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Central European Institute of Technology

BRNO | CZECH REPUBLIC

CEITEC CELLIM

CZECH BIOIMAGING

Imaging principles of life

EURO BIOIMAGING

MUNI

Mgr. Milan Esner, Ph.D.

Cellular Imaging Core Facility CELLIM

Ceitec MU, Brno, Czechia

September 6, 2023

Bio AFM summer workshop

cellim@ceitec.muni.cz

https://cellim.ceitec.cz

CELLIM overview

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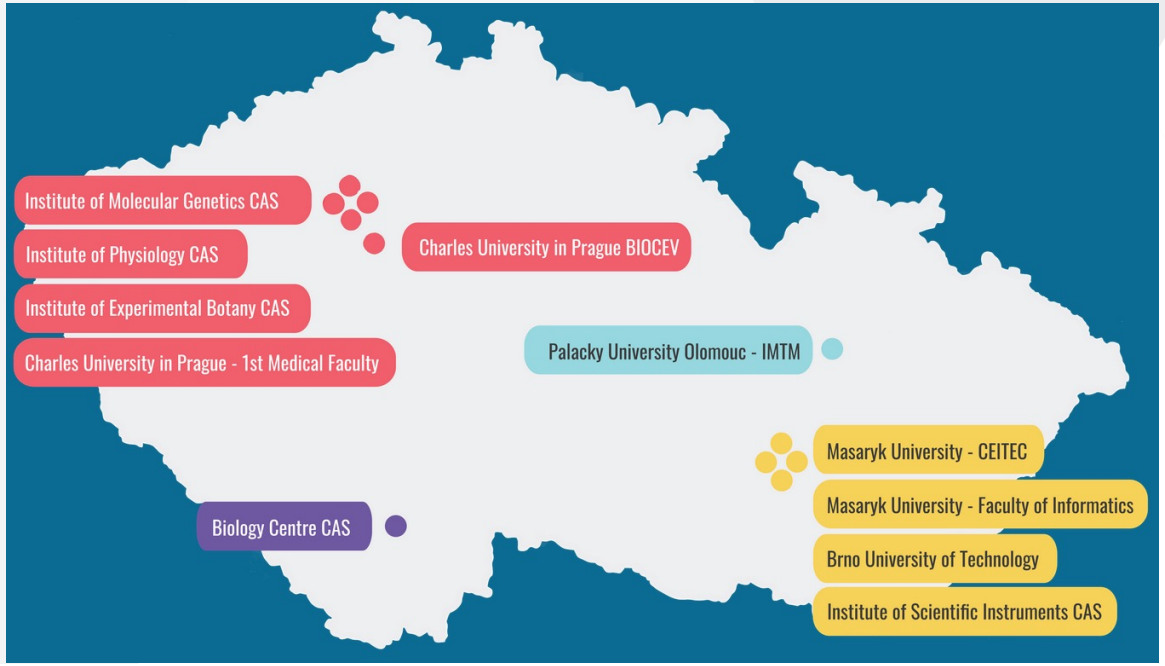
CZECH BIOIMAGING
Imaging principles of life

MŠMT



https://www.czech-bioimaging.cz/

CzBI Open Access

Czech BioImaging offers an open non-discriminatory access to the top technologies (instrumentation and expertise) in the field of biomedical imaging.

CzBI open access mode

It is an excellence-driven access mode, which is exclusively dependent on the scientific excellence, originality, quality and technical feasibility of an application as evaluated by the respective Czech-BioImaging core facility expert (complex projects can be additionally evaluated externally).

All users are welcome to apply for the CzBI open access. The Czech-BioImaging Access Policy is formulated with accordance to the **European Charter for Access to Research Infrastructure**. CzBI open access is efficient, supportive, transparent, and open at the point of service for the user. The CzBI user will be granted access to required resources (e.g. access to instrumentation, expertise, training, data software and analysis tools) at all stages of the research project.

CzBI facilities operating in open access are located in Prague, Brno, Olomouc, and Ceske Budejovice.

CzBI Grant Scheme

For a special support to conduct a project within the Czech-BioImaging

The aim is to promote open access to the core facilities participating in the Czech-BioImaging research infrastructure. Czech-BioImaging provides financial support in performing projects within the Czech-BioImaging open access to users from all over the world.

CELLIM overview

EUROBIOIMAGING

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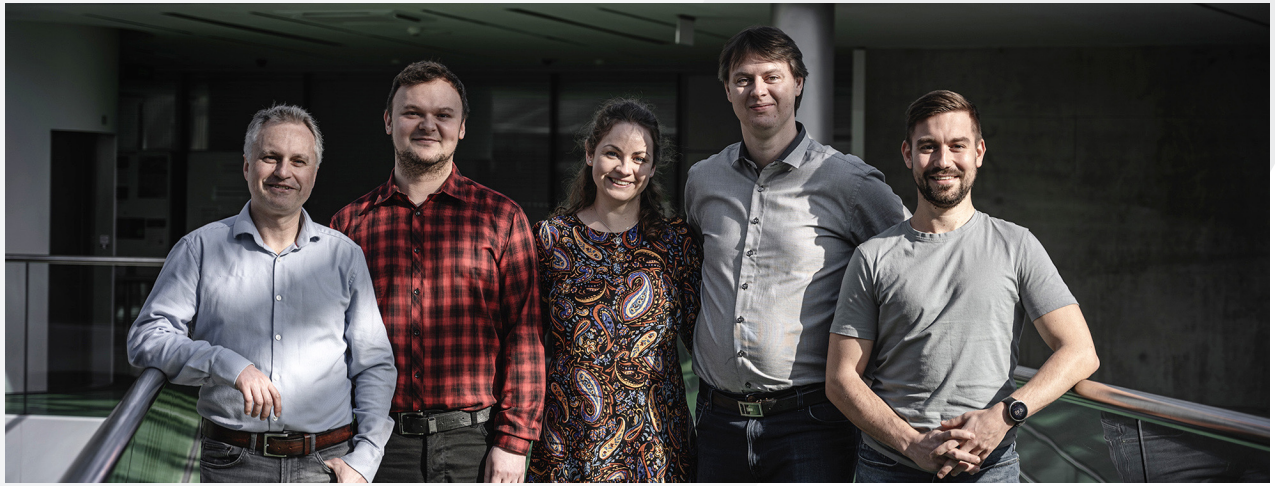
CZECH REPUBLIC

Advanced Light Microscopy and Medical Imaging Node Brno CZ

Cellular Imaging Core Facility - Ceitec MU
Experimental Biophotonics Facility – Ceitec BUT
Multimodal and Functional Imaging Laboratory – Ceitec MU
Magnetic Resonance and Cryogenics - Institute of Scientific Instrumentation CAS

https://www.eurobioimaging.eu/

CELLIM overview



	2019	2020	2021	2022
Number of users	117	133	151	166
User publications	17	16	16	32

PLANT SCIENCE

Meiotic exit in *Arabidopsis* is driven by P-body–mediated inhibition of translation

Albert Cairo[1], Anna Vargova[1], Neha Shukla[1], Claudio Capitao[2], Pavlina Mikulkova[1], Sona Valuchova[1], Jana Pecinkova[1], Petra Bulankova[2]†, Karel Riha[1]*

Meiosis, at the transition between diploid and haploid life cycle phases, is accompanied by reprograming of cell division machinery and followed by a transition back to mitosis. We show that, in *Arabidopsis*, this transition is driven by inhibition of translation, achieved by a mechanism that involves processing bodies (P-. During the second meiotic division, the meiosis-specific protein THREE-DIVISION MUTANT 1 (TDM incorporated into P-bodies through interaction with SUPPRESSOR WITH MORPHOGENETIC EFFEC GENITALIA 7 (SMG7). TDM1 attracts eIF4F, the main translation initiation complex, temporarily seq in P-bodies and inhibiting translation. The failure of *tdm1* mutants to terminate meiosis can be ov chemical inhibition of translation. We propose that TDM1-containing P-bodies down-regulate expre meiotic transcripts to facilitate transition of cell fates to postmeiotic gametophyte differentiation.

CellPress OPEN ACCESS

Structure

Article

Molecular mechanisms underlying the role of the centriolar CEP164-TTBK2 complex in ciliopathies

Ivan Rosa e Silva,[1,2,*] Lucia Binó,[3] Christopher M. Johnson,[2] Trevor J. Rutherford,[2] David Neuhaus,[2] Antonina Andreeva,[2] Lukáš Cajánek,[3] and Mark van Breugel[1,2,4,*]
[1]Queen Mary University of London, School of Biological and Chemic[illegible]
[2]Medical Research Council – Laboratory of Molecular Biology, Franc
[3]Department of Histology and Embryology, Faculty of Medicine, Mas
[4]Lead contact
*Correspondence: m.vanbreugel@qmul.ac.uk (M.v.B.), ivan.silva@al
https://doi.org/10.1016/j.str.2021.08.007

Published Online: 19 April, 2022 I Supp Info: http://doi.org/10.26508/lsa.202201421
Downloaded from life-science-alliance.org on 25 April, 2022

Cell Reports

CellPress OPEN ACCESS

Article

Continuous double-strand break induction and their differential processing sustain chiasma formation during *Caenorhabditis elegans* meiosis

Tara Hicks,[1] Shalini Trivedi,[2] Mikayla Eppert,[1] Richard Bowman,[1] Hui Tian,[1] Amna Dafalla,[1] Caroline Crahan,[1] Sarit Smolikove,[1,*] and Nicola Silva[2,3,*]
[1]Department of Biology, The University of Iowa, Iowa City, IA 52242, USA
[2]Department of Biology, Faculty of Medicine, Masaryk University, Brno 625 00, Czech Republic
[3]Lead contact
*Correspondence: sarit-smolikove@uiowa.edu (S.S.), silva@med.muni.cz (N.S.)
https://doi.org/10.1016/j.celrep.2022.111403

Resource

TRANSPARENT PROCESS OPEN ACCESS Life Science Alliance

Check for updates

LuminoCell: a versatile and affordable platform for real-time monitoring of luciferase-based reporters

Kamila Weissová[1], Bohumil Fafílek[2,3,4], Tomasz Radaszkiewicz[5], Canan Celiker[1], Petra Macháčková[6], Tamara Čechová[3,4], Jana Šebestíková[1,5], Aleš Hampl[1,4], Vítězslav Bryja[5], Pavel Krejčí[2,3,4], Tomáš Bárta[1,5]

Cellular Imaging Core Facility - CELLIM

Light microscopy facility of Ceitec Masaryk University.

