

CZECH — BIOIMAGING NEWSLETTER

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FOCUS ON TECHNOLOGIES

Introducing cryo-SEM Verios with WITec RISE confocal Raman imaging and Bruker FlatQUAD EDS detector

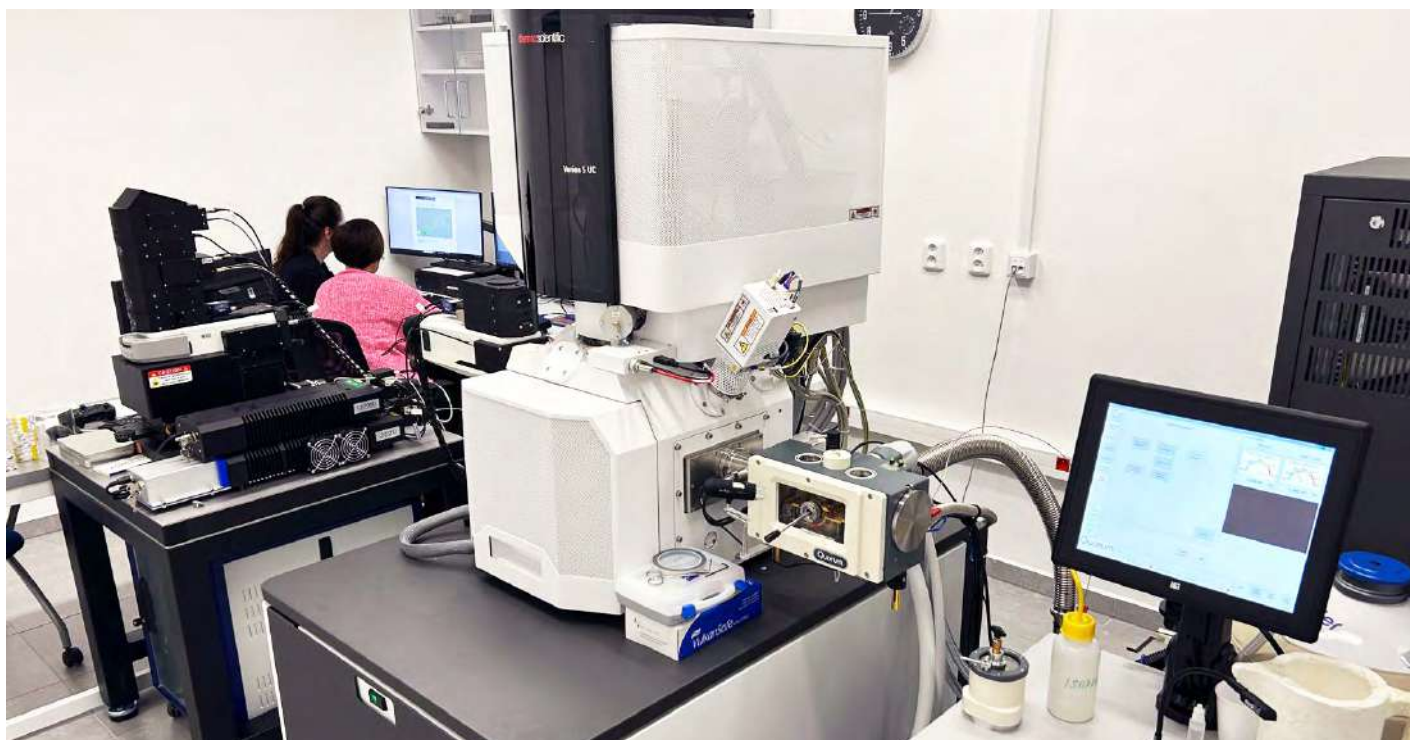


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In September 2025, the Laboratory of Electron Microscopy, Biology Centre CAS in České Budějovice, officially launched its new **cryo-SEM Verios (TFS), equipped with WITec RISE confocal Raman imaging and a Bruker FlatQUAD EDS detector**. This globally unique system combines high-resolution, low-voltage SEM imaging with fluorescence, cathodoluminescence, elemental,

and chemical mapping from the same region of interest. By enabling correlative studies at both room temperature and cryogenic conditions, allowing imaging biological samples structures close to the natural state of, the new cryo-SEM opens unprecedented opportunities for research across a broad spectrum of biological and material sciences.



