

CZECH — BIOIMAGING NEWSLETTER

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SPOTLIGHT ON A NEW CZECH-BIOIMAGING FACILITY

The Core Facility Electron Microscopy and Raman Spectroscopy



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Introduction

The Core Facility Electron Microscopy and Raman Spectroscopy (CF) serves as a dedicated research infrastructure, offering support services to academic institutions and industrial companies engaged in fundamental research. The facility's operations are motivated by particular application requirements and insightful user feedback. Our goal is to upgrade the technology available in the labs.

Access to the services provided by the laboratory

is facilitated by their inclusion in the extensive Czech-BioImaging (since 2023) and Euro-BioImaging (since 2024) infrastructure networks. These collaborative networks not only contribute to funding the facility's operations but also provide expert guidance and feedback, ensuring that the services rendered maintain the highest standards of quality.

Services and equipment

SEM Magellan 400/L (Thermo Fisher Scientific);



DualBeam FIB-SEM Helios (Thermo Fisher Scientific); Cryo-equipment extending the SEM Magellan 400 (FEI) to cryo-SEM; Cryo-high-vacuum preparation chamber ACE600 with freeze-fracture system, and cryo-vacuum transfer system VCT100 (Leica microsystems); EM GP2 Automatic Plunge Freezing; Equipment for

chemical processing of biological samples (chemical fixation, critical point dryer, etc.); High-pressure-freezer EM ICE (Leica microsystems); Freeze-substitution unit EM AFS2 (Leica microsystems); Ultramicrotome (Leica microsystems); Raman microscopy and spectroscopy inVia (Renishaw); Raman tweezers -

instrument enabling trapping, sorting and analysis of single cells based on Raman signal; Microfluidic devices (different options, developed in-house)

What makes us different?

The CF specializes in various imaging techniques, including room-temperature SEM, cryo-SEM, FIB-SEM, multimodal imaging, and quantitative STEM imaging. Advanced Raman microscopy and spectroscopy methods, including micromanipulation techniques, are among the available unique methods within Czech-Biolmaging. We are also dedicated to data processing using Python libraries, 3D data analysis, and our in-house Raman spectrum database, "RamanBase". We are working on enhanced microscopy techniques and procedures for preparing biological specimens, reducing toxicity, and preserving delicate specimens at the

same time. This allows us to provide comprehensive microscopic and spectroscopic analysis capabilities, as well as a unique ability to provide a tailored approach, including for special applications requiring extreme imaging and analysis conditions (e.g., very low temperatures down to 40 K, microfluidic platform modification, and micromanipulation techniques).

Vision

Our mission is to provide open access to advanced technologies, state-of-the-art devices, and cutting-edge imaging methods for our users, while specializing in applications that demand extreme conditions.

