

# NEWSLETTER WINTER 2024

## USER PROJECT HIGHLIGHT



### ANALYSIS OF LARGE-SCALE MICROSCOPY IMAGES OF THE MOUSE BRAIN (FIRST EURO-BIOIMAGING ANALYSIS PROJECT)

Author: Michaela Blažíková, Ph.D. | LMCF IMG | ✉

Analysis of large-scale microscopy images is a challenging task that requires specialized software tools, programming skills, as well as sufficient hardware. Fortunately, there is an option to outsource the image processing and analysis part of the project. Light Microscopy Core Facility at the Institute of Molecular Genetics offers image analysis as a service, not only through the national Czech-BioImaging infrastructure, but also through the [Euro-Bioimaging](#) infrastructure that offers open access to imaging technologies, training and data services in biological and biomedical imaging on a European scale.

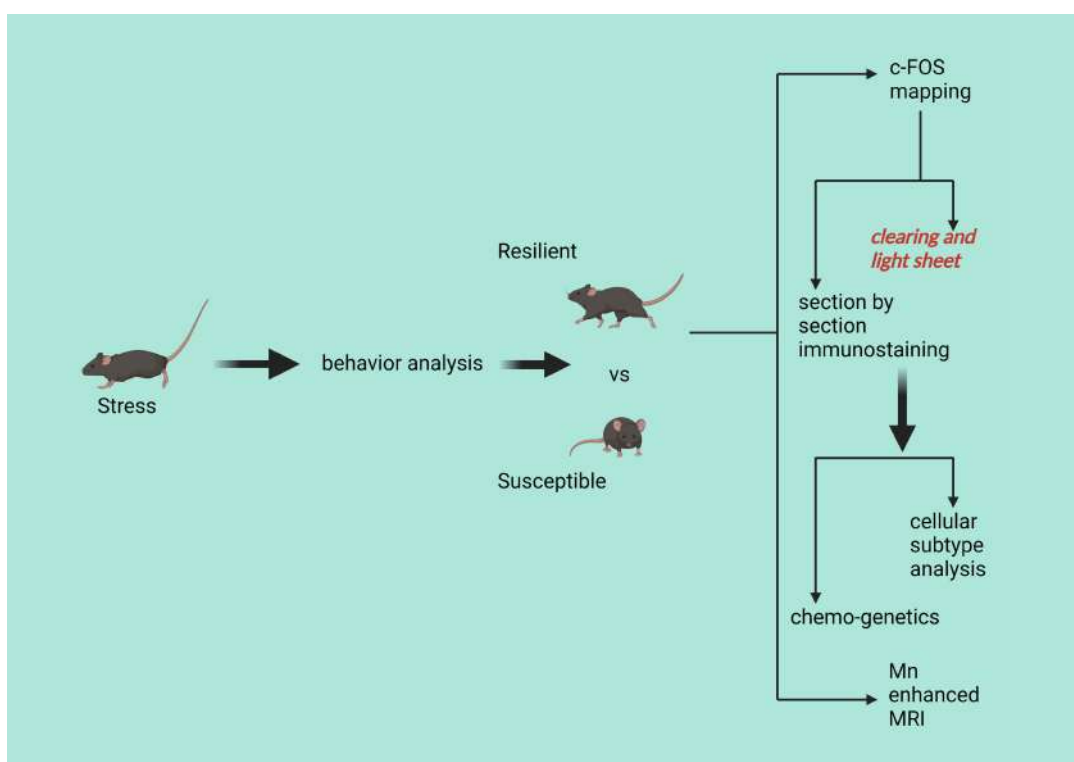


Figure 1: Flowchart of the experiment. A courtesy of Shiladitya Mitra, Laboratory of Stress Resilience, Max Planck Institute of Psychiatry, Germany.