What we are doing:

Providing access to a wide spectrum of light microscopes, including training and assistance services

Providing access to image processing and analysis tools (hardware and software), including training

Maintenance (QC, cleaning, calibration) of all our microscopes

Providing project design assistance and help with planning experiments, sample preparation

Developing and applying new methods and protocols for and in collaboration with our users

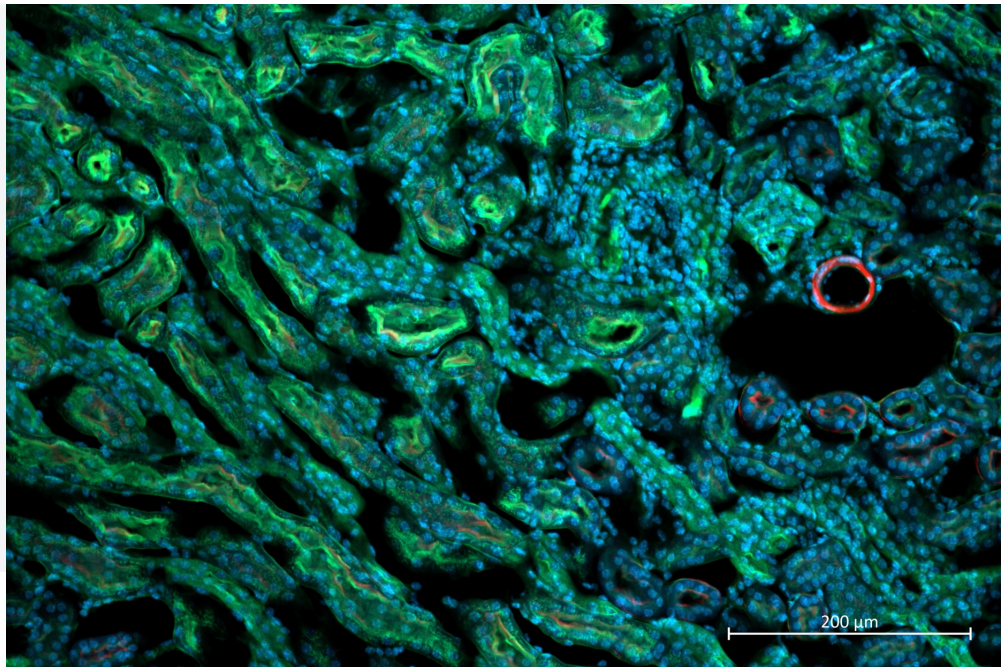
Full service – sample preparation, image acquisition, image analysis – dependent on staff availability