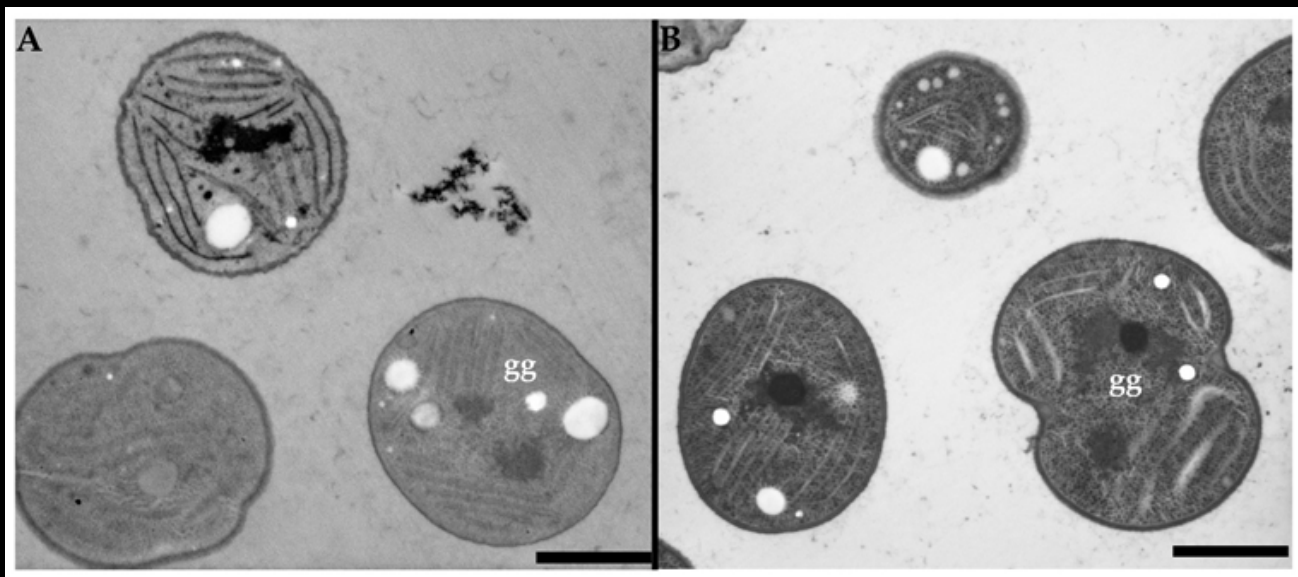


Figure 1: Cyanobacterial cells were imaged using SEM equipped with a STEM detector with a 15 kV accelerating voltage electron beam. (A) Unstained sample, (B) sample stained using uranyl acetate and lead citrate. Glycogen granules marked by "gg". Scale bar: 1 μ m. DOI 10.3390/microorganisms11040888



How to get in touch?

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FOCUS ON TECHNOLOGIES

Dive into plant tissues - using Virtual Reality for plant image analysis



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In plant research, understanding the intricate layers of plant tissues can be a complex task. A notable example of this complexity is the root, which consists of many cellular layers that present challenges in both orientation and measurement. To tackle these challenges, we have embraced the innovative use of Virtual Reality (VR) in our research. What are the benefits of Virtual Reality in Plant Research?

Visualization of Complex Structures:

Virtual Reality allows us to visualize plant tissues not just in three dimensions, but also across time, enabling the tracking of dynamic processes within the plant. This capability transforms our understanding of plant structures by providing an immersive experience that traditional microscopy cannot match.