A year ago, in September 2022, we were contacted via the Euro-BiolImaging infrastructure by a user from the Max Planck Institute of Psychiatry in Germany who was working on the analysis of mouse stress and social avoidance behavior (Fig. 1). Mouse brain hemispheres were labeled against c-Fos, an immediate early gene, and cleared using iDISCO. They were subsequently imaged using Light Sheet microscope Ultramicroscope II from MIltenyi Biotech and stitched with Big Stitcher. The goal was to identify c-Fos in number and intensity between groups compared to control in different brain regions. This is enabled by annotating brain images into the Allen Brain Atlas, a platform for visualizing single cell data across the mammalian brain and identifying brain regions.

An already published analysis pipeline included **ClearMap**, a toolbox for the analysis and registration of 3D datasets obtained via light sheet microscopy from cleared tissues. ClearMap is written in Python, so it can be easily accessed through, for example, a Jupyter Notebook. The first part of the analysis included segmentation of the c-Fos foci, elastic transformation of the Allen Brain Atlas images to match the autofluorescence channel of the acquired brain images and final identification of the brain regions. The annotation to the atlas was followed by statistical analysis in MATLAB using a custom written script. In addition to comparing cell numbers and fluorescence intensities in different brain regions, cell density maps were constructed (Fig 2.).

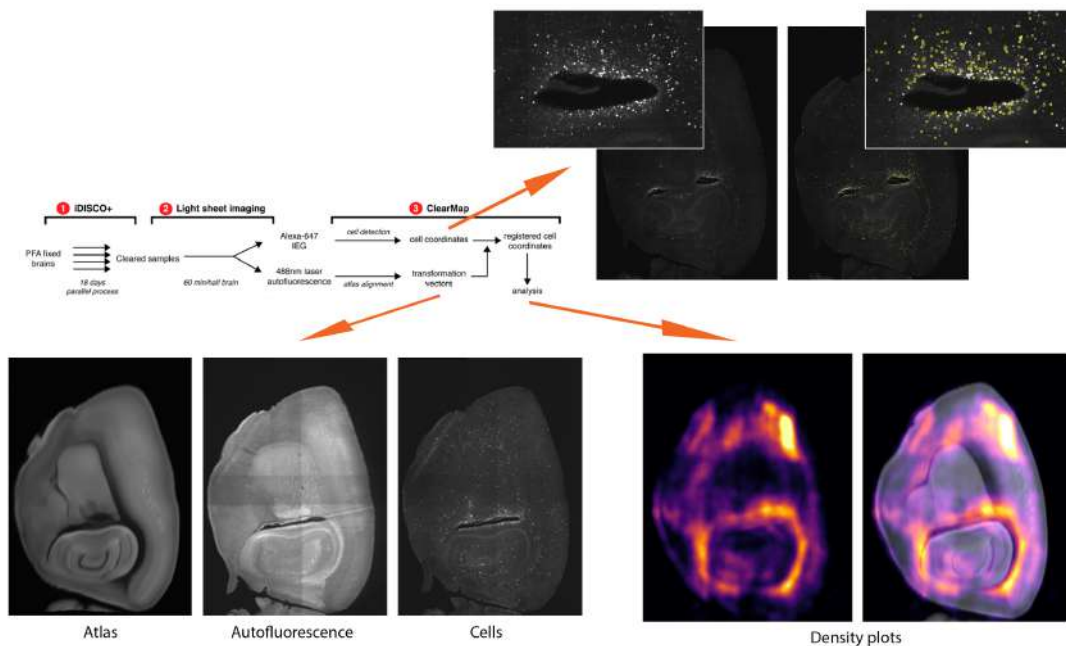


Figure 2: Scheme of the image processing and analysis part. Images are a courtesy of Shiladitya Mitra, Laboratory of Stress Resilience, Max Planck Institute of Psychiatry, Germany.

The project required some time to set up - terms, data transfer, format of results or timeline had to be agreed upon. Its implementation started in February 2023 and lasted for 8 months with gradual refinement of the requirements and the form of the output. In total, around 1TB of data was transferred and processed, and the final results, both image and statistical outputs, were sent to the end user. Such external projects are of great importance for microscopy facilities, as they bring new opportunities and the acquired experience can be further used in solving internal tasks.

If you require assistance with your image data analysis and processing tasks, don't hesitate to contact us or visit our [facility](#).