Educational activities – courses, workshops, demos of new instruments …

Large specimen imaging

Zeiss AxioZoom – Apotome 2

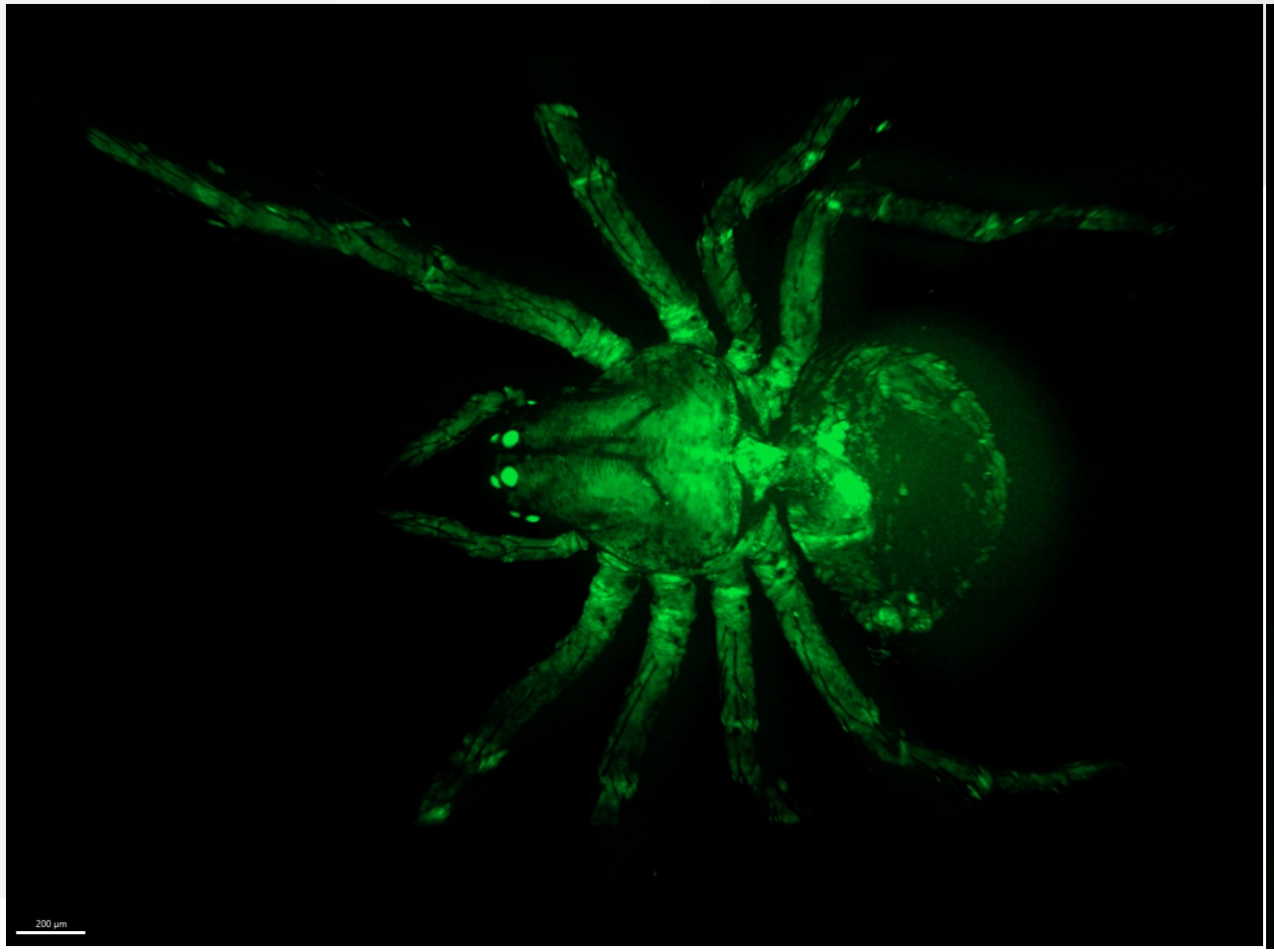
Olympus SZX 16

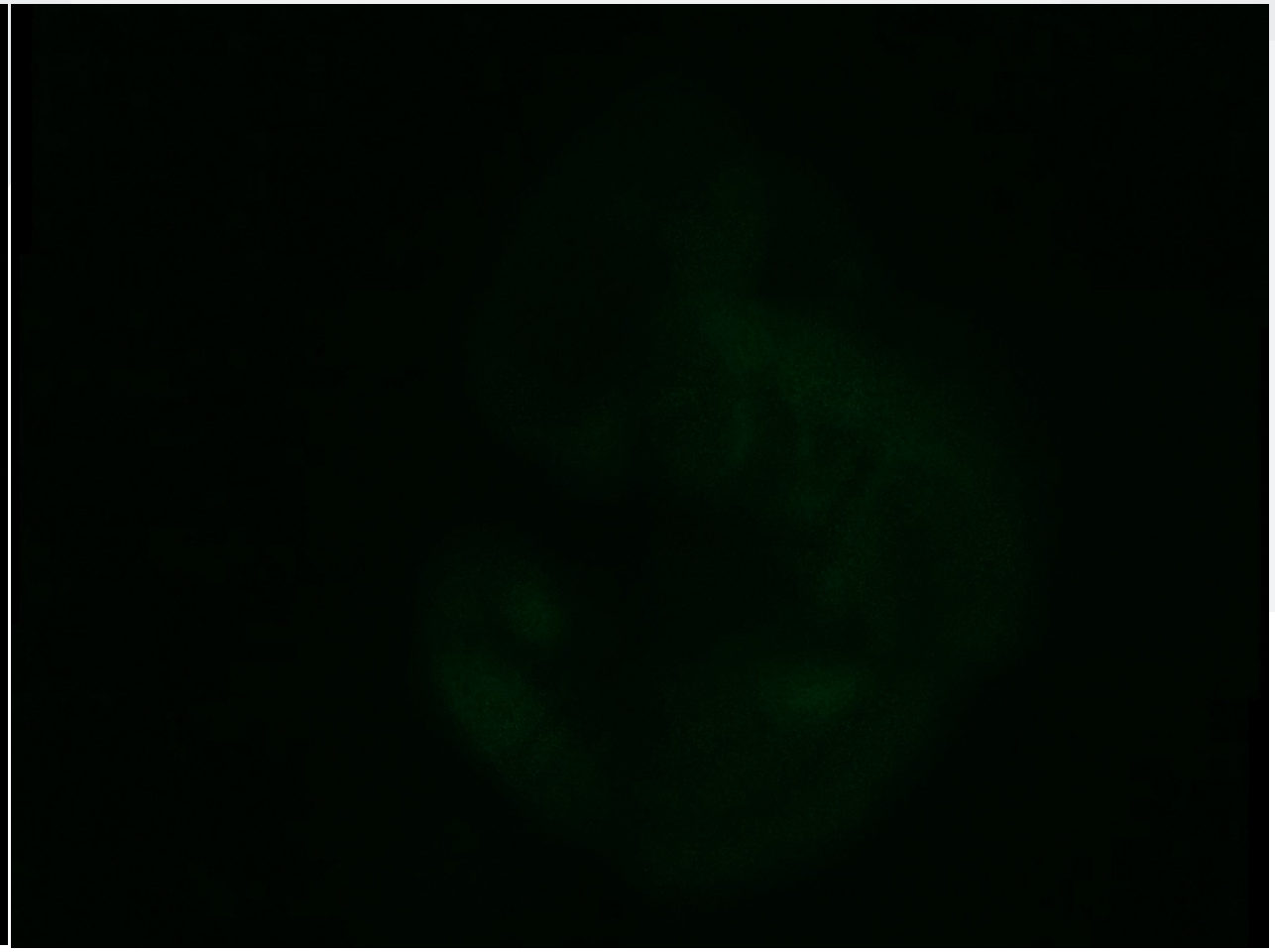


Mouse kidney section

Head louse - *Pediculus capitis*

Optical sections with Apotome

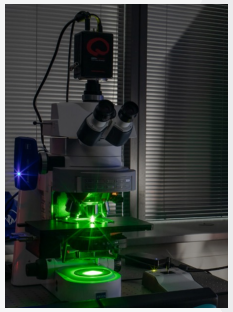


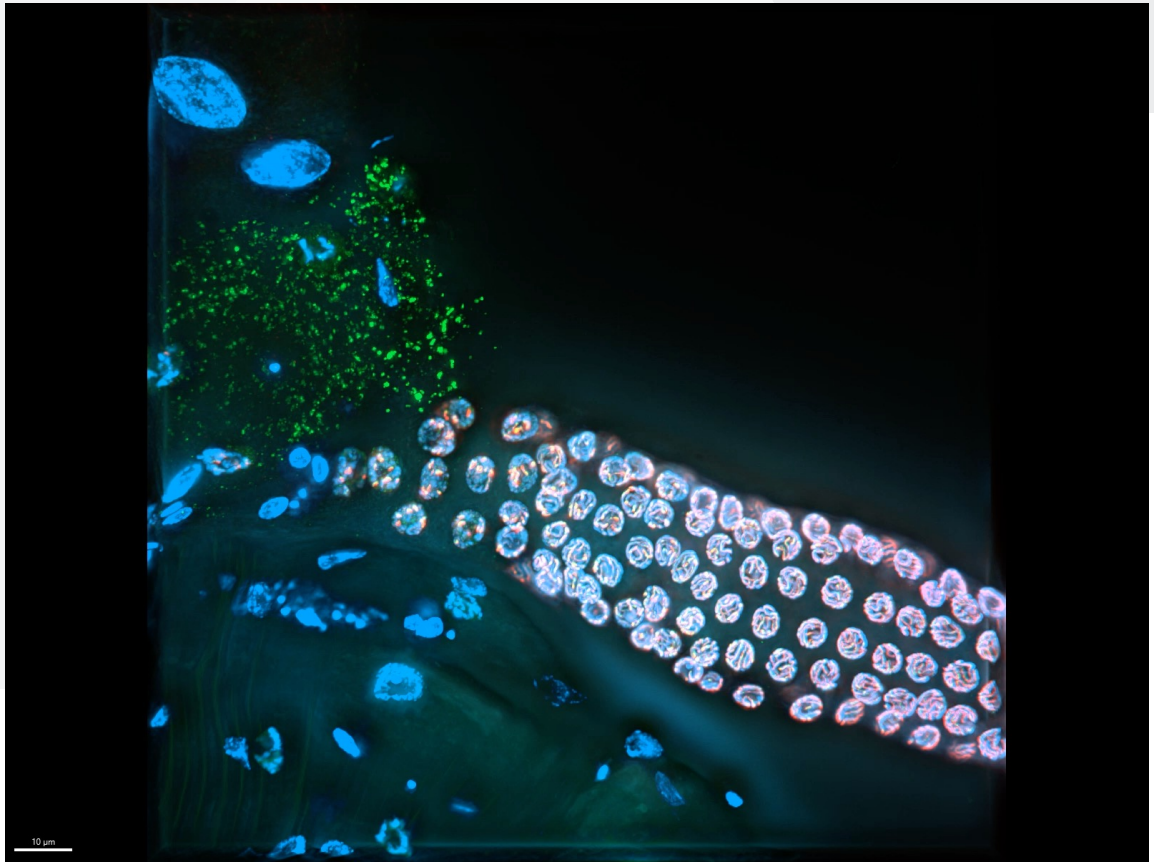


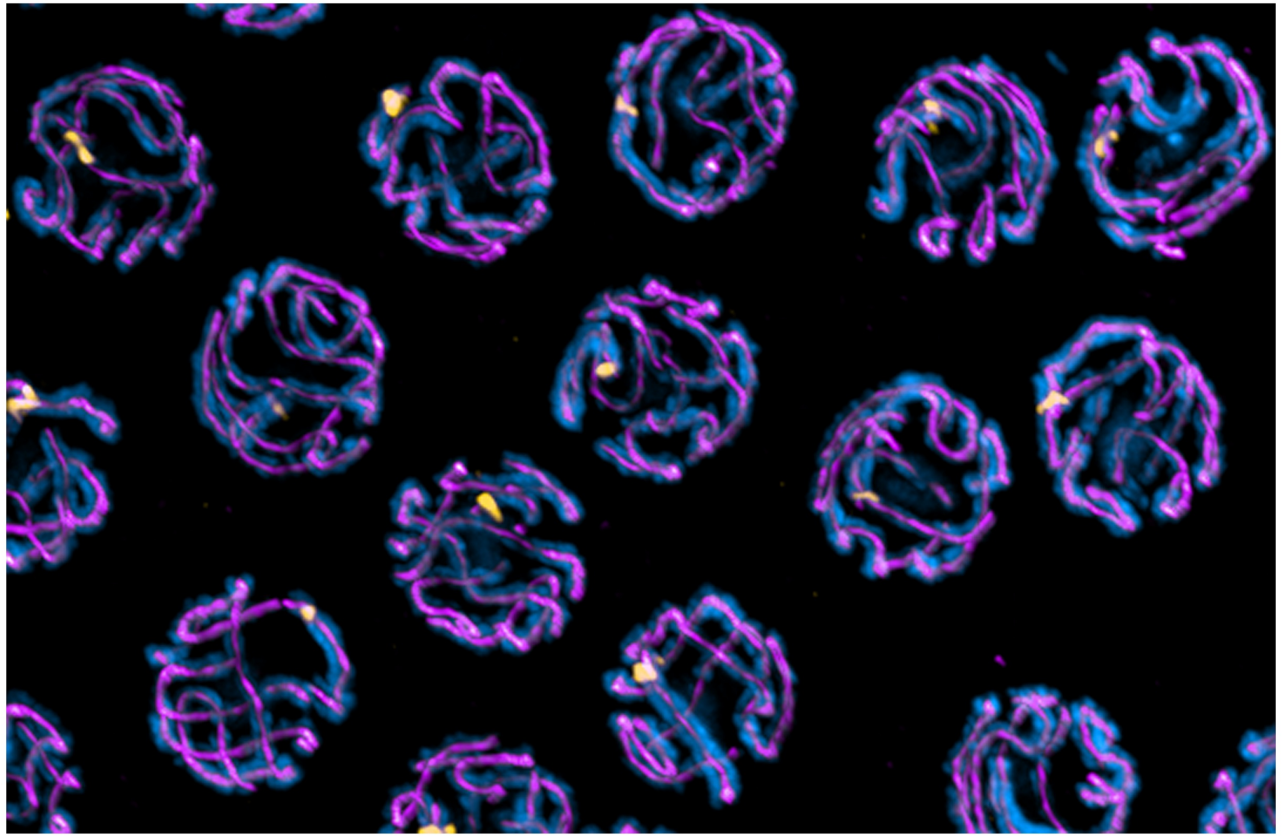
Courtesy of Nela Jandova and Marcela Buchtova
Institute of Animal Physiology and Genetics, CAS CZ

Widefield microscopy with deconvolution

Zeiss AxioImager – Apotome 3

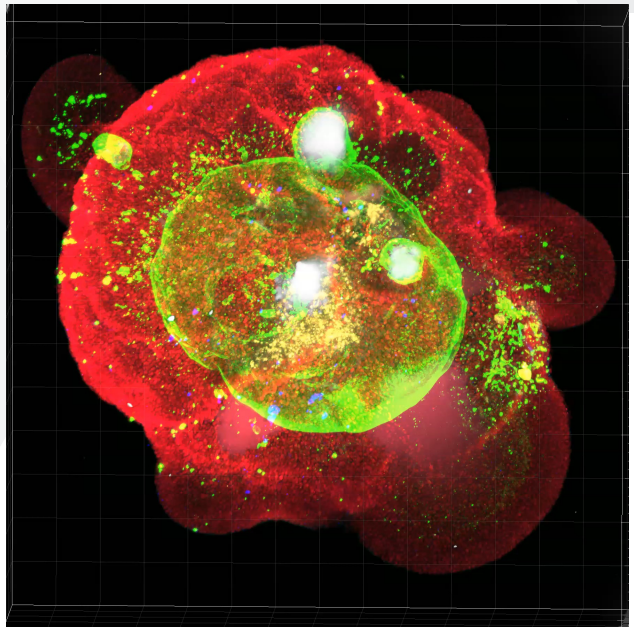




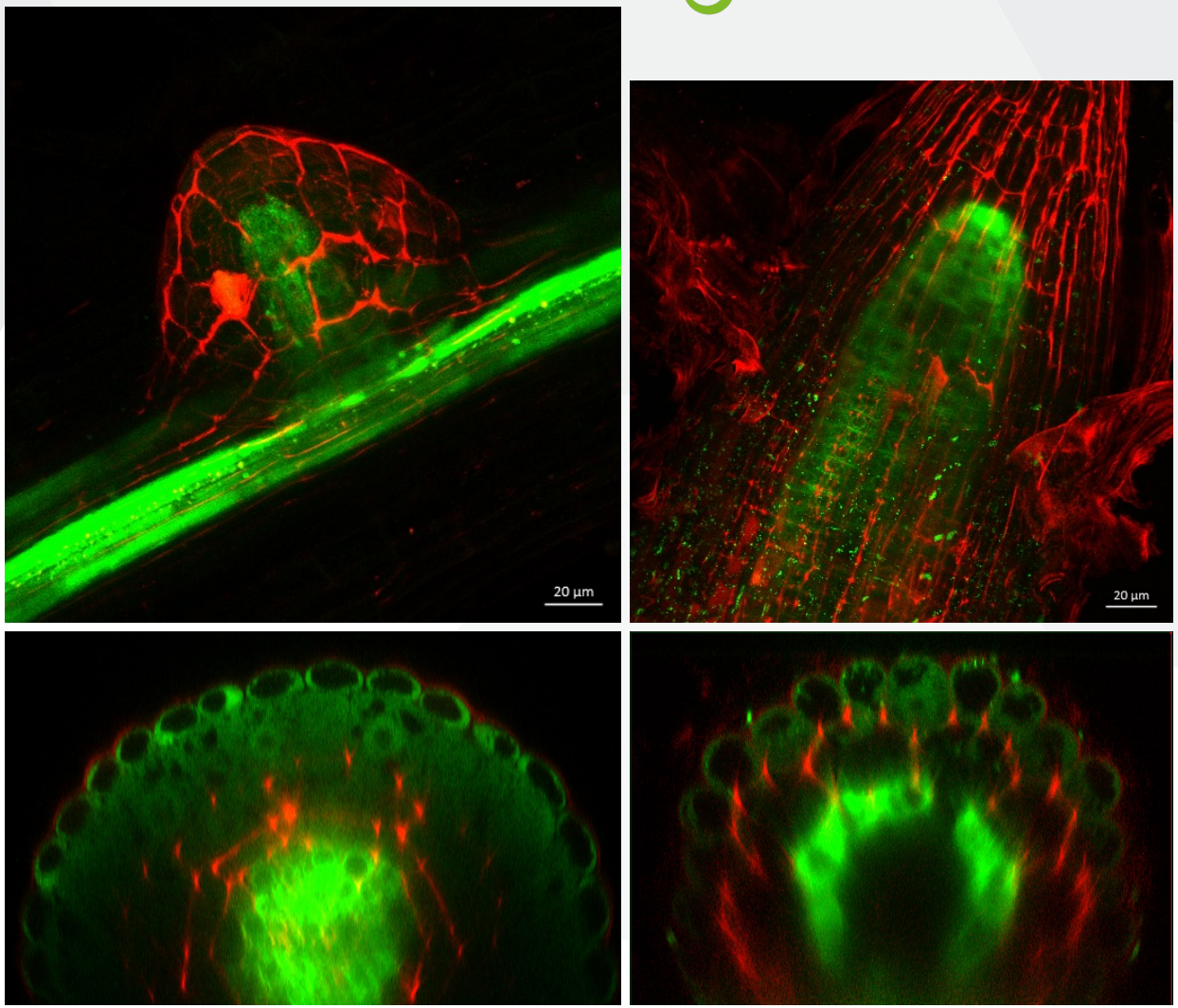


Courtesy of Nicola Silva, Faculty of Medicine, Masaryk University, Brno

Laser scanning confocal microscopy



Organoid from stem cells
Courtesy of Tomas Barta and Jan Krivanek
Faculty of Medicine, Masaryk University



