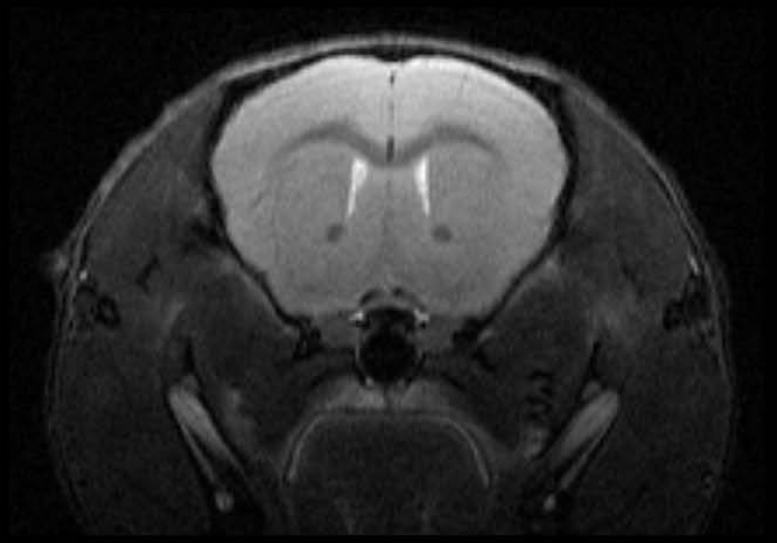
PATHBIO

Summer Course

Module II



Mouse Imaging

STRASBOURG, Sept. 21st– 29th 2020

PATHBIO (www.pathbio.org) is an EU-funded ERASMUS+ Knowledge Alliance for "**Precision Pathobiology for Disease Models**", including major European Universities, 5 European "Mouse clinics" for high-throughput phenotyping of mice, major mouse providers (Charles River, JAX, TCP), as well as associated partners worldwide (KMPC, APN, UATE, UCT). This Knowledge Alliance will provide courses and online teaching material for mouse embryology and anatomy, mouse pathology, and for mouse imaging.

In **September 21st-29th, 2020**, the second course on **Mouse Imaging,** will be organized by PHENOMIN-ICS (PHENOMIN- Institut Clinique de la Souris) as **virtual classes**. The aim is to provide Master's students, PhD and postdoc students with basic and expert knowledge to phenotype morphologically mouse models of human diseases. At this course, expert mouse embryologists, anatomists, pathologists and researchers from Europe, Asia, and Canada will give lectures and discuss with the participants different aspects of mouse imaging technologies providing powerful tools to understand and follow the progress of diseases in humans as well as in mouse models.

It gives the opportunity to learn more about image-based phenotyping using a wide variety of methods to characterize morphologically and functionally disease models. This PATHBIO module covered the "state of art" for the most relevant imaging techniques used in mice, such as X-ray, microCT, MRI, OPT, HREM, optoacoustic imaging, echography, intravital microscopy, as well as the basis for image analysis and 3D rendering. Most of these are translational from the human clinic as the technologies were initially developed for assessing human patients and later adapted to mouse models.

The course teaching will combine lectures and workshop in which participants will learn how to use Image J for analysis, discern and discuss the processing and the analyzing methods between OPT, HREM, micro-CT & MRI, and finally understand how to take advantage of these imaging methods to answer your scientific questions, specifically focusing on the 3'R criteria (Refinement, Replacement and Reduction), ethics and animal welfare.

There is not fee for this course. Interested participants should apply online with CV and letter of motivation. Deadline for applications is August 20th, 2020. Accepted participants will be informed early in September.

Co-funded by the Erasmus+ Programme of the European Union

Monday September 21st

Introduction & image analysis

10:00-10:15	Welcome
10:15-10:25	Introduction to PATHBIO and PATHBIO summer course **Yann HERAULT**
10:25-11:00	Quick Overview of the imaging principles technics used in mouse pathology analysis **Hugues JACOBS**

Break 15'

11:15-12:05	Integrated morphological mouse phenotyping: synergies between pathology and imaging **Jesus RUBERTE**

Lunch

14:00-16:30 (Break included)	Workshop: Image analysis with IMAGE J **Bertrand VERNAY** **Hugues JACOBS**

An advanced workshop on your own samples is scheduled on Tuesday 29th
(Not mandatory – under registration)

Tuesday September 22nd

Optical imaging, X-rays and µCT imaging

9:00-09:50	Bone imaging: from X-Rays, passing through CT, to specialized microscopical imaging **Jesus RUBERTE**
Break 5'	
09:55-10:30	Application of microCT analysis with a specific focus on Teeth **Jan PROCHAZKA**
Break 15'	
10:45-11:20	Intravital Microscopy : Introduction and applications of Multi-photon Microscopy **Nicolas RECEVEUR**
11:20-11:55	In vivo mechanisms of (pro)platelet formation **Catherine LEON**
Lunch	
14:00-14:50	Embryo phenotyping and HREM **Olivia WENDLING**
Break 5'	
14:55-15:45	Embryo phenotyping and X-rays OPT **Rosie BUNTON-STASYSHYN**