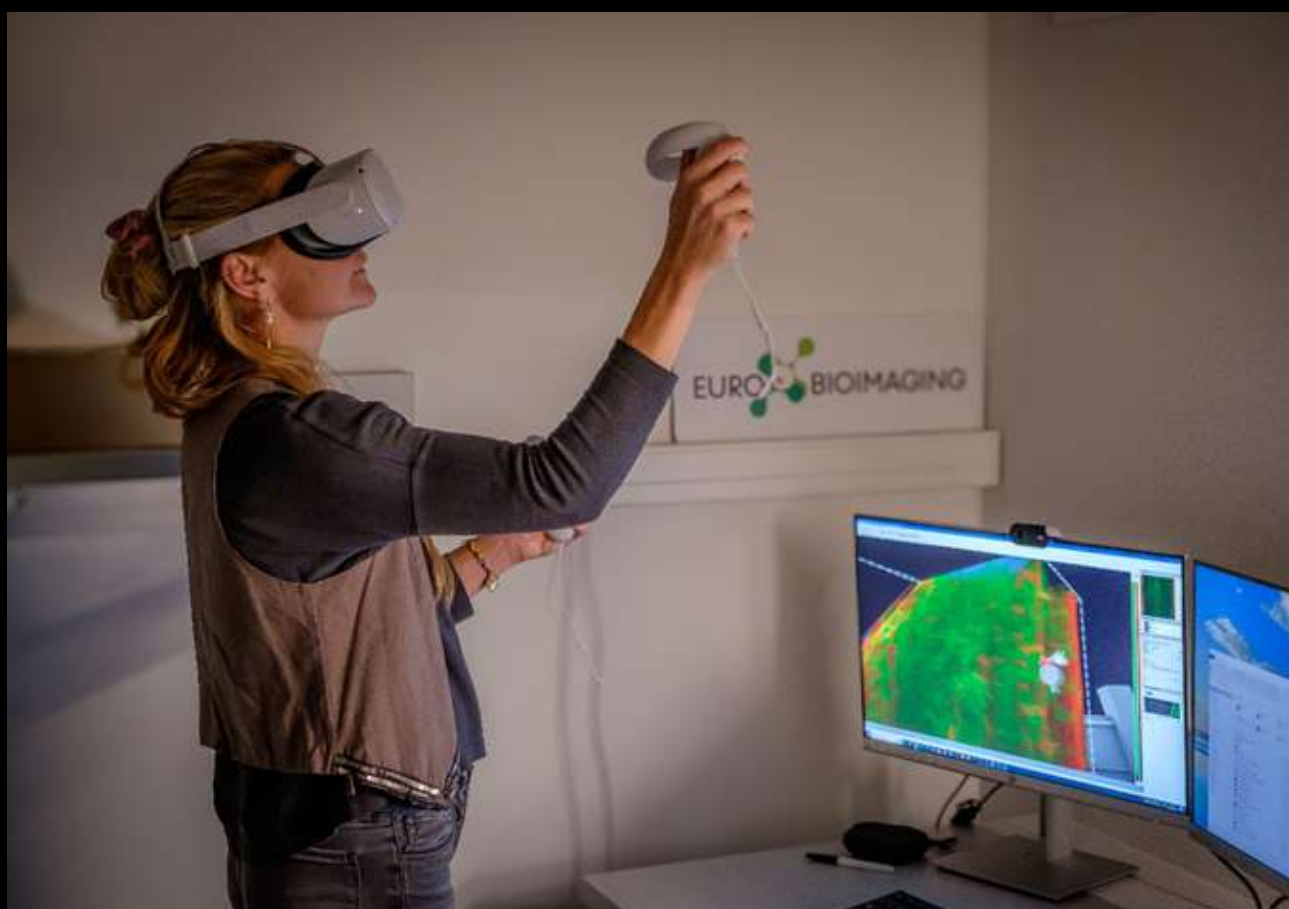


Photo of Adriana Jelinkova using VR at the IF IEB facility taken by Petr Klíma

Precise Measurements:

We use Arivis VR software and Oculus Quest 2 to select and measure specific cells within deep tissues without the need for segmentation. This streamlined process enhances our efficiency in data collection and analysis.

Popularization and Engagement:

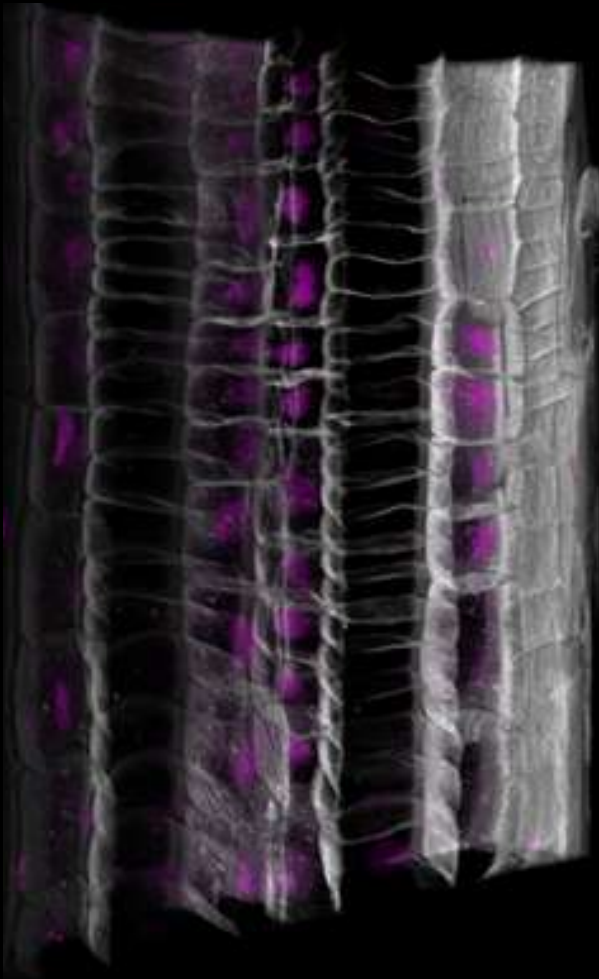
VR serves as an engaging tool for outreach, helping to popularize plant research among younger audiences and making complex scientific concepts more accessible. The hands-on experience offered by VR attracts interest and curiosity, generating a greater

appreciation for plant science.

A small demo of Virtual Reality is used during the annual two-day course on "Multimodal Light Microscopy Imaging in Plant Research" organised by Katerina Malinska and Imaging Facility of the Institute of Experimental Botany in Prague. You could have read more about this in last year's EuBI Newsletter.

<https://www.eurobioimaging.eu/news/learning-new-plant-imaging-techniques-at-an-ifieb-training-course/>

Stay tuned for more updates and exciting developments in the world of plant research!