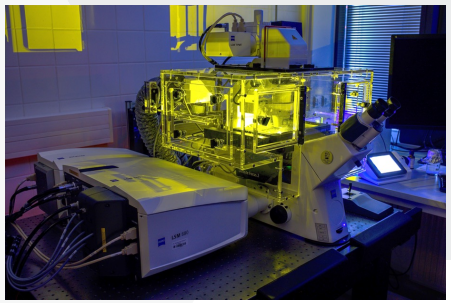
***Arabidopsis thaliana* root apical meristem**
Courtesy of Marketa Samalova and Jan Hejatko
Ceitec Masaryk University

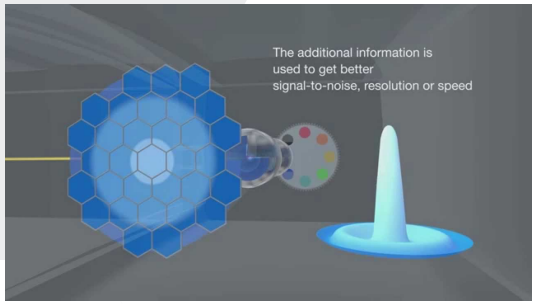
Airyscan – entry level to superresolution

Higher resolution, higher SNR compare to standard confocal microscope

Zeiss LSM 780-Airy

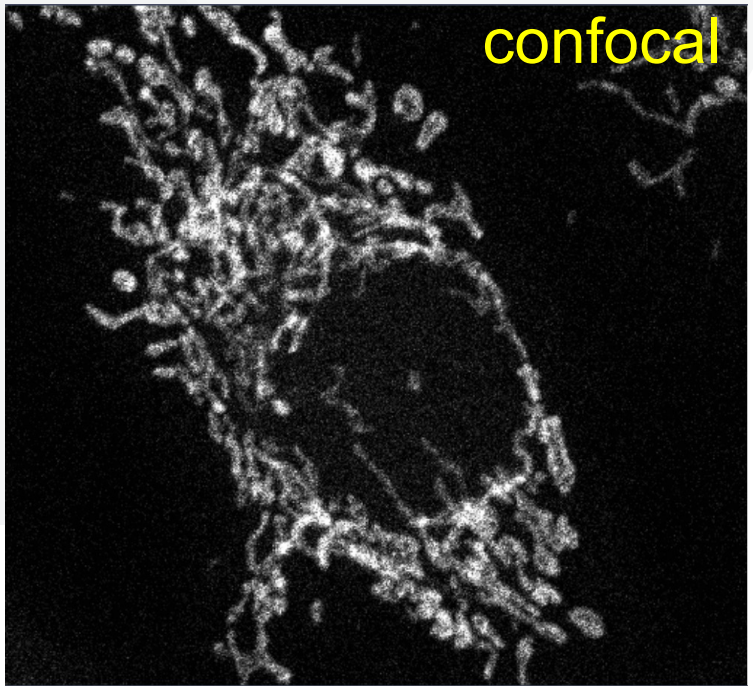
Zeiss LSM 880-Airy

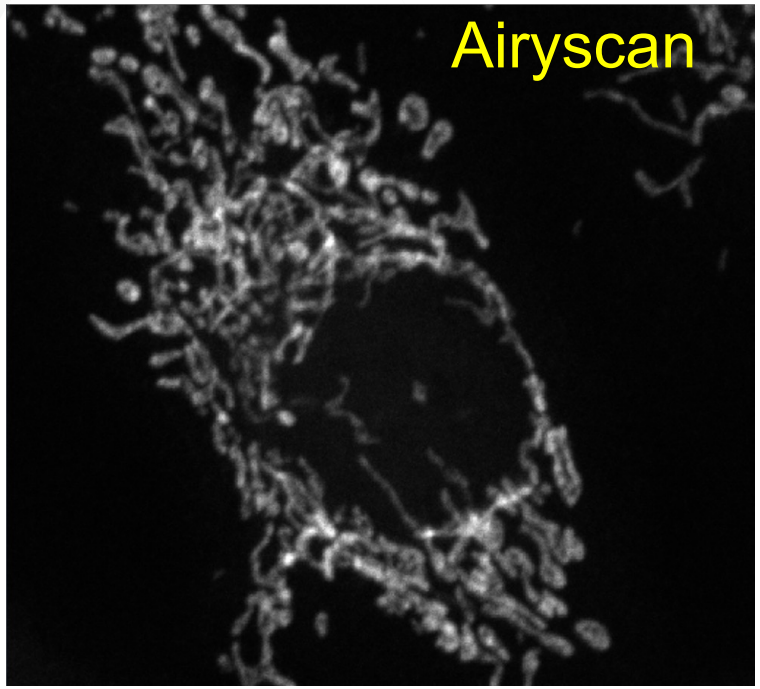


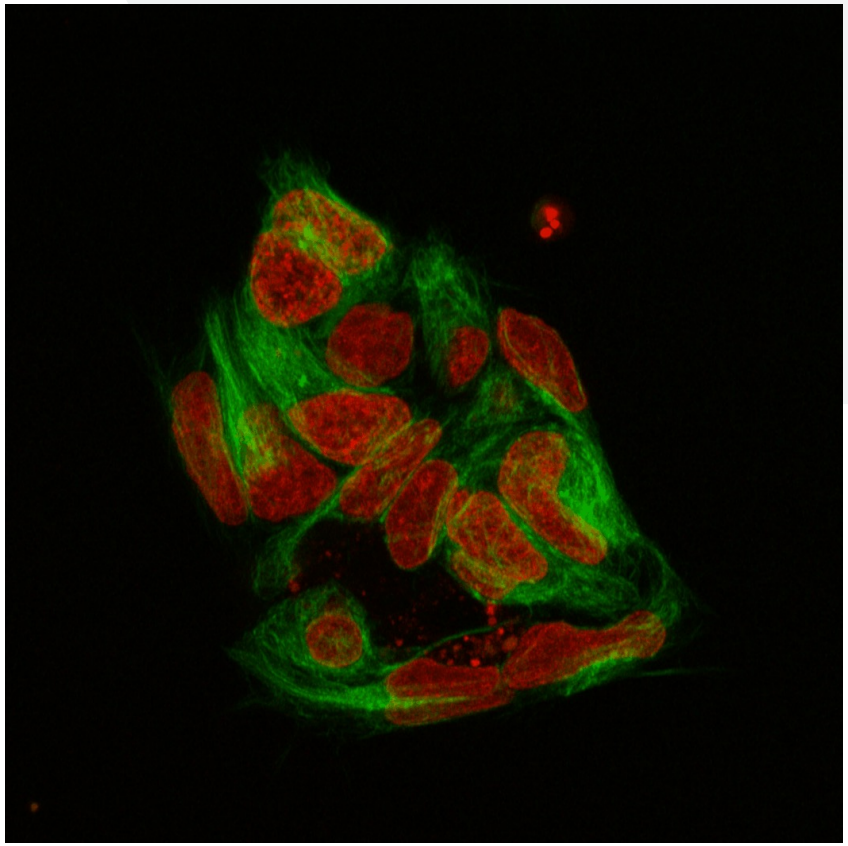


Temperature control
CO2 control
DefinitFocus2

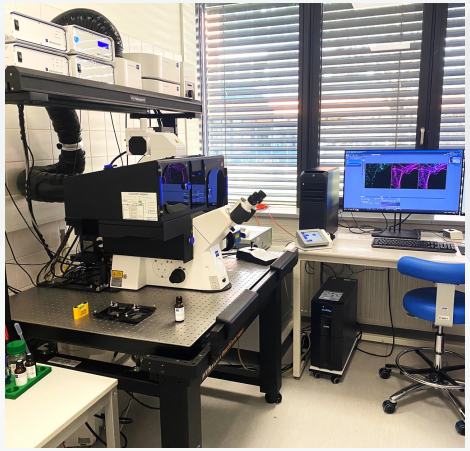
Piezo Z drive
Water immersion objectives

