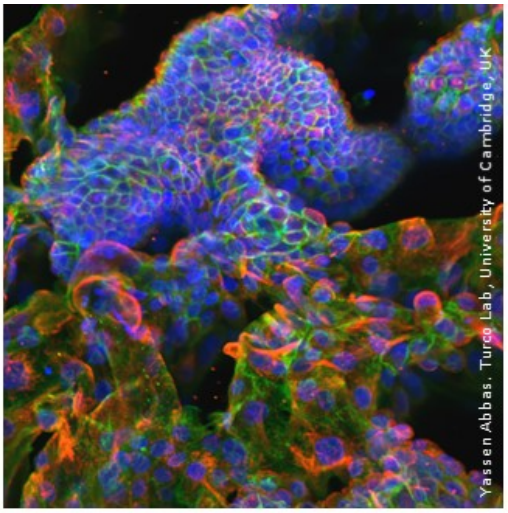
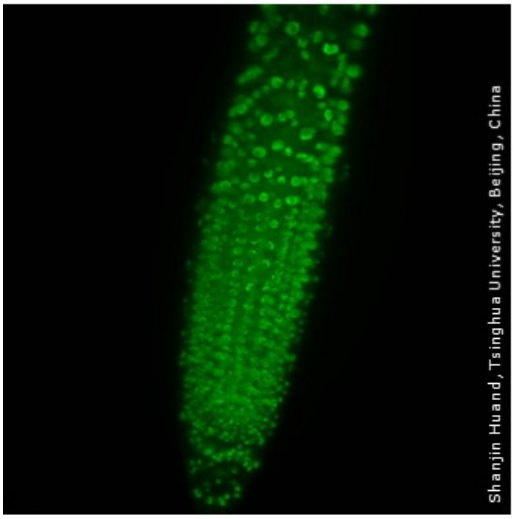
Center of Advanced Light Microscopy (CALM) | Luxendo

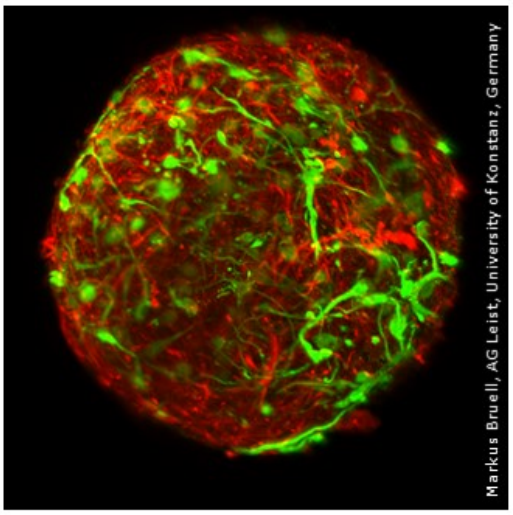
Light-Sheet Microscopy Workshop

15th – 17th April 2020

BioSysM & I







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Workshop Overview

The Light-Sheet Microscopy Workshop is jointly organized by the Center of Advanced Light Microscopy (CALM) at the LMU Biocenter in Munich and Luxendo GmbH, with the support of ibidi GmbH, Logos Biosystems, and Imaris. The event has been conceived to provide a comprehensive view of live-cell and cleared-sample imaging with light-sheet microscopy.

The workshop will bring together renowned experts in the field of light-sheet fluorescence microscopy (LSFM) and its applications, researchers interested in the topic and students, to generate an open forum for scientific discussion. Topics including basic principles, applications, strengths, and challenges of LSFM will be covered during the seminars, while a series of hands-on sessions will allow the participants to test the systems as well as to learn about sample preparation, imaging, and data processing.

Luxendo will provide three of its light-sheet microscopy systems: the QuVi SPIM, the InVi SPIM Lattice Pro and the LCS SPIM. These enable imaging a broad spectrum of samples for a variety of applications - from cell culture to whole embryos, live and cleared samples as well as single or multi-position imaging.

The attendees will further profit from workshops focused on sample preparation, tissue clearing methods, and data processing.

Speakers

Prof. Dr. Ernst H. K. Stelzer
Johann Wolfgang Goethe University of Frankfurt am Main
Institute for Cell Biology and Neuroscience
Buchmann Institute for Molecular Life Sciences
Frankfurt, Germany

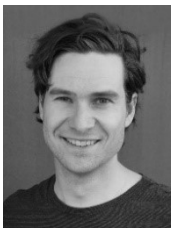
Prof. Dr. Ali Ertürk
Helmholtz Center Munich
Institute of Tissue Engineering and Regenerative Medicine (iTERM)
German Research Center for Environmental Health (GmbH)
Institute for Tissue Engineering and Regenerative Medicine
Neuherberg, Germany

Prof. Dr. Emmanuel G. Reynaud
University College Dublin
School of Biomolecular and Biomedical Science
Dublin, Ireland