**How to get in touch?**

Please visit our web or contact us directly via email:

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UPCOMING COURSES

November 24

INTRODUCTION TO PROGRAMMING FOR IMAGE PROCESSING

November 13-15, 2024 | Institute of Experimental Medicine of the Czech Academy of Sciences, Prague

FLIM NOT ONLY FOR BIOLOGISTS, PRACTICAL ASPECTS WITH HANDS-ON EXPERIENCE

November 18-20, 2024 | BIOCEV, CUNI, Vestec

ANALYSIS OF MR SPECTRA WITH AMARES

November 22, 2024 | Institute of Scientific Instruments of the Czech Academy of Sciences, Brno

TRANSMISSION ELECTRON MICROSCOPY IN LIFE SCIENCES

November 25-29, 2024 | Institute of Molecular Genetics of the Czech Academy of Sciences, Prague

MECHANICAL CHARACTERIZATION OF BIOLOGICAL SAMPLES USING CORRELATIVE METHODS

November 26-27, 2024 | Building Da I. Institute of Physiology of the Czech Academy of Sciences, Prague



December 24

LIVE CELL IMAGING

December 2-4, 2024 | Institute of Molecular Genetics of the Czech Academy of Sciences, Prague

ADVANCED METHODS OF SCANNING ELECTRON MICROSCOPY AND RAMAN SPECTROSCOPY

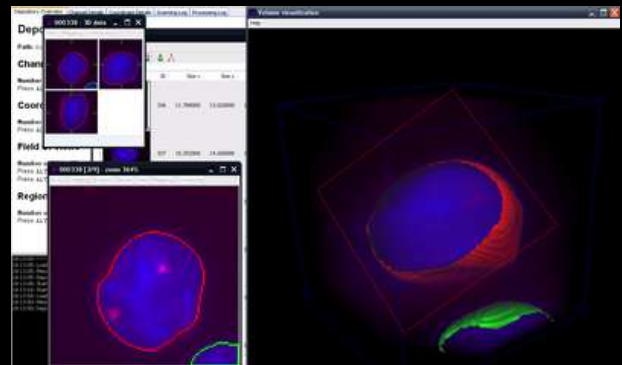
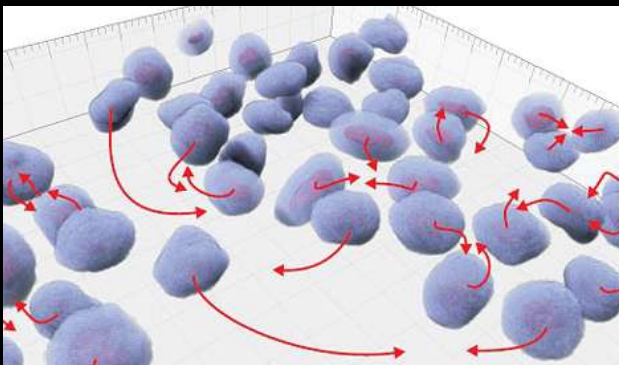
December 2-4, 2024 | Institute of Scientific Instruments of the Czech Academy of Sciences, Brno

PROCESSING AND ANALYSIS OF BIOLOGICAL IMAGES

December 3-6, 2024 | Faculty of Informatics MU, Brno & CELLIM, CEITEC Brno

IMAGE DATA PRESENTATION

December 10-11, 2024 | Institute of Molecular Genetics of the Czech Academy of Sciences, Prague



CZECH-BIOIMAGING OPPORTUNITIES

Show us your microscopic images

We continue to run two image contests Picture of the Month & Picture of the Year organized by the Prague Node facilities and CELLIM Best Picture contest.

Main prize for the Picture of the Year is 10 000 CZK, kindly sponsored by microscopy companies and announced at the annual barbecue Photons, Electrons and Sausages. Main prize in the CELLIM contest is a binocular Zeiss Terra ED 10x42, offered by Carl Zeiss

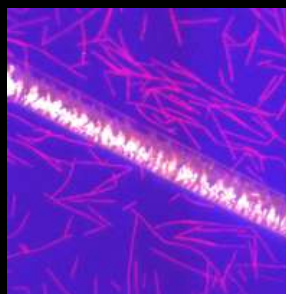
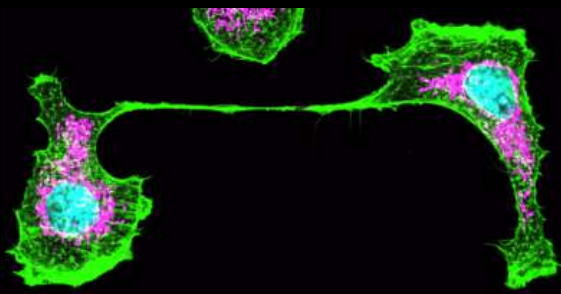
spol. s.r.o.

Successful contributions will be featured in Czech-BioImaging promotional materials, giving you visibility and recognition in the scientific community.

For more information visit:

<https://imcf.natur.cuni.cz/IMCF/picture-of-the-month/>

<https://cellim.ceitec.cz/contest/>



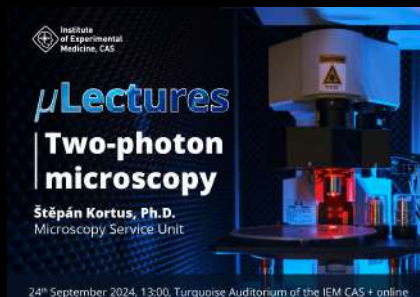
Join us at μ Lectures

The seminar series μ Lectures organized by the Microscopy Service Centre at the Institute of Experimental Medicine of the Czech Academy of Sciences titled **μ Lectures** is designed to enhance researchers' understanding of microscopy's fundamental workings and principles. Each session, lasting 30 minutes, focuses on a specific concept or topic within microscopy. The practical information presented aims to deepen researchers' comprehension of their microscopy experiments, giving them a

better overview of the options available and enabling them to improve their experimental design and more effectively identify and resolve potential issues.

Register for the next one at:

<https://www.iem.cas.cz/en/category/professional-events/%ce%bclectures/>



Apply for open access

Are you ready to take your research to the next level? Apply online to access state-of-the-art equipment, expertise, and training at one (or multiple) of our Core Facilities in Prague, Brno, Olomouc, or Ceske Budejovice.

How it works?

1. Choose the facility that offers the technology or expertise you require.
2. Submit your application through the Czech-Bioluming open access form.
3. After approval, you will be contacted by the core facility head to discuss your project

4. At the facility, you will receive hands-on training, access to instrumentation, support with data acquisition and analysis, and help with the arrangements of your stay.
5. After your project finishes, you will be asked to complete a satisfaction survey and inform us about any publications or other outcomes resulting from your project.

APPLY

EURO-BIOLUMING OPPORTUNITIES

Funding

Do you have an interesting project in mind but need support? Get funding for your research from European Projects Horizon Europe via Euro-Bioluming!

Check out the current open calls in the canSERV and AgroServ projects that Czech-Bioluming is involved in.

More at:
www.eurobioimaging.eu/how-to-access/funding/

Virtual Pub

Every Friday at 13.00 CE(S)T, Node staff and Friends of Euro-Bioluming join with the Euro-Bioluming Hub staff for a virtual meeting - about topics that interest us all.

Feel free to explore the upcoming topics and connect for a discussion.

More at:
<https://www.eurobioimaging.eu/our-events/virtual-pub/>



PAST EVENTS & ACTIVITIES

Imaging Principles of Life 2024

Our annual scientific conference “Imaging Principles of Life 2024”, held from September 30 to October 2 in Hustopeče, was a resounding success, bringing together 120 participants to explore the latest advancements in imaging technologies. The event featured 25 poster session presentations and 32 oral presentations, including 18 on light microscopy, 6 on medical imaging, 4 on electron microscopy, and 4 on

correlative methods. We were honored to have Dr. Johanna Bishof from Euro-BiolImaging discuss new opportunities for users and CF staff, prof. Uwe Himmelreich from KU Leuven deliver a compelling keynote presentation, and Dr. Lalith Shiyam Sundar from the Medical University of Vienna present an inspiring and innovative talk. We also would like to take this opportunity and extend our gratitude to our sponsors for their invaluable support.



Participation of Czech-BioImaging Core Facilities in the Researchers' Night 2024

Multiple Czech-BioImaging Core Facilities participated in this year's Czech European Researchers' Night event, held on September 27th, 2024.

This popular science event, aimed at engaging the general public with the wonders of scientific discovery, saw our microscopy experts showcasing the fascinating world of light microscopy, electron microscopy, medical imaging and digital images produced in the microscopes.

Visitors of all ages had the opportunity to explore the invisible realms through hands-on demonstrations and interactive exhibits at the Institute of Molecular Genetics, Institute of Experimental Medicine, Institute of Physiology, Biology Centre, and Masaryk University - CEITEC. Our team was on hand to explain the

latest advancements in microscopy, image analysis and medical imaging how these technologies are revolutionizing research in various fields.

We are proud to contribute to the popularization of science and to inspire the next generation of scientists. Thank you to our partner institutions, who joined this very important event, to the Core Facility staff, who came up with the amazing and very interactive program and everyone who visited our exhibits and made the event a success!

For more information about the event, visit Researchers' Night official website: <https://www.nocvedcu.cz/en>



**Do you have
any questions?**



Visit our website or contact us at

info@czech-bioimaging.cz

WWW.CZECH-BIOIMAGING.CZ



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