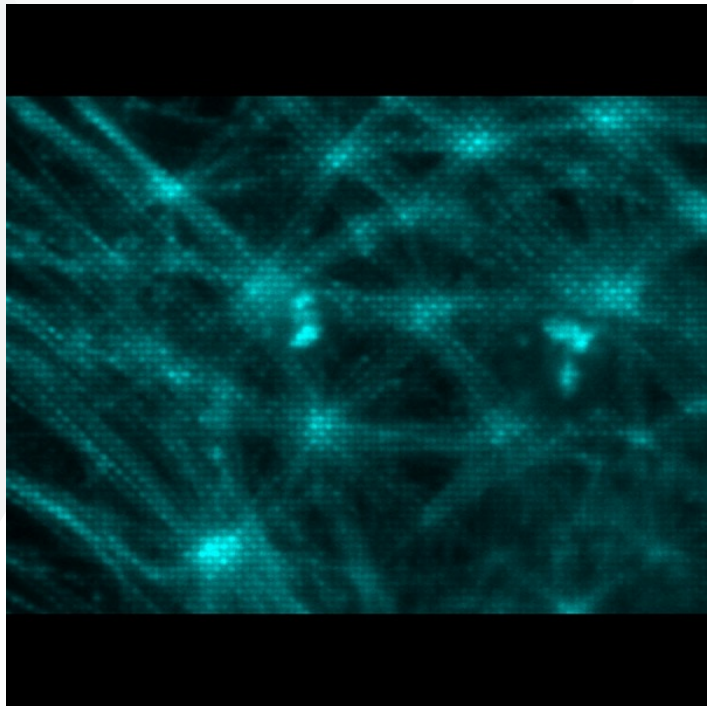


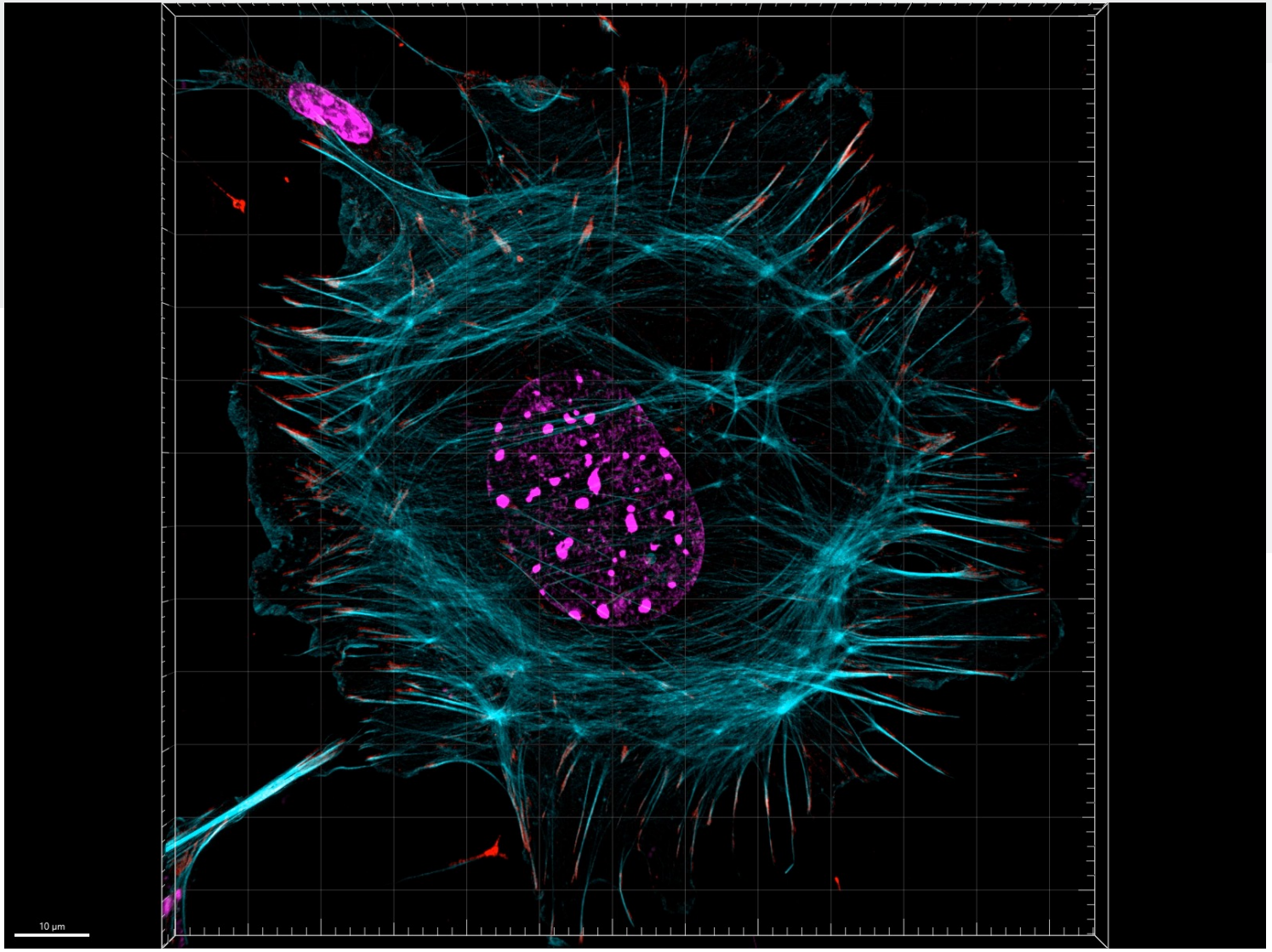




Carl Zeiss Elyra 7- Lattice SIM, SMLM







Lattice structured illumination microscopy

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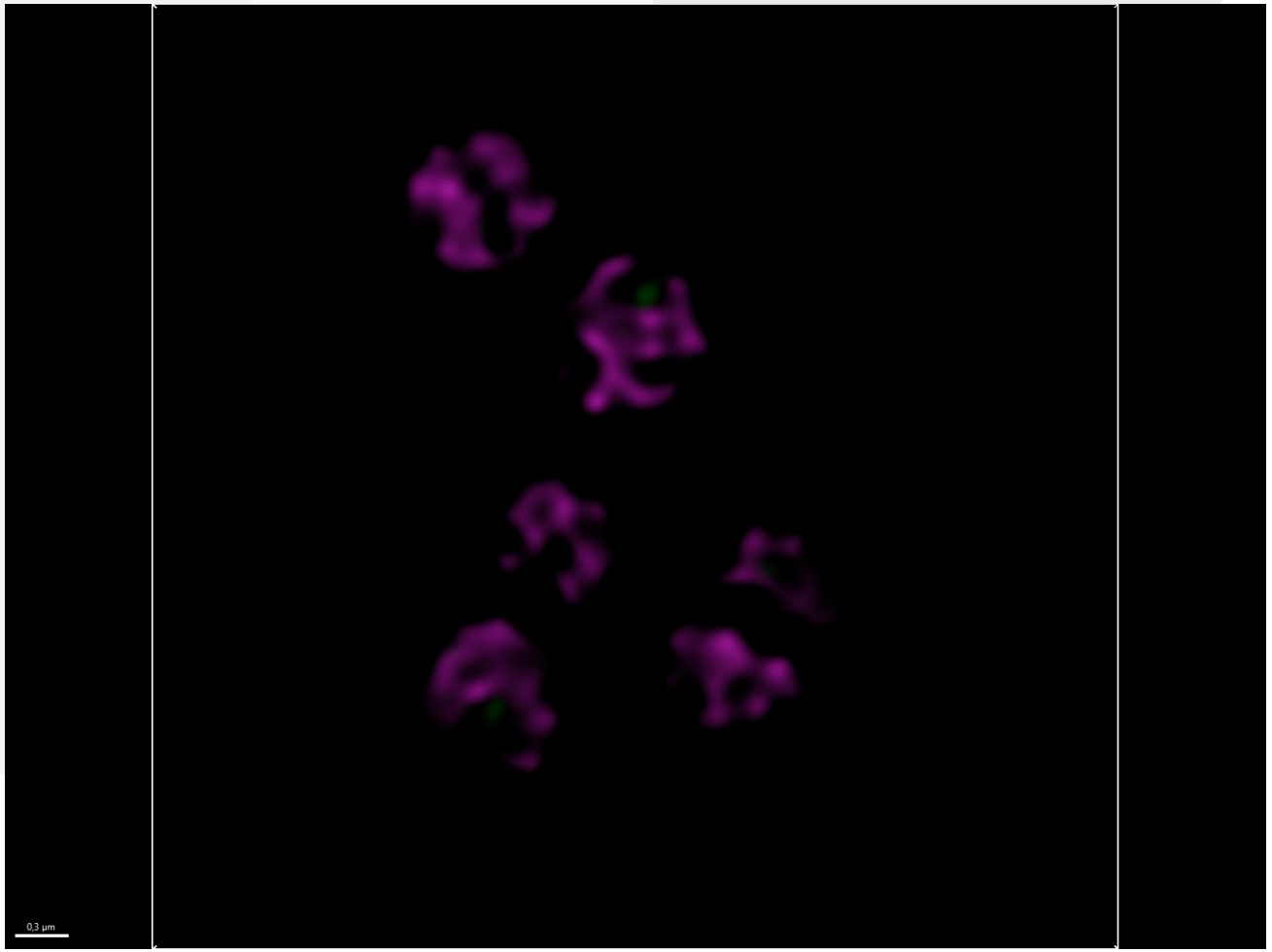
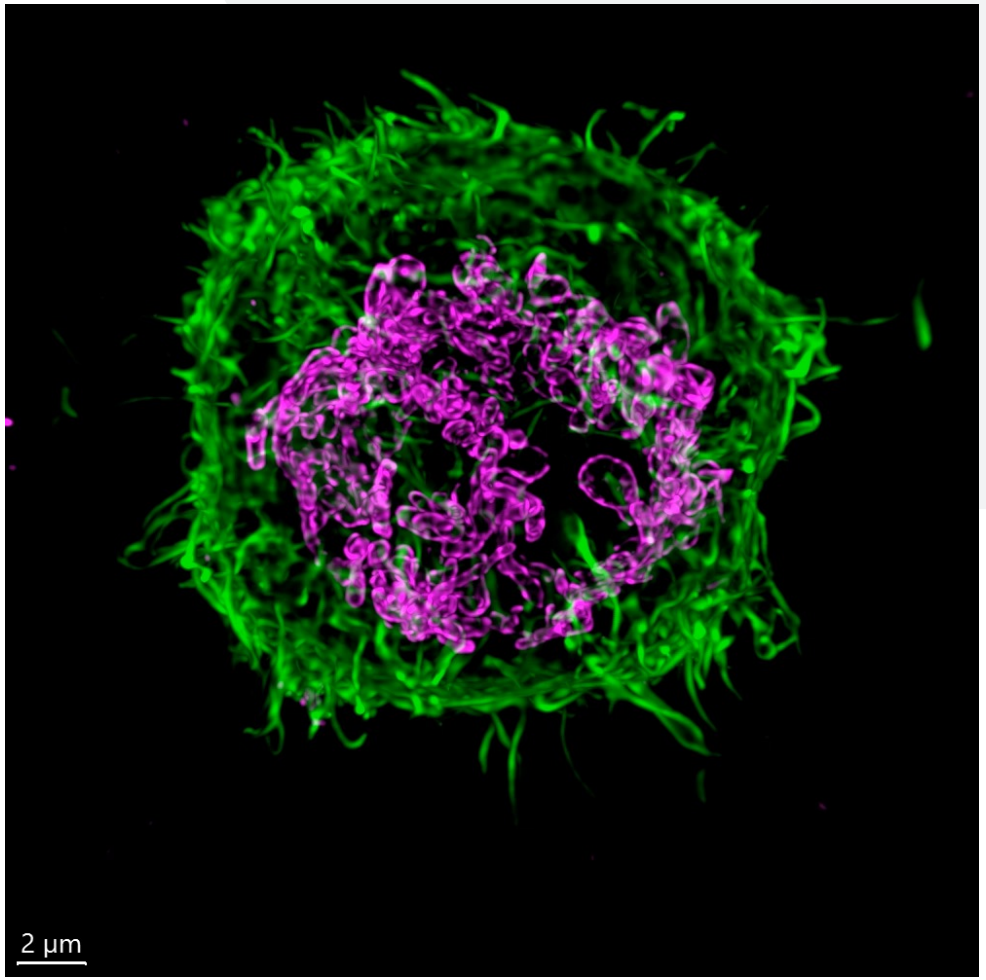
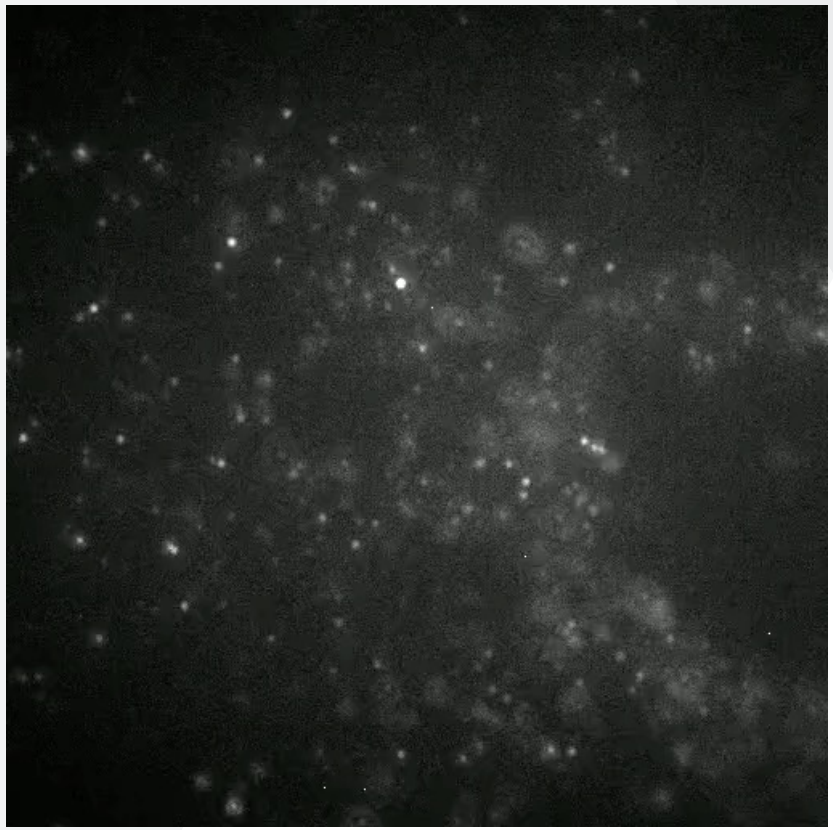
Staphyloccocus cells
Cell mebrane (green), Nuclei (purple)
(Michaela Procházková, Pavel Plevka, Ceitec MU Brno)

