MIC)

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Structure Profile

The MIC was founded in 2005 and has since developed into the University of Bern's center of excellence for high-end microscopy in the life sciences. Experts in microscopy from a total of 14 institutes from the Medical Faculty, the Faculty of Science and the Vetsuisse Faculty of the University of Bern and from the University of Fribourg have joined forces to provide central access to numerous high-end microscopes and imaging systems for all university members. In 2017 the directive panel, which is the MIC Commission, consisted of 27 representatives from the participating institutes. The steering panel of the MIC is the MIC Board formed by the MIC chair, the representatives from the participating faculties and the MIC coordinator. Currently MIC manages 50 instruments among which are 36 light microscopes, 8 electron microscopes, 3 mesoscopes, 2 atomic force microscopy systems and a microCT, which have been used in 2017 by more than 290 active users. Highly qualified scientists, who provide expertise and support, oversee the equipment of the MIC. The MIC is furthermore instrumental in identifying new technologies to be implemented at the University of Bern and thus in supporting strategical novel acquisitions for example through R'Equip programs.

Research Partners

- Swiss BioImaging - Swiss Microscopy and Imaging Core Facility Network, www.swissbioimaging.org
- German BioImaging (GerBI) - German national network of microscopists and imaging specialists, www.germanbioimaging.org
- Euro-BioImaging - The European Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences (Euro-BioImaging, EuBI or EuBI ERIC), www.eurobioimaging.eu
- European Light Microscopy Initiative (ELMI) - Communication network between European scientists working in the field of light microscopy and the manufacturers of their equipment, www.embl.org/elmi/
- Neubias - The Network of European BioImage Analysts, COST Action CA15124, eubias.org/neubias/
- Science IT Support, SciTS, www.scits.unibe.ch, PD Dr. Sigve Haug, Mathematical Institute, University of Bern
- Prof. Paolo Favaro, Institute of Computer Science, University of Bern
- Prof. Raphael Sznitman, ARTORG Center - Ophthalmic Technology Lab, University of Bern
- Dr. Akitaka Ariga, Laboratory for High Energy Physics (LHEP), University of Bern

Research Profile

The MIC brings together researchers from various life science areas. They provide expert knowledge in microscopy to make the discipline «Microscopy» accessible to the researcher's community of the University of Bern at an uppermost expert level. The expertise ranges from live imaging of whole organisms to organs, cells and subcellular dynamics. High-throughput setups are available to screen large cohorts of living or fixed samples. The MIC portfolio offers imaging from 2D to 4D and from the mesoscopic scale to the ultra-structural level. Electron microscopy allows resolution up to the nanometer scale in transmission or scanning mode and can be combined with serial block face sectioning. Atomic force microscopy allows for the analysis of surfaces of materials or organism with micrometer to nanometer resolution. For details of the full range of MIC activities and services, please visit the MIC homepage at www.mic.unibe.ch.

Teaching Profile

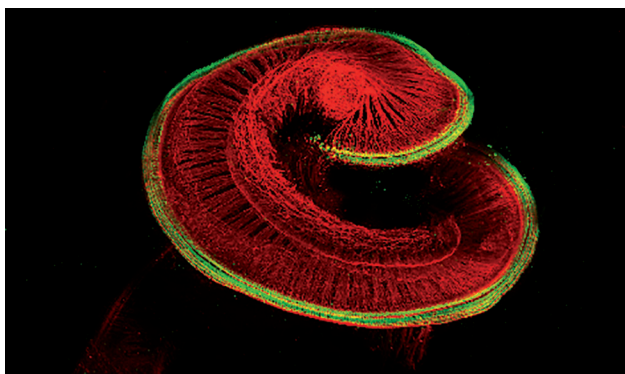
MIC sustains a wide range of teaching activities. In 2017, the lecture series on Advanced Microscopy was attended by 72 students at the master and PhD level. MIC workshops are offered by MIC experts on selected microscopy techniques. MIC trainings cover a multitude of topics, ranging from basic wide field microscopy to confocal microscopy and from software handling to writing own scripts for automated image acquisition or analysis. A swissuniversity-funded PhD program, named Cutting Edge Microscopy (CEM), has started in January 2017. The MIC organizes a yearly summer school and other teaching events for the 20 students of the CEM PhD program.

Highlights 2017

On April 5, 2017, the MIC organized a Mini Symposium on 'Image analysis in microscopy'. It was the first event of this kind, aiming to bring together researchers from the Universities of Bern and Fribourg interested in image processing as well as experts from outside. Presentations dealt with the application of state-of-the-art image processing methods and software. This mini-symposium was very well attended and lively discussions reflected the importance of the topic. Based on requests from several participants, the MIC has organized workshops on ilastik, KNIME and FIJI macros in the following months.