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New possibilities at the Biophotonics Core Facility and their applications in nanorobots

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The Biophotonics Core Facility is a state-of-the-art imaging service designed for biomedical microscopy and enhanced live-cell analysis at CEITEC Brno University of Technology. During spring and summer 2025, the facility **was expanded with new equipment**. We would therefore like to introduce you to our facility and its new capabilities.

The underlying technology is **Quantitative Phase Imaging (QPI)**. QPI enables high-contrast, long-term, and label-free imaging of living cells. From the QPI time lapses, cell growth and motility can be quantified easily, which is particularly important for cancer research. Therefore, different drugs with migrastatic potential can be tested, and their effect on the cancer cell population can be compared. Our laboratory uses **Telight's Q-Phase** device, extended with a fluorescence module. The

combination of QPI and fluorescence allows the use of correlation microscopy tools, which is ideal for proof of concept experiments.

Recently, the Q-Phase microscope significantly contributed to the research published in ACS Nano (doi: 10.1021/acsnano.5c02092), where the interaction of nanorobots with live cells was investigated.

In particular, **QPI enabled detailed observation of cell proliferation and cell migration** in response to nanorobots exposure in "random walk" assay. QPI high sensitivity and long-term stability without the need for labeling allows direct observation of living cells as well as quantitative dry mass measurements of cells to monitor cell growth.

"Time-lapse imaging was employed to observe the effects of two concentrations of Au-SiO₂