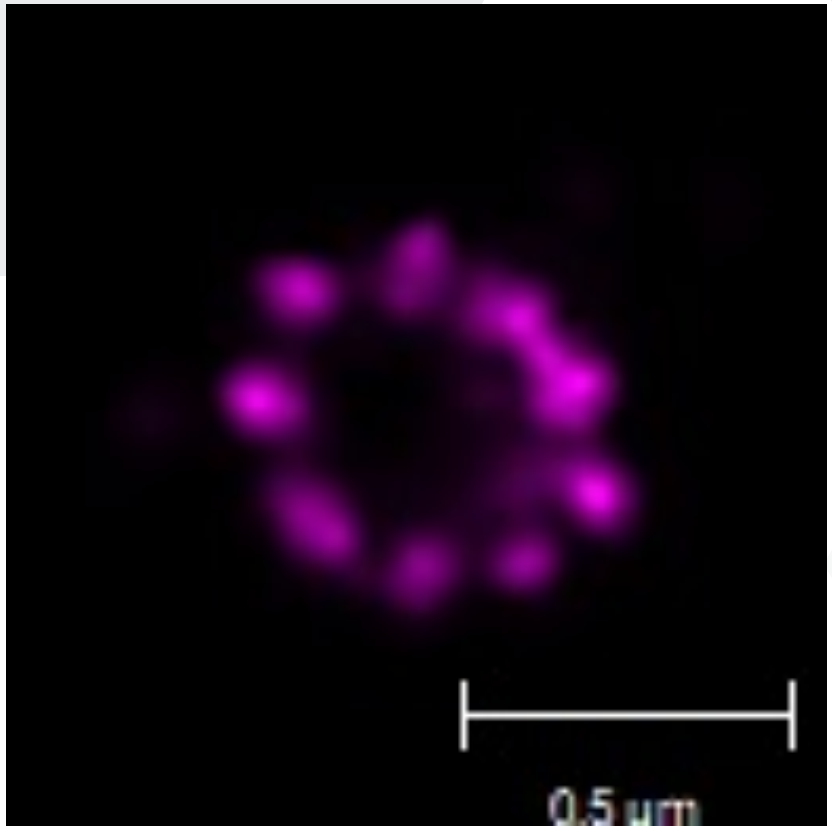


3D reconstruction of Lymphocyte cell
Actin filament (green), mitochondria (magenta).
(Pedro Faria Zeni, Marek Mráz, Ceitec MU Brno)

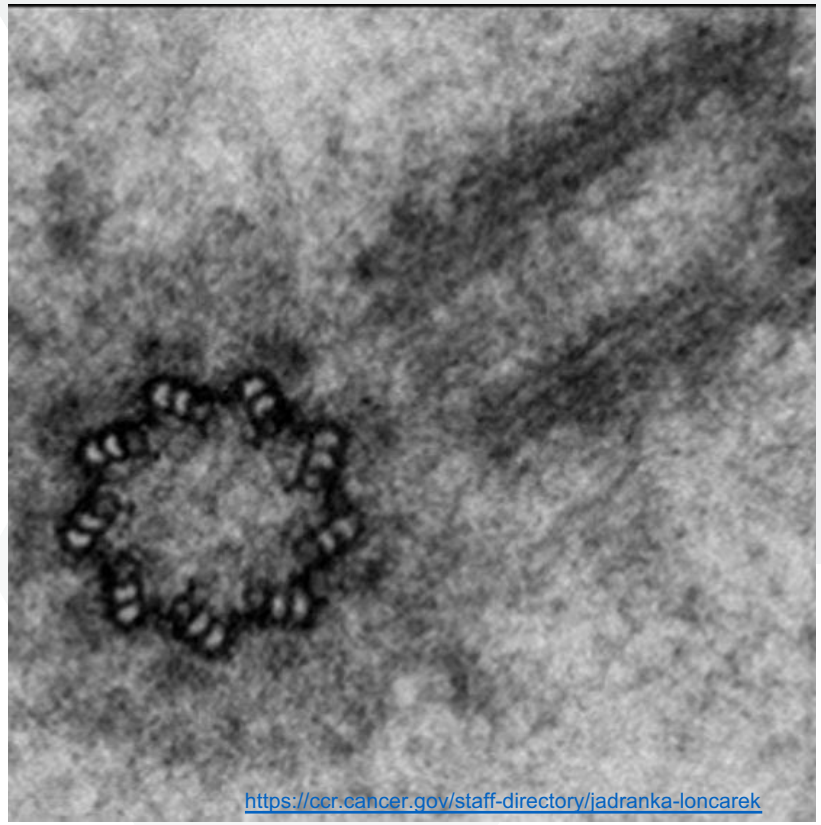


Single molecule localization microscopy





Centriole dSTORM microscopy
centriole (magenta*) (Ondřej Bernatík, Lukáš Čajánek group, LF MU)*



Centriole TEM microscopy

Lightsheet microscopy

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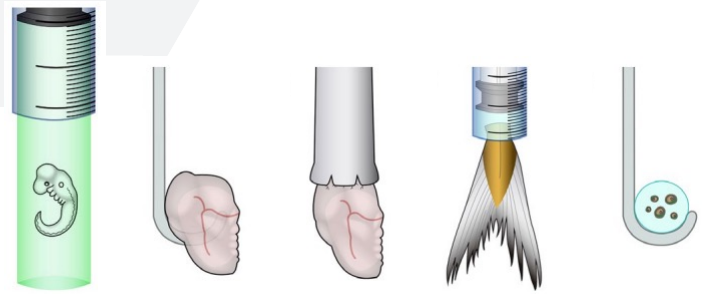
Zeiss Lightsheet 7

Chamber - Water | Chamber – 20xClr | Chamber – 5xClr

Mesoscale Imaging System



Organic solvent-based clearing protocols	Ethyl cinnamate (ECi) RI ≈ 1.5 – 1.6	Klingberg et al. 2017
Aqueous-based clearing protocols	60% Glycerol RI ≈ 1.47	Vargas et al. (1999)
	CUBIC 2 RI ≈ 1.45-1.48	Tainaka et al. 2018