## PAST EVENT SPOTLIGHT

### WORKSHOP VMCF IN COOPERATION WITH BIOMT

Author: | Miroslav Hyliš, Ph.D. | ✉

The VMCF is co-organizer of the image analysis workshop at the Dartmouth College.

VMCF, in collaboration with bioMT, Department of Biochemistry and Cell Biology, Dartmouth College, Hanover NH, USA, chaired the BioImage Analysis in Super-resolution Microscopy workshop. The workshop included introductory lectures on superresolution microscopy techniques, hands-on exercises using Fiji and ThunderSTORM software, and discussions on software tools such as Noise2Void, StarDist, Huygens, Ilastik, and CLIJ2. There was also a scientific talk on cardiomyocytes and a session on customizing Fiji with ImageJ Macro. The VMCF staff members were represented by Zuzana Burdíková, Ph.D., Martin Schätz, Ph.D. and Jakub Soukup, Ph.D. The workshop was developed in collaboration with Zdenek Švindrych, Ph.D., and Pat Robinson, Ph.D. from bioMT.



1. Workshop preparation



2. Martin Schätz, presenting Data Management

The combination of the expertise of the experienced lecturers contributed to the success of the workshop, both from VMCF (CR) and bioMT (USA). The workshop was supported by COBRE P20-GM113132 (NIH) and LM2018129 Czech-BioImaging grant. The feedback from the students who attended the workshop was overwhelmingly positive. Their feedback indicated that the workshop was very valuable and provided them with a deeper understanding of Super-resolution Microscopy and image analysis. The participants especially appreciated the hands-on nature of the program and the expertise of faculty, including those from VMCF and bioMT, in helping participants gain practical skills in image analysis and high-resolution microscopy.



3. The workshop hands on part.



4. Zuzana Burdikova, Ph.D. and Martin Schätz, Ph.D.

## SAVE THE DATE

### IMAGING PRINCIPLES OF LIFE 2024 Czech-BioImaging Annual Scientific Conference

The date and venue of the Czech-BioImaging conference for 2024 has been arranged. Save the date!

📅 October 1-2, 2024

📍 Hustopeče, near Brno



## PLANNED COURSES

### ADVANCED IMAGE ANALYSIS

Course | January 29 - February 2, 2024 | Faculty of Science, Charles University, Prague

### PROCESSING AND ANALYSIS OF MICROSCOPIC IMAGES IN BIOMEDICINE

Course | April 8 - 12, 2024 | IMG, Prague

### EM SAMPLE PREPARATION SERIES

Course | April 22 - 25, 2024 | BIOCEV, Vestec

### HANDS-ON COURSE ON OPENING MOUSE BLOOD BRAIN BARRIER WITH FOCUSED ULTRASOUND IN UHF-MR SYSTEM

Course | Spring 2024 | ISI, Brno

Check <https://www.czech-bioimaging.cz/courses> for updates.

### CALL FOR NODE UPGRADES 2023/2024

Two of our EuBI Nodes are submitting their Expressions of Interest for Upgrades to Nodes, to include new imaging facilities to the Node structure and offer their unique methods and expertise to attract users from abroad.

- **Advanced Light Microscopy and Medical Imaging Node Brno CZ** applies to include:
  - Core Facility of Electron microscopy and Raman spectroscopy, Institute of Scientific Instruments of the Czech Academy of Sciences, v.v.i. in Brno
  - Centre for Biomedical Image Analysis at the Faculty of Informatics, Masaryk University in Brno
- **Advanced Light and Electron Microscopy Node Prague CZ** applies to include:
  - Microscopy Service Centre, Institute of Experimental Medicine of the Czech Academy of Sciences, v.v.i. in Prague

The submitted expressions of interest for Node Upgrades will be evaluated by the Euro-BioImaging Scientific Advisory Board, and decided upon by the Euro-BioImaging Board.

We are wishing the best of luck to both applications!



### USEFUL LINKS

[Czech-BioImaging website](#)

[Czech-BioImaging – pro veřejnost](#)

[Euro-BioImaging website](#)

[Velké výzkumné infrastruktury v České republice](#)

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