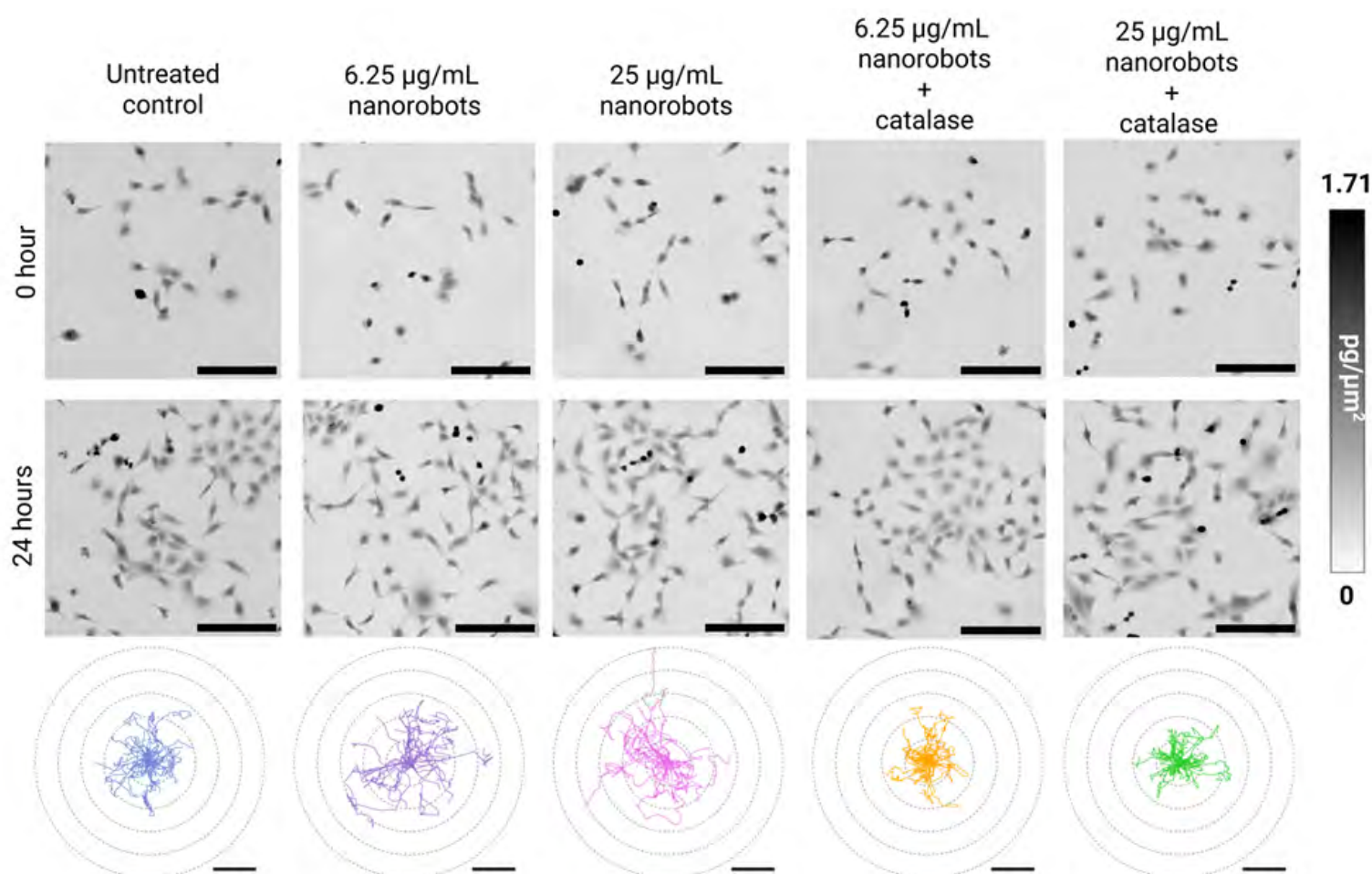


Fig. : Differentiation between cell migration and cell proliferation using QPI. Compensated phase micrographs of initial and final distribution of cells (scale bar 200 µm) and motility tracks of cells with and without nanorobot treatment plotted from a common origin, N=30 (scale bar 100 µm). Adapted from: doi: 10.1021/acsnano.5c02092.

nanorobots, with and without enzyme catalase, on sparsely seeded HT1080 cells at 30 min intervals over 24 h. Important differences in cell motility were evident between the untreated and catalase-treated cells compared to the nanorobot-treated groups. Untreated and catalase-treated cells remained within 100 μm of their original position, whereas low-dose nanorobot treated cells migrated over 150 μm , and those treated with the high-dose nanorobots traveled over 200 μm . A significant difference was also observed in cell proliferation between the low- and high-dosage nanorobot treatments. The mean doubling time of cells decreased from 16.8 h in the untreated group to 12.9 h in the low-dose group (77% of the control) but increased to 18.1 h in the high-dose group (108% of the control)."

Therefore, the researchers infer that Au-SiO₂ nanorobots, through steady-state generation of H₂O₂, influence not only cell migration but also cell proliferation.

The nanorobot project also utilized another newly introduced technique at our facility, the laser-scanning confocal microscope, **Zeiss LSM 980**, which is now equipped with **Airyscan** super-resolution technology and a **multiphoton module**. This provides unmatched imaging flexibility. Airyscan offers higher sensitivity and improved deep tissue imaging with reduced phototoxicity, making it ideal for organoids, tissue sections and 3D cultures.

The system also features full spectral detection and flexible laser configurations to support complex, multi-channel experiments with minimal crosstalk. To support sample preparation and standard observation, the Biophotonics core facility has been newly equipped with a **Aixio Observer microscope with Zernike phase contrast and widefield fluorescence**. This microscope also includes a stage top incubator with temperature, CO₂, and humidity control around the sample.

Strategically located next to the cell-culture laboratory, the facility integrates sample preparation and sophisticated imaging workflows

to streamline research and maximize efficiency. The Biophotonics Core Facility operates within the Biological Imaging Section of Czech-Biolmaging, a national infrastructure integrating major Czech imaging centers. It forms the Brno node of Euro-Biolmaging, extending open-access opportunities to researchers. It is more than just a shared microscopy laboratory: it offers a collaborative, progressive environment designed to meet the evolving needs of scientists working in both biological and material sciences.