Workshop tomography- scheduled on Monday 28th (Mandatory)

Wednesday September 23rd

Optical imaging, Echography, Opto-acoustic imaging

09:00-09:50 Introduction to Micro-ultrasound for preclinical imaging
Ghina BOUABOUT

Break 5'

09:55-10:45 Short overview of applications and the next evolution of ultrasound
Dieter FUCHS/ Philippe DAVAULT

Break 15'

11:00-11:50 Opto-acoustic imaging for oncology
Stéphanie LERONDEL

Lunch

13:30-14:20 High-resolution ultrasound and Photoacoustic imaging in embryology, neurovascular and cardiovascular diseases
Pierre SICARD

Break 15'

14:35-15:35 Workshop : echography (heart, Abdominal)
Ghina BOUABOUT
Philippe DAVAULT

An advanced workshop to analyze echography imaging is scheduled on Tuesday 29th (Not mandatory – under registration)

Thursday September 24th

Nuclear imaging and Magnetic Resonance Imaging (MRI)

09:00-09:30	Introduction to Magnetic Resonance Imaging **Markus KRAIGER**
09:30-10:00	MRI and image analysis **Christelle PO**
Break 15'	
10:15-10:45	*In vivo* molecular imaging from pathology to clinic: illustrations **Ho-Young LEE**
Break 5'	
10:50-11:40	Nuclear Imaging Spect-CT/PET and Bioluminescence experience at the PHENOMIN-TAAM **Stéphanie LERONDEL**
Lunch	
14:00-14:50	Nuclear Imaging in animal research at ImAbio: micro PET-TEMP and microCT and recent application for diagnos **David BRASSE**

Friday September 25th

Imaging analysis, tissue sampling, dedicated case studies in mouse pathology

11:00-11:50	Ontologies for imaging analysis in Mouse Pathology **Paul SCHOFIELD**
Lunch	
14:00-14:50	Gross Pathology & Routine Histology; It all starts with a good necropsy and a good tissue section **Colin McKERLIE**
Break 5'	
14:55-15:45	Histopathology; Common "normal" histopathology in laboratory mice (spontaneous, strain-related, and incidental) AND the value of histopathology phenotyping to model human disease **Colin McKERLIE**
15:45-16:00	Conclusions- End of the first week **Yann HERAULT**

Monday September 28th

Animal research workshop

10:00: 12:30 Workshop on good practices in animal research: ethical and regulatory aspects, and how imaging supports 3'Rs

(Break included)

Isabelle GONCALVES
Stéphanie LERONDEL

Lunch

Tomography workshop

14:00: 16:30 Demonstration and workshop: HREM, CT and OPT

(Break included)

Olivia WENDLING
Hugues JACOBS

Tuesday September 29th

Optical clearing

09:30-10:20 Immunolabeling followed by optical clearing with solvents (3DISCO) and light-sheet microscopy reveals morphological phenotyping
Alain CHEDOTAL

10:20-10:45 Conclusions- Questions - feedback
Yann HERAULT

End of the school & Workshops which are not mandatory

Break 15'

11:00: 12:00 Image analysis in echography
Ghina BOUABOUT
Philippe DAVAULT

Lunch

14:00: 16:00 Advanced Image analysis with Image J
Your own sample analysis
Bertrand VERNAY

This course is also sponsored by

INFRAFRONTIER
mouse disease models

IMPC
INTERNATIONAL MOUSE PHENOTYPING CONSORTIUM

List of speakers

NAME	FIRST NAME	INSTITUT	LOGO
BOU ABOUT	**Ghina**	PHENOMIN-ICS	
BRASSE	**David**	IPHC, Strasbourg	
BUNTON-STASYSHYN	**Rosie**	MRC Harwell	
CHEDOTAL	**Alain**	Institut de la Vision	
DAVAULT	**Philippe**	Fujifilm	
FUCHS	**Dieter**	Fujifilm	
GONCALVES	**Isabelle**	PHENOMIN-ICS	
HERAULT	**Yann**	PHENOMIN-ICS	
JACOBS	**Hugues**	PHENOMIN-ICS	
KRAIGER	**Markus**	GMC	
LEE	**Ho-Young**	Seoul National University - KMPC	
LEON	**Catherine**	EFS, Strasbourg	

LERONDEL	**Stéphanie**	PHENOMIN-TAAM	
McKERLIE	**Colin**	TCP	
PO	**Christelle**	ICUBE, Strasbourg University	
PROCHAZKA	**Jan**	IMG	
RECEVEUR	**Nicolas**	EFS, Strasbourg	
RUBERTE	**Jesus**	UAB	
SCHOFIELD	**Paul**	UCAM	
SICARD	**Pierre**	PHYