FBI-AT 2024

Light-Sheet Fluorescence Microscopy: Principles and application to Neurosciences and 3D cell culture models

Morning Seminar Program

	Day 01 - Monday 04/11	Day 02 - Tuesday 05/11
9:00	Course 01 - LSFM Principles **P. Girard** (IJM, *Paris France)* & **M. Ducros** *(BIC, Bordeaux, France)*	**Adam Glasser** How to see the big and the small? New technologies for mapping centimeter scale tissues with nanoscale resolution *(Allen Institute for Neural Dynamics, Seatle, USA)*
9:40	Course 02 - Sample preparation and clearing methods overview **Carole Siret** (Aix-Marseille Univ., CNRS, INSERM, Centre d'Immunologie de Marseille-Luminy (CIML), Marseille, France)	**Farida Hellal** Advanced Tissue-Clearing and Imaging Technologies Transform Biomedical Research *(Institute for Tissue Engineering and Regenerative Medicine (iTERM), Helmholtz Center Munich, Germany)*
10:20	Course 03 - Light Sheet Fluorescence Microscopy Data management **G. Maucort** *(Univ. Bordeaux, CNRS, INSERM, Bordeaux Imaging Center, Bordeaux, France)*	**Alfred Millet-Sikking** Fast, high resolution and versatile light-sheet microscopy in a convenient format: system design *and applications.* *(Calico Life Sciences LLC, San-Francisco USA)*
11:00	*Break*	*Break*
11:20	**Laura Batti** Light-Sheet Microscopy: empowering advancement in neuroscience and medicine *(Wyss Center for Bio and Neuroengineering in Geneva)*	**Gaelle Recher** Epithelial cell self-organisation in closed system, evidences for a gradient of phenotypes from healthy to cancerous morphogenesis *(Univ. Bordeaux, CNRS, Laboratoire Photonique, Numérique et Nanosciences, Institut d'Optique Graduate School, Bordeaux, France)*
12:00	**Julien Colombelli** Scattered lightsheet microscopy for label free cleared tissue imaging *(Institute for Research in Biomedicine, Barcelona Spain)*	**Ihssane Idrissi & Rémi Galland** Multi-scale Imaging using the JeWell-soSPIM Technology & Application for a Hepatotoxicity Assay *(Univ. Bordeaux, CNRS, Interdisciplinary Institute for Neurosciences, Bordeaux, France)*
		Indus Flash Talk – Imaging Optique & 3i

	Day 03 - Wednesday 06/11	Day04 - Thursday 07/11
9:00	**Vincent Studer** Building and live imaging of neuronal spheroids using patterned light *(Univ. Bordeaux, CNRS, Interdisciplinary Institute for Neurosciences, Bordeaux, France)*	**Akanksha Jain** Mechanistic study of Human Brain Development using Brain Organoids *(ETH – Zurich, Switzerland)*
9:40	**Franziska Moos** Open top dual view light sheet microscope for live imaging of large multicellular systems *(Univ. Basel, Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland)*	**Angela Getz & Mathieu Ducros** Lattice Light-Sheet Microscopy applied to Neuroscience Research. *(Univ. Bordeaux, CNRS, INSERM, Bordeaux Imaging Center, Bordeaux, France &* Vrije Universiteit Amsterdam*)*
10:20	**Georges Debrégeas** Small brains and big data *(Jean Perrin Laboratory, Paris France)*	**Johannes Roos** Arkitekt: Streaming analysis and real-time workflows for microscopy *(Johannes Kepler University, Linz Austria)*
11:00	*Break*	*Break*
11:20	**Thai Truong** Elucidating the Neural Basis of Behaviors in Zebrafish through Structural and Functional Imaging *(University of Southern California, Los Angeles USA)*	**Alexandra Fragola** Fast adaptive optics light-sheet microscopy for in vivo high-resolution imaging in depth *(Univ. Paris Saclay, Institut des Sciences Moléculaires d'Orsay, Orsay France)*
12:00	**E. Faure** MorphoNet 2.0 : Efficient bio-curation of large 3D and 3D+t imaging datasets *(Univ. Montpellier, CNRS, Laboratory of Computer Science, Robotics and Microelectronics, Montpellier France)*	
12:40	*Indus Flash Talk – Leica & Gataca*	

Thematic courses

P1	Large sample imaging – Clearing & Expansion
P2	3D cellular model Culture & Imaging
P3	Neuronal network imaging
P4	Image Analysis