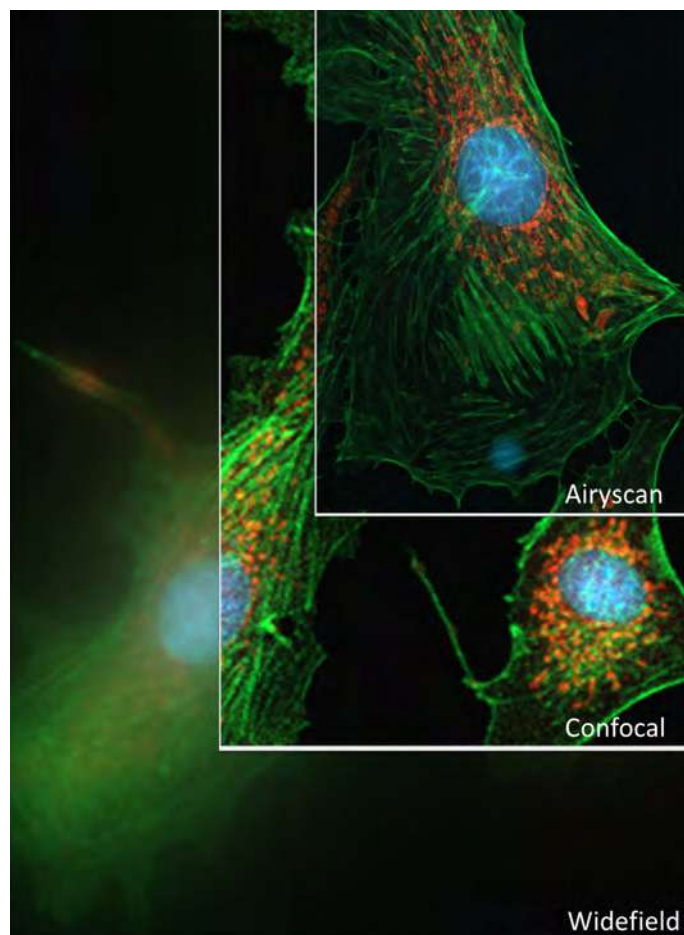


Fig. : Bovine pulmonary artery endothelial cells (BPAEC) labelled with: MitoTracker™ Red: mitochondria, Alexa Fluor™ 488 phalloidin: F-actin, and DAPI: nuclei. (FluoCells™, Invitrogen). Images taken using widefield, laser scanning confocal and Airyscan microscopy. Images taken using widefield, laser scanning confocal and Airyscan microscopy at the Biophotonics Core Facility.



How to get in touch?

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🌐 www.ceitec.eu/biophotonics-core-facility/cf391

USER PROJECT SUPPORT IN 2026

Through our open calls, we usually allocate approximately CZK 2.3 million per year.

However, in 2026, the full budget will be dedicated to a single call in the autumn (there will be no spring call).

Over the years, many successful collaborations supported by this scheme have led to impactful publications that wouldn't have been possible without this initial support. If you have a groundbreaking project in mind, we look forward to receiving your proposal in autumn 2026.

Eligibility criteria:

Methodological Importance: Is the project original, novel, and impactful from a methodological perspective? Does it contribute to the development of the research facility and improve service usability?

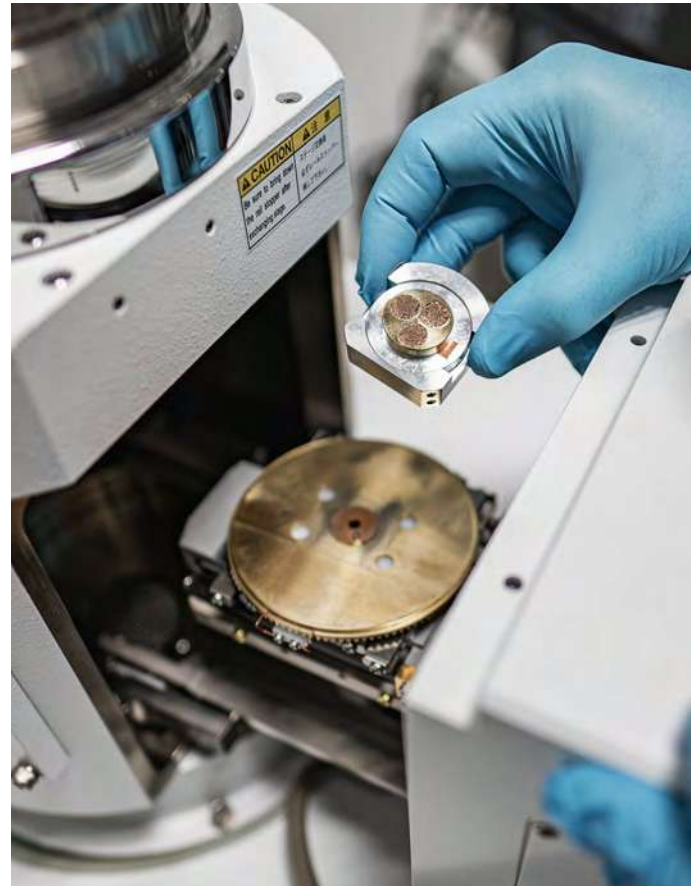
Scientific Excellence: Is the science solid, exciting, and promising to deliver important new data relevant to the field?