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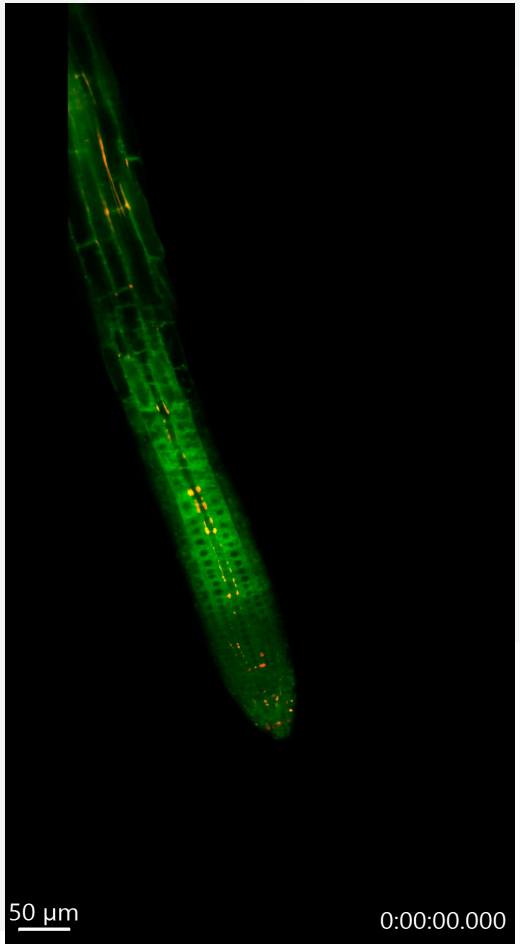
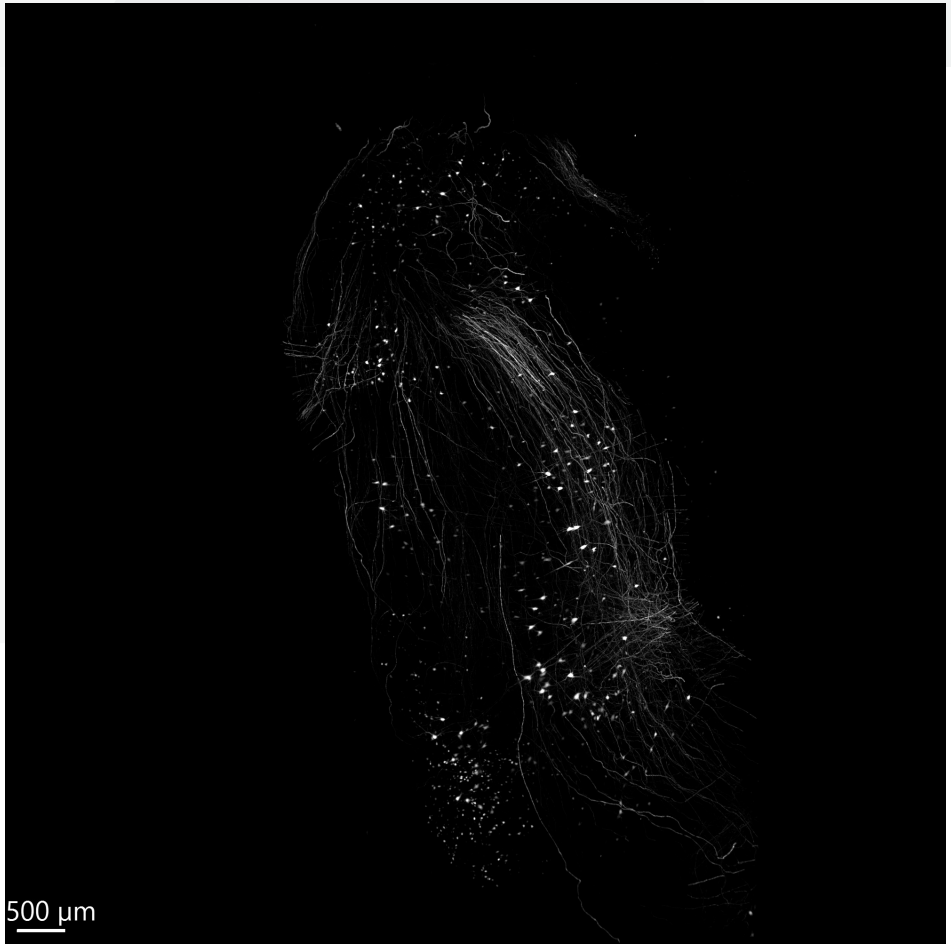
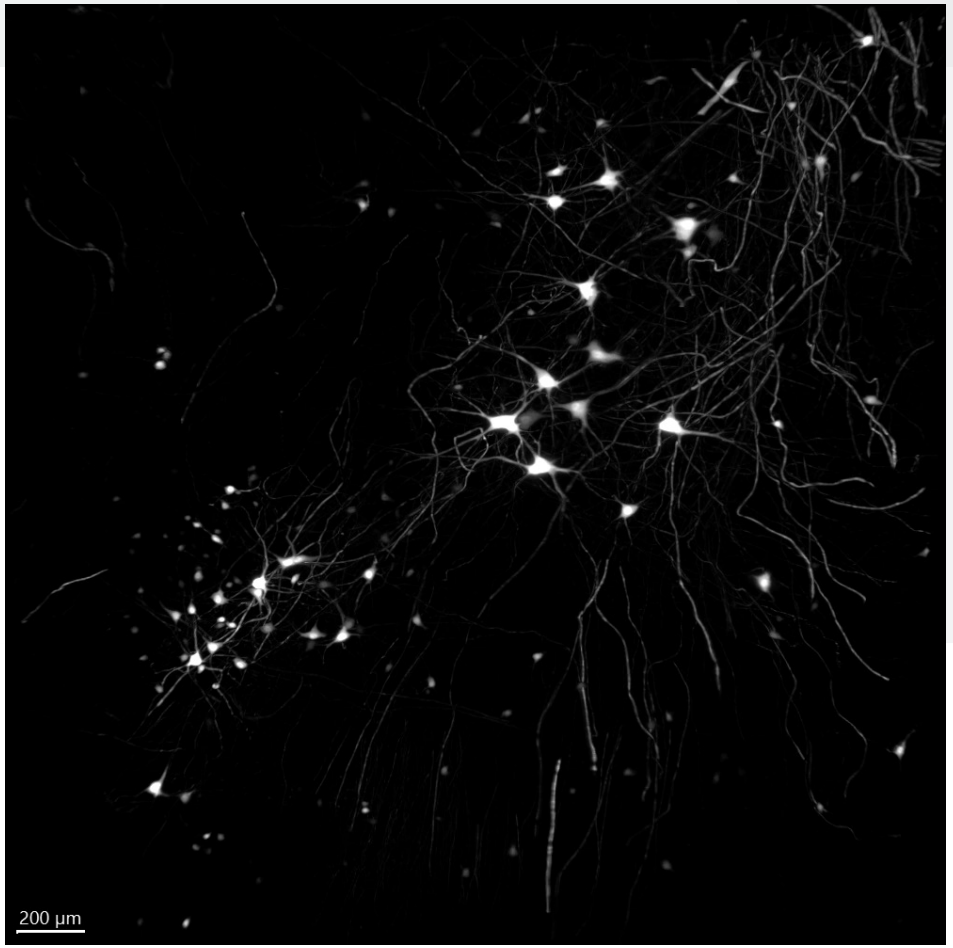
Lightsheet microscopy







***Arabidospis thaliana* root growth**
Water (Ri= 1.33), Plan-Apochromat 20x/1.0
Courtesy of M. Samalova and P. Macháčková

Detailed view of mouse brain
BABB/Eci (Ri=1.50), EC "Plan-Neofluar" 5x/0.16 M27
Courtesy of M. Goudarzi, P. Macháčková, W. Jesionek

Temporal data storage

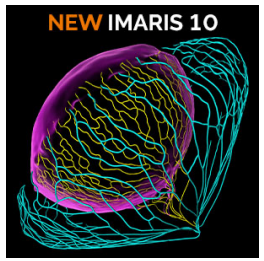
Storage/analysis server
Acquifer ODEON

1 TB RAM, Nvidia RTX6000, 2 x 24 Intel XEON CPU, 300TB storage space
10 GB data link to all microscopes – direct data saving from microscopes
account on demand

ZEN
ZEISS

1 licence, full pack
Airyscan, SIM processing
Deconvolution
Lightsheet processing

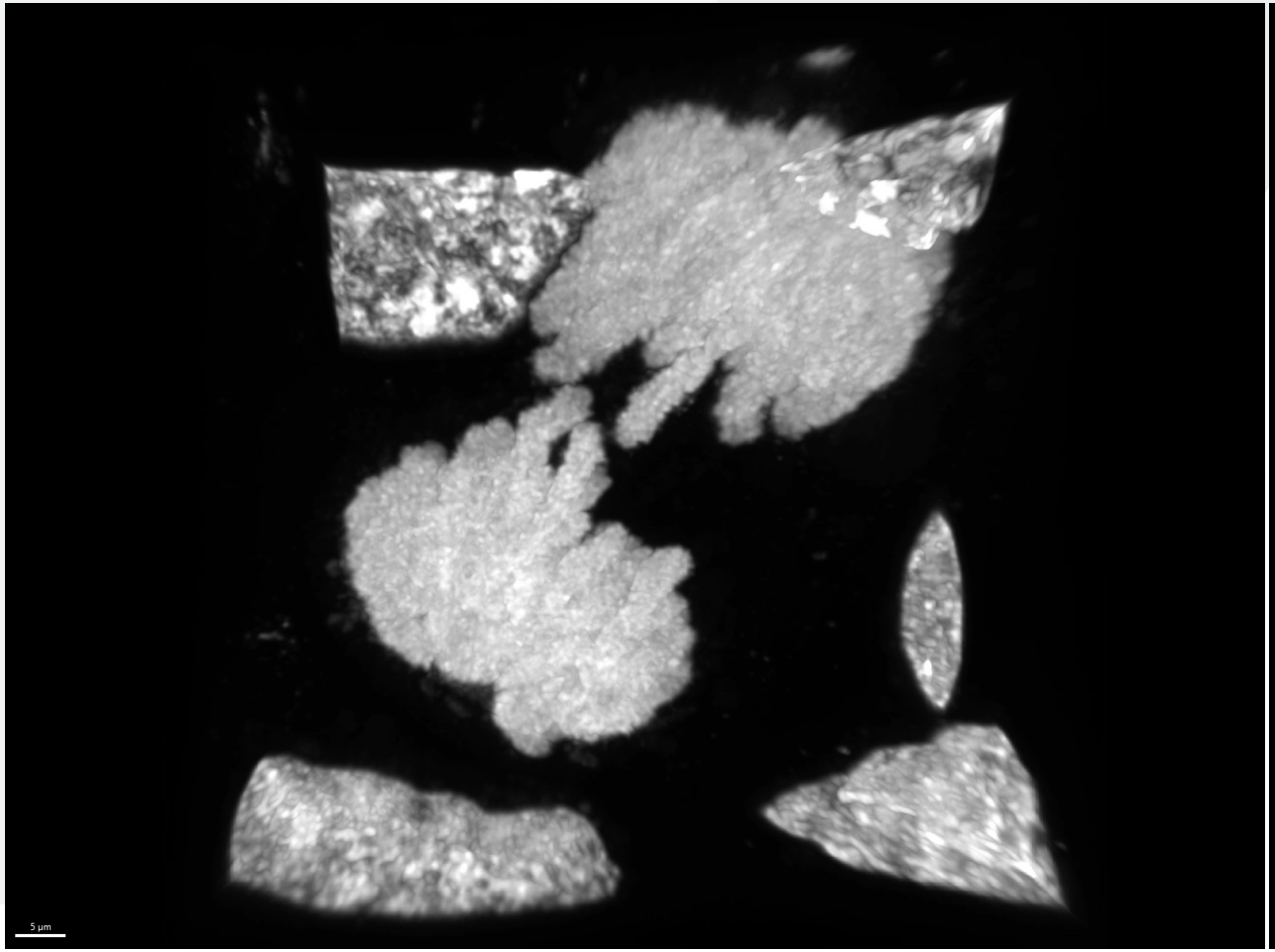
Open source
Objects segmentations, measurements
Lightsheet processing