The MIC Research Day took place in the afternoon of June 28, 2017, at the Vetsuisse Faculty, University of Bern. The MIC Research Day is designed to provide a platform for

exchange between scientists of the University of Bern and the University of Fribourg who rely on microscopy in their life science research.



Cochlea of the rat. Sensory hair cells are stained in green, the neurons of the auditory nerve, known as spiral ganglion neurons, are shown in red. Michael Perny, Marta Rocchio, Inner Ear Research Laboratory, DBMR, University of Bern.

On June 28, 2017, the students of the CEM PhD program attended the Kick-Off meeting jointly organized by the MIC and the CEM administration at Schloss Bümpliz. An interactive atmosphere and lively discussions characterized the Kick-Off meeting.

On September 5, 2017, the MIC members met at Schloss Bümpliz for the MIC Retreat. We discussed the "Vision 2025" for future development of the MIC. A common tenor was the call for the MIC to be a SNF-recognized core facility. All MIC members agreed on the difficulties in covering maintenance costs of microscopes. Overall, this event was perfectly suited for discussions in a relaxed atmosphere and for having a common look at the MICs' future.

On September 16, 2017, the University of Bern celebrated the Nacht der Forschung. The MIC contributed various short talks about the benefit and fascination of high-quality microscopy. An exhibition of historic microscopes and of microscopic images decorated the seminar room and thus added to the enjoyable atmosphere of the presentations. In parallel, the visitors had the opportunity to build a simple microscope with their mobile phone camera, using a glass bead and a holder. We also set up three binocular microscopes and a specimen preparation station. In addition, histological samples from the medicine basic education



Left: Microscopy for the public. PhD student Nora Ruef demonstrates microscopy to a school girl. ©Manu Friederich, University of Bern. Right: Migration of a fibroblast. Montage of subsequent steps into one image. ©Olivier Pertz, Institute of Cell Biology.

were available for close scrutiny. Specimen preparation and inspection through the microscope was highly attractive especially for children.

On September 14, 2017, representatives of the Swiss Microscopy Core Facilities gathered in Fribourg at a meeting that was co-organized by members of the University of Fribourg and the Swiss Integrative Center for Human Health (SICHH). The main topic of this event was the management of research data. This perfectly organized event enhanced the networking between the Swiss Microscopy Core Facilities.

On December 8, 2017, the traditional MIC Symposium took place in the Langhans Auditorium of the Institute of Pathology, University of Bern. This year, a record of 150 participants from the University of Bern, whole Switzerland, Italy and Germany met to discuss recent advances and challenges in the area of big data in light and electron microscopy.



MIC Symposium 2017. Snapshots.

Selected Competitive Grants

- SNF R'Equip 2017: A spinning disk microscope with equipment for high-content throughput and live-cell microscopy. Professor Olivier Pertz, Institute of Cell Biology, University of Bern

Selected Publications

- Burda PC, Caldelari R, Heussler VT: Manipulation of the Host Cell Membrane during Plasmodium Liver Stage Egress. *MBio* 2017, 8(2)
- Thiel A, Mogel H, Bruggisser J, Baumann A, Wyder M, Stoffel MH, Summerfield A, Posthaus H: Effect of Clostridium perfringens beta-Toxin on Platelets. *Toxins (Basel)* 2017, 9(10)
- Guichard P, Hamel V, Le Guennec M, Banterle N, Iacovache I, Nemcikova V, Fluckiger I, Goldie KN, Stahlberg H, Levy D et al: Cell-free reconstitution reveals centriole cartwheel assembly mechanisms. *Nature communications* 2017, 8:14813
- Ackerknecht M, Gollmer K, Germann P, Ficht X, Abe J, Fukui Y, Swoger J, Ripoll J, Sharpe J, Stein JV: Antigen Availability and DOCK2-Driven Motility Govern CD4(+) T Cell Interactions with Dendritic Cells In Vivo. *J Immunol* 2017, 199(2):520-530
- Lyck R, Lecuyer MA, Abadier M, Wyss CB, Matti C, Rosito M, Enzmann G, Zeis T, Michel L, Garcia Martin AB et al: ALCAM (CD166) is involved in extravasation of monocytes rather than T cells across the blood-brain barrier. *J Cereb Blood Flow Metab* 2017, 37(8):2894-2909