Impact on the Scientific Community: Will the outcomes benefit a wide scientific community in the relevant field?

Feasibility: Is the project realistic considering the research approach, team size, and project duration?

Methodological Appropriateness: Is the chosen methodology suitable for the project's objectives?

Clarity of Experimental Plan: Is the experimental



design clearly articulated, with specific objectives and a transparent plan for data collection and analysis? Does it avoid vague or overly ambitious claims by presenting concrete, verifiable steps?

Budget Structure and Justification: Is the budget well-structured, with realistic estimates of samples, hours, and resources required? Are the costs justified in relation to the project goals?

Acknowledge us

Please include the following acknowledgment in your outputs:

The authors used services of the Czech-BioImaging research infrastructure, specifically [Name of the Core Facility], [Institution], supported by project

LM2023050 funded by the Ministry of Education, Youth and Sports of the Czech Republic, with the instrumental equipment co-financed by the European Union.

Find more details at:

czech-bioimaging.cz/activities/open-calls

RECENT EVENTS

Highlights from Czech-Biolmaging

How we celebrated 10th Anniversary of with our users and staff at the annual conference

From 17 to 19 September 2025, the Czech-Biolmaging community gathered in Brno (Hotel Atlantis, Rozdrojovice) for the **Imaging Principles of Life 2025** conference. This year's edition was more than just an annual meeting — it became a milestone event to mark the 10th anniversary of Czech-Biolmaging.

The program was densely packed with engaging content: six invited talks, a poster session showcasing fresh results; and a lively exhibition from industry partners unveiling new technologies. A special “user meeting session” allowed the community to reflect on the past ten years and look forward to future directions.

The social dimension was not forgotten. The welcome reception (featuring Moravian wines) and a gala dinner with live music by DeeSaxx and dancing added warmth and connection to the scientific exchange.

Over the past ten years, Czech-Biolmaging has grown into a backbone for imaging research in the Czech Republic. With 16 leading facilities, more than 200 instruments, and hundreds of users.

Thank you to all speakers, poster presenters, industry partners, and guests who made the conference a success.



Poster session discussions



Scientific session



Saxophonist from DeeSaxx



Baubak Bajoghli, Austrian Biolmaging/CMI Director

Czech-Biolmaging will continue to expand with new services, equipment upgrades, and funding opportunities in the period ahead.

The next Imaging Principles of Life Conference will take place in 2026.
Details will be announced on our website.

Stay tuned and join us next year!



Group image of all participants of the Imaging Principles of Life 2025, Rozdrojovice, Czech Republic

Participation at the 17th Multinational Congress on Microscopy in Portorož, Slovenia

At the 17th Multinational Congress on Microscopy (Portorož, 7–12 September 2025), Czech-Biolmaging was represented by **Pavel Hozák (CzBI Director)**, **Kamila Hrubanová (ISI EM)**, **Jiří Týč**, **Marie Vančová**, **František Kitzberger (all BC LEM)**, and **Eva Ďurinová (CUNI IMCF BIOCEV)**. All of them contributed through talks, poster presentations, and participation in scientific sessions helping to strengthen our connections within the international microscopy and bioimaging community.

The 17MCM brought together researchers and instrument developers from across Europe and beyond, covering the latest advances in electron and light microscopy, image analysis, and correlative approaches. With its combination of scientific program, workshops, and industry exhibitions, the congress provided a valuable platform for exchanging expertise and highlighting the contributions of Czech-Biolmaging to the global microscopy field.



*Eva Ďurinová, CUNI IMCF BIOCEV, presenting a lecture titled
Volume Electron Microscopy Methods for Investigating Nitrogen
Handling and Cellular Vision in Microscopic Algae*

Participation at the 17th International Congress of Histochemistry and Cytochemistry in Rimini, Italy

At the 17th International Congress of Histochemistry and Cytochemistry (ICHC 2025, Rimini, 27–30 August), Czech-Biolmaging was proud to be present and actively engaged in the scientific program. In particular, **Pavel Hozák delivered a plenary lecture titled “From nucleolar morphology to molecular regulation of gene expression by phase separation” as the recipient of the Paul Nakane Prize**, an honor announced earlier in the year, in recognition of his lifetime contributions to histochemistry and cytochemistry.