Workshops

Thematic	Instruments	Instructors	Short Descriptions
P1-1	Ultramicroscope II (Miltenyi)	J. Teillon	**Whole brains imaging by Ultramicroscopy** • Practical considerations for large mouse brain clearing • Whole brain imaging by ultramicroscopy • 3D analysis pipeline using the *clearmap* tool dev. By N. Renier
P1-2	AxL (3i)	M. Fernandez Monreal	**3D imaging of neuronal expanded samples** • Practical considerations of sample expansion • Expanded neurospheres imaging • 3D data-set handling and management discussion
P1-3	Blaze (Miltenyi)	C. Siret & E. Castellani	**3D entire small animal imaging** • Practical consideration for the clearing of entire embryonic mouse • Whole mouse embryo fast imaging • 3D data-set handling and analysis using the Imaris software
P2-1	soSPIM (Home-made)	R. Galland & I. Idrissi	**3D Cellular models culture and imaging using the soSPIM technology** • Parallelized culture of 3D cellular models in the JeWells device • Automatic screening of hepato-organoids • Automated analysis pipeline description
P2-2	HS-ISM (Home-made)	V. Studer	**Micro-niche creation for 3D cell culture and 3D imaging using the HS-ISM technique** • Creation of customizable micro-niches for the culture of 3D cellular models • 3D & multi-color imaging using a Hyper-spectral Instant Scanning Microscope
P2-3	TrueLive 3D (Bruker)	B. Chauvineau & S. Derossi	**Neurospheres culture and imaging using the MuViSPIM** • Method to culture neurospheres from primary rat neurons • Neurospheres labeling strategies • Neurospheres 3D imaging (Live and fixed)
P3-1	Lattice Light Sheet (Home-made)	M. Ducros	**Brain slices imaging using a Lattice Light Sheet Microscope** • Brain slice labelling and mounting consideration • Brain slide imaging at high spatial and temporal resolution
P3-3	TrueLive 3D (Bruker)	A. Hubert	**Functional neuronal network imaging in ZebraFish**

			• Presentation of the animal model (Zebrafish) and handling consideration • Functional imaging of the zebrafish neuronal activity
P4-1	Arkitekt	J. Roos	**Orchestrating complex bioimage workflows using the Arkitekt solution** • challenges of modern bioimage workflows, especially real-time data analysis and management • Our solution: Arkitekt - a powerful middleman between users and bioimage apps for building and orchestrating real-time analysis and microscopy workflows • Arkitekt's capability demonstration
P4-2	Napari	K. Yamauchi	**Napari for 3D data handling** • Presentation of the Napari solution, how to install it and use it to visualize and perform image analysis steps in this environment through the many plugins developed
P4-3	Mophonet	E. Faure	**How to segment a 3D dataset in just a few clicks?** • Concepts of the MorphoNet platform: classical usage of 3D (or 4D) interactions • Plugins for 3D segmentation integrated in MorphoNet

- P1 • Large sample imaging – Clearing & Expansion
- P2 • 3D cellular model Culture & Imaging
- P3 • Neuronal network imaging
- P4 • Image Analysis

Day 01 – 04/11				
Workshop 1-1 **Whole brains imaging by Ultramicroscopy**	Workshop 1-2 **3D imaging of neuronal expanded samples**	Workshop 2-2 **Micro-niche creation for 3D cell culture and 3D imaging using the HS-ISM technique**	Workshop 2-3 **Neurospheres culture and imaging using the MuViSPIM**	Workshop 4-2 **Napari for 3D data handling**
Jérémie Teillon	**Monica Fernandez Monreal** **Benjamin Chauvineau**	**Vincent Studer** **Alveol**	**Sylvain De Rossi** **Benjamin Chauvineau**	**Lorenzo Gaifas**
• Elodie Caccomo-Garcia • Anita Cybulska-Kłosowicz • Elisa Imbimbo • Elvire Guiot	• Nadège Le Roy • Aurélien Debonne • Xiaotong Yuan • Clara Hayn	• Mariana Flores • Amnah Alsayyar • Caroline Vignes • Thibault Brugière	• Ashley Nord • Chiara Paviolo	• Guillaume Le Bourdellès • Luca Verger • Shiraz DIB • Matheus Arana • Anne-Laure Privat • Lander Rabaut

Day 02 – 05/11				
Worshop 1-1 **Whole brains imaging by Ultramicroscopy**	Worshop 1-3 **3D entire small animal imaging**	Worshop 2-3 **Neurospheres culture and imaging using the MuViSPIM**	Worshop 3-1 **Brain slices imaging using a Lattice Light Sheet Microscope**	Worshop 4-2 **Napari for 3D data handling**
Jérémie Teillon	**Carole Siret** **Elsa Castellani**	**Sylvain De Rossi** **Benjamin Chauvineau**	**Mathieu Ducros**	**Lorenzo Gaifas**
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Day 03 – 06/11				
Worshop 1-2 **3D imaging of neuronal expanded samples**	Worshop 2-1 **3D Cellular models culture and imaging using the soSPIM technology**	Worshop 3-1 **Brain slices imaging using a Lattice Light Sheet Microscope**	Worshop 3-3 **Functional neuronal network imaging in ZebraFish**	Worshop 4-3 **How to segment a 3D dataset in just a few clicks?**
Monica Fernandez Monreal **Benjamin Chauvineau**	**Ihssane Idrissi** **Rémi Galland**	**Mathieu Ducros**	**Antoine Hubert**	**Emmanuel Faure**
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Day 04 – 07/11				
Worshop 2-1 **3D Cellular models culture and imaging using the soSPIM technology**	Worshop 3-1 **Brain slices imaging using a Lattice Light Sheet Microscope**	Worshop 3-3 **Functional neuronal network imaging in ZebraFish**	Worshop 4-1 **Orchestrating complex bioimage workflows using the Arkitekt solution**	Worshop 4-3 **How to segment a 3D dataset in just a few clicks?**
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