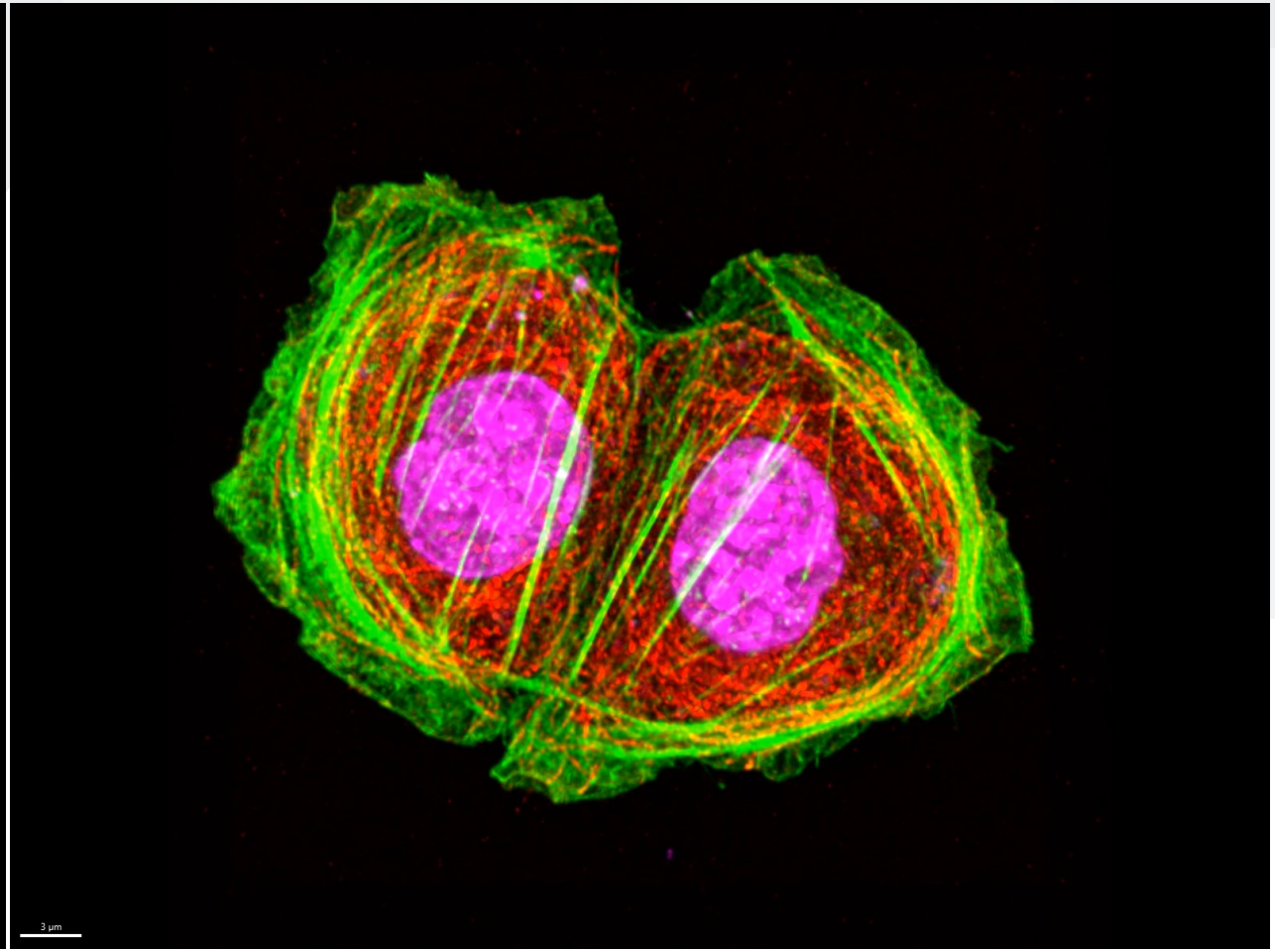


1 licence
Objects segmentations, measurements, tracking
3D rendering

Open source
Objects segmentations, measurements
High throughput

Image processing and analysis





Cellular Imaging Core Facility - CELLIM

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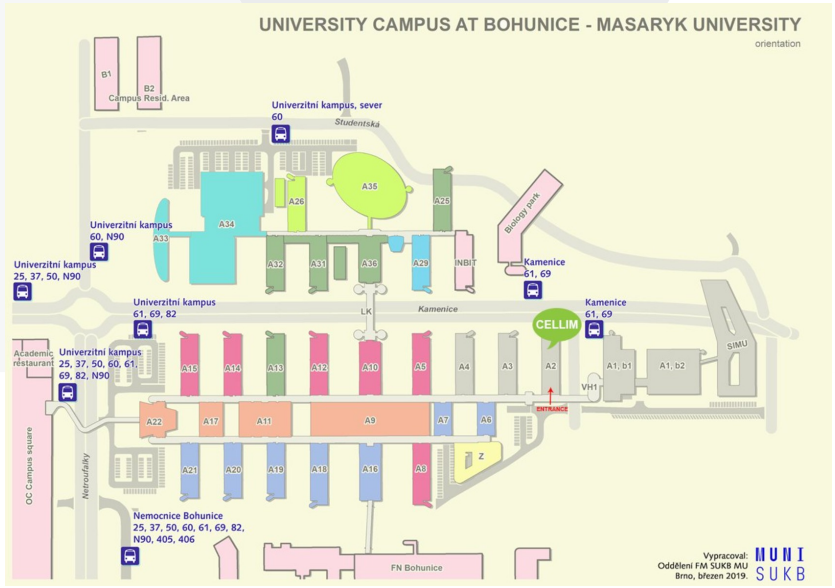
Imaging principles of life



Edit profile

Cellular Imaging Core Facility - CEITEC
@Ceitec_CellimCF

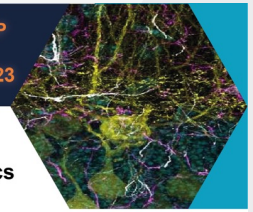
Light microscopy facility of @CEITEC_Brno @muni_cz. Part of #CzechBioimaging and @EuroBioimaging research infrastructures.

https://twitter.com/Ceitec_CellimCF

Upcoming events

CEITEC CELLIM

WORKSHOP
12-14.09.2023



Cellular Imaging Core Facility, Nikon and **CrestOptics** would like to invite you on workshop:

Fast and easy live cell super resolution based on spinning disk confocal

Spinning disk confocal is the most suitable microscopy technique when it comes to 3D imaging of fast processes in living cells and/or 3D imaging over long periods of time. Nikon's leading platform, the **Eclipse Ti2** inverted microscope, already offers high throughput and high speed automation for advanced imaging. The **X Light V3** is the next generation of spinning disk. It relies on the cutting edge technology, advanced optical design and engineering solutions developed by CrestOptics to meet the very high end specifications required by modern fluorescence microscopy applications. Super resolution, down to 100 nm, is now achievable by simply using the **DeepSIM** Super resolution module based on a multi spot structured illumination system.

PROGRAM:
12.09.2023

Room E35/145
10:00 – 12:00
Introduction of the Crest X Light V3 Spinning Disk Confocal System with DeepSIM Super resolution module

Room C02/113
13:00 – 17:00 HANDS ON SESSION

13. & 14.09.2023
Room C02/113
09:00 – 17:00 HANDS ON SESSION

HANDS ON REGISTRATION:
ondrej.sedlak@nikon.com

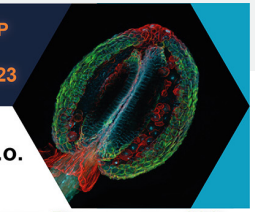
CrestOptics Nikon

Visit us: cellim.ceitec.cz
@Ceitec_CellimCF

CZECH BIOIMAGING EURO BIOIMAGING MŠMT

CEITEC CELLIM

WORKSHOP
10.-12.10.2023



Cellular Imaging Core Facility and **OptiXs s.r.o.** would like to invite you to workshop

ANDOR Flagship High-Speed Confocal System: Dragonfly 600 Deeper Imaging. Deeper Insights. Deeper Understanding.

The new **Dragonfly 600 multimodal spinning disk confocal system** with SMLM delivers outstanding multi-dimensional images from subcellular (nm) to whole organism (cm), while significantly boosting productivity. It integrates super-resolution solutions compatible with confocal, widefield or TIRF. Furthermore, it incorporates the newly developed High Power Laser Engine (HLE) and new B-TIRF imaging modality.

The new B-TIRF and super-resolution modules reveal smaller details, such as the dynamics of viral infection and the ultrastructure of chromatin or organelles.

PROGRAM:

10.10.2023
Room C03/117
09:00 – 09:15 Welcome & Introduction
(Milan Ešner, CELLIM , Blanka Schusterová, OptiXs)
09:15 – 10:00 Introduction to Dragonfly 600 system
(Bruno Combettes, ANDOR)
Room C02/113
10:15 – 11:00 Dragonfly 600 overview demo group 1
11:00 – 11:45 Dragonfly 600 overview demo group 2
13:00 – 17:00 Hands-on Session

11. & 12.10.2023
Room C02/113
09:00 – 17:00 Hands-on Session

WORKSHOP MAIN TOPICS:
- SINGLE-MOLECULE STUDIES
- dSTORM, PALM & DNA-PAINT
- LIVE-CELL SUPER-RESOLUTION
- PHOTOSTIMULATION

HANDS-ON REGISTRATION:
Capacity is limited.
If you want to try your own samples, please contact schusterova@optixs.cz for more details or register here
SCAN & REGISTER

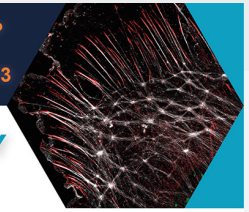
OXFORD INSTRUMENTS ANDOR OptiXs

Visit us: cellim.ceitec.cz
@Ceitec_CellimCF

CZECH BIOIMAGING EURO BIOIMAGING MŠMT

CEITEC CELLIM

WORKSHOP
17-19.10.2023



Advanced Light Microscopy Methods in Biology

We would like to invite you to a practical course on advanced methods in light microscopy, where you will learn about the main methods of super-resolution imaging and light-sheet microscopy used in biology.
The theoretical part will be followed by a hands-on session where you will have the opportunity to try out different techniques on real samples, including data analysis and visualisation.
The course is primarily aimed at students who already have experience with standard microscopy techniques.

Places are limited. Registration is required - see the link below.
Registration fee: 1000 CZK + VAT academic users, 4000 CZK + VAT commercial users.
Coffee and refreshment will be provided during the course.

PROGRAM:

17.10.2023
Room E35/1S102 09:00 - 17:00
- Milan Esner: Diffraction limits in light microscopy
- Jakub Pospisil: Different approaches to break the diffraction barrier
- Petra Kucerova: Light-sheet microscopy
- Josef Lavicky: Lightsheet microscopy for studying embryonic development
- Surendra Saddala: Exploring biological condensates in plants through super-resolution microscopy

18.10.2023
Room C02/CELLIM 09:00 - 17:00
Practical session

19.10.2023
Room E35/1S102 09:00 - 17:00
- Wojciech Jesionek: Image processing and analysis

REGISTRATION:
https://qr.page/g/3VoyqgdVF9E

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Thank you for your attention

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