His award and talk underscored the growing international visibility of Czech imaging science, and our presence at ICHC helped reinforce connections across histochemistry, cytochemistry, microscopy, and imaging communities.



Pavel Hozák presenting a plenary lecture at the ICHC 2025



Pavel Hozák after receiving the Paul Nakane Prize at the ICHC 2025

Czech-Biolmaging Core Facilities at the Researcher's Night 2025

Our Core Facilities once again joined the European Researchers' Night, this year held on September 26th, 2025, with the **theme of Wealth**. Visitors explored the hidden worlds of microscopy, imaging, and scientific discovery through interactive demonstrations prepared by our CF staff at IMG LM, IMG EM, MUNI MAFIL CEITEC, IPHYS BIF, and BC LEM. We are proud to continue inspiring curiosity and sharing how cutting-edge imaging technologies contribute to knowledge and innovation — especially in the many children who attended the event.



UPCOMING COURSES

October - December 2025

PYTHON FOR ANALYSIS AND PROCESSING OF IMAGES - UPDATED DATE

October 13 – 14 + October 20 – 21, 2025 | BIOCEV, CUNI, Vestec

MICROSCOPY METHODS IN BIOMEDICINE

October 13-17, 2025 | Institute of Molecular Genetics of the Czech Academy of Sciences, Prague

ADVANCED MULTI-MODAL LIGHT MICROSCOPY IMAGING IN PLANT RESEARCH

October 14-15, 2025 | Institute of Experimental Botany of the Czech Academy of Sciences, Prague

LIVE CELL IMAGING

November 11-13, 2025 | Institute of Molecular Genetics of the Czech Academy of Sciences, Prague

INTRODUCTION TO PROGRAMMING FOR IMAGE PROCESSING

November 12-14, 2025 | Institute of Experimental Medicine of the Czech Academy of Sciences, Prague

3D-CLEM IMAGING FUNCTION AND ULTRASTRUCTURE

November 18-21, 2025 | BIOCEV, CUNI, Vestec

NEUROIMAGING: MAPPING THE FUNCTION AND STRUCTURE OF BRAIN

November 19-21, 2025 | MAFIL CEITEC, MUNI, Brno

TRANSMISSION ELECTRON MICROSCOPY IN LIFE SCIENCES

November 24-28, 2025 | Institute of Molecular Genetics of the Czech Academy of Sciences, Prague

PROCESSIONG AND ANALYSIS OF BIOLOGICAL IMAGES

December 2-5, 2025 | CELLIM CEITEC, MUNI, Brno

MECHANICAL CHARACTERIZATION OF BIOLOGICAL SAMPLES USING CORRELATIVE METHODS - UPDATED DATE

December 9-10, 2025 | Institute of Physiology of the Czech Academy of Sciences, Prague

czech-bioimaging.cz/activities/courses

CZECH-BIOIMAGING OPPORTUNITIES

Brno: CELLIM Best Microscopy Picture Contest

Each year, the CELLIM Core Facility at CEITEC MU hosts a Microscopy Picture Contest to highlight stunning images captured by its users. Announced at the beginning of the year, the contest showcases images acquired on CELLIM microscopes during the previous year and offers exciting prizes, including a grand prize sponsored by Carl Zeiss spol. s r.o.

For more information visit:

cellim.ceitec.cz/contest



Prague Node: Participate in the Picture of the Month/Year competition

Submit your most stunning images captured on microscopes at the Prague Node and compete for monthly recognition and prizes. Each month, a winning image is selected and featured online. Monthly winners advance to the annual Picture of the Year award, with prizes generously sponsored by industry partners. Submissions are open until the end of each month.

Latest Winner – August 2025

Congratulations to **Štěpánka Martišková** for her image **Fragile flowers, showing growth cones of differentiated SH-SY5Y cells with microtubules (green) and actin (magenta), captured on a Leica Sp8 and processed in ImageJ.**

For more details and submission guidelines, visit:

imcf.natur.cuni.cz/IMCF/picture-of-the-month



Fragile flowers by Štěpánka Martišková

**Do you have
any questions?**



Visit our website or contact us at

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www.czech-bioimaging.cz



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