Prof. Dr. Alexis Maizel
University of Heidelberg
Center for Organismal Studies Heidelberg (COS)
Heidelberg, Germany

Dr. Ulrike Engel
University of Heidelberg
Bioquant Heidelberg
Nikon Imaging Center
Heidelberg, Germany

Dr. Judith Reichmann
EMBL Heidelberg
Cell Biology and Biophysics Unit
Heidelberg, Germany



Dr. Martin Weigert
Swiss Federal Institute of Technology (EPFL)
School of Life Sciences
Lausanne
Switzerland

David Hörl
PhD. Student
LMU München
BioSysM
Butenandtstr. 1
81377 München
Germany

Program

Please notice that the seminars will be open to the public but there will be a limited number of slots available for the hands-on sessions.

There are 9 Hand-on sessions available. During each slot, several hands-on sessions will run in parallel, giving you multiple opportunities to attend them.

The InVi SPIM Lattice Pro, the QuVi SPIM and the LCS SPIM as well as the OLS Logos Biosystems hands-on sessions, CERO and X-Clarity, will be available on Wednesday and Thursday afternoon. The Imaris Hands-on sessions will be offered on Thursday and Friday.

In order to arrange the Hands-on session groups, please let us know if you have any preference or restriction to the slots available. We will try to locate you on the one of your convenience. Please apply by sending an email to lightsheet2020@bio.lmu.de and specify which session/s you want to join.

	WEDNESDAY 15	**THURSDAY 16**	**FRIDAY 17**
9:00	Opening Remarks Heinrich Leonhardt |Munich Lars Hufnagel | Heidelberg	Keynote Prof. Dr. Ernst Stelzer Frankfurt	Hands on Session 7
9:30	Keynote Dr. Ali Ertürk Munich		
10:00		Emmanuel Reynaud Dublin	
10:30	Alexis Maizel Heidelberg	Martin Weigert Lausanne	Hands on Session 8
11:00	Ulrike Engel Heidelberg	David Hörl Munich	
11:30	Judith Reichmann Heidelberg	Closing remarks Hartmann Harz Munich	
12:00	Lunch Break	Lunch Break	Hands On Session 9
12:30			
13:00	Hands on Session 1	Hands on Session 4	
13:30			
14:00			
14:30	Hands on Session 2	Hands on Session 5	
15:00			
15:30			
16:00	Hands On Session 3	Hands On Session 6	
16:30			
17:00			

Workshops

There is a total of nine hands-on sessions. During each session, several workshops will be available (TBD). You will have several opportunities to attend the workshops of your interest.

Luxendo

InVi SPIM Lattice Pro

The InVi SPIM Lattice Pro is suited for applications including Imaging cellular interactions and membrane dynamics, cell cycle imaging, subcellular structure visualization, tracking protein movements in 3D as well as long time-lapse imaging.

The microscope offers tailorable, interactive adaptability of the beam shape to suit the highly specific requirements of your sample. It provides the highest level of flexibility for illuminating your sample with a light-sheet e.g. single or multiple variable Bessel beams, optical lattices, and structured illumination, or static or scanned Gaussian beams. Choose what gives you the best results – large field of view, high speed and/or optimal spatial resolution.

QuVi SPIM

The QuVi SPIM is a very flexible system designed for applications including living, fixed or cleared tissue imaging (e.g. brain slices), long-term imaging of 3D cell culture models (spheroids, organoids, tumoroids), imaging of conventional cell culture in high throughput, and even functional (e.g. calcium) imaging.

It combines dual view with dual detection channels. The novel stage design enables using SBS-format plates and provides easy sample accessibility by means of its quick load feature. The transition between living and cleared tissue imaging is simple and straightforward and the exchangeable objective lenses provide the adaptability to image samples of different sizes and preparations.

LCS SPIM

The LCS SPIM (Large Cleared Sample) is specially designed to image large optically cleared tissues e.g. whole mouse embryos, mouse brain and organs, relevant for the study of nervous system networks, organ development or tumor structure and tumorigenesis in oncology.

The sample mounting strategy is based on the use of a quartz crystal cuvette, ensuring simple mounting of delicate samples and compatibility to a broad variety of clearing solutions.

Based on a very versatile layout, the highly flexible upgrade options expand the performance of the system to increase speed and optical performance.

OLS / Logos Biosystems

CERO – Think in New Dimensions!

CERO, the 3D benchtop incubator and bioreactor is manufactured by OLS OMNI Life Science, Bremen. CERO is overcoming known limitations of static cultures. Easy, standardized, ready-to-use protocols, standardizable workflows and auto-adhesion of cells without any need for Carriers or Matrigel! CERO enables the generation of homogeneous iPSC and ESC aggregates that can easily be used in 2D downstream applications. As a result, CERO enables high yield expansion of pluripotent stem cells or long-term cultivation of tissue for >20 days (Spheroids >80 or Organoids >180). CERO is a unique platform for biobanking, cell-based drug development, toxicity testing, regenerative medicine, serving as a model for studying the cellular and molecular phenotype of diseases and more.

The workshop will comprise a short talk on the CERO technology giving you insights into the simple and reproducible workflow on generating high-quality organoids and spheroids for imaging.

X-CLARITY – Clear Tissues with Ease Now!

Tissue clearing has become an important step for imaging tissues in 3D at single-cell resolution. The X-CLARITY™ is a collection of systems and ready-to-use reagents to standardize, simplify, and accelerate each step of the tissue clearing process. X-CLARITY™ is based on the CLARITY (Clear Lipid-exchanged Acrylamide-hybridized Rigid Imaging / Immunostaining /in situ-hybridization-compatible Tissue hYdrogel) method. With CLARITY, preserved tissues are embedded in a hydrogel matrix and lipids are actively extracted through electrophoresis to create a stable and optically transparent tissue-hydrogel hybrid that is chemically accessible for multiple rounds of antibody labeling and imaging.

Take advantage of our X-CLARITY Workshop and learn how to accelerate the clearing steps for varied types of mouse/rat/human and plant tissues for your 3D Imaging Workflow.

Imaris

Visualization & Analysis of Light-Sheet and other large image datasets with Imaris

Imaris is a powerful software for interactive visualization and quantitative analysis of three-dimensional microscopical datasets and time series of any size.

With Imaris you can render very large 3D datasets and interact with the visualized data in real time. Additionally it allows you to animate and export your data as movie file.

On top of the visualization, Imaris offers a complete toolbox for quantitative analysis of your data. It provides very flexible tools for segmentation of objects and for measuring their number, shape, volume, intensity etc. The measurements can directly be plotted in Imaris or exported for further statistical analysis.

All these segmentation tools can also be applied for time series, so that development of tissues or the movement of objects can be analyzed and tracked over time.

The workshop will give a general overview of the Imaris visualization and analysis workflow, focusing on the import, stitching, visualization and analysis of huge datasets and also present the free Imaris Viewer which can be used for visualization of huge datasets independently of an existing Imaris license.

Further information about Imaris can be found at http://imaris.oxinst.com

Other Workshops

Open source large-scale image analysis with Fiji

ImageJ/Fiji is the gold standard open source image analysis platform with a vibrant ecosystem of plug-ins for a multitude of image processing and visualization tasks. Fiji plug-ins provide state-of-the-art analysis tools ranging from machine learning-based segmentation to fast processing of very large datasets powered by the underlying ImgLib2 library and multi-resolution data structures.

After a brief introduction into Fiji in general, this workshop will focus on Fiji plug-ins specifically geared towards processing of terabyte-sized datasets, as they are commonly encountered in LSFM experiments. A special focus will be on BigStitcher and Multi View Reconstruction for the alignment of multi-image datasets and the compensation of a variety of optical aberrations and on BigDataViewer for on-the-fly visualization of analysis results and manual curation of results. Using multi-resolution-optimized intensity- and feature-based alignment algorithms and virtual processing, BigStitcher and MVR can handle datasets of arbitrary size on conventional hardware.

The Venue

The Light-Sheet Microscopy Workshop will be held in the BioSysM & Biocenter, LMU Munich. The lectures will take place in the Biocenter while the hands-on sessions in the BioSysM Building.

Address

Lectures

Biocenter LMU (Campus Martinsried)
Großhaderner Str. 2 82152 Planegg-Martinsried
Kleiner Hörsaal B01.027

Hands-on sessions

BioSysM (Campus Großhadern)
Butenandtstraße 1, 81377 München

Biocenter LMU (Campus Martinsried)

BioSysM (Campus Großhadern)

About the Organizers

Center of Advanced Light Microscopy (CALM)

The Center for Advanced Light Microscopy (CALM) at the LMU Biocenter, in Munich, is a center of excellence equipped with cutting-edge imaging devices. It was envisioned to provide easy access to these technologies as well as support to researchers at the LMU, scientific collaborators and external users during image acquisition and data analysis.

For more information, please visit http://www.calm.bio.lmu.de/ .

Luxendo GmbH

Headquartered in Heidelberg, Germany, **LUXENDO** was founded in September 2015 as a spin-off of the European Molecular Biology Laboratory (EMBL). **LUXENDO** was able to rapidly develop robust product solutions based on the patented SPIM technology. Now, as part of Bruker Corporation, **LUXENDO**'s light-sheet microscopes join Bruker's existing portfolio of swept-field confocal, super-resolution, and multiphoton fluorescence microscope product lines, enabling new research advances in small organism embryology, live-cell imaging, brain development, cleared brain tissue, and optogenetics applications.

For more information, please visit www.luxendo.eu.

Collaborators

Thank you very much for your support!

Contact us

lightsheet2020@bio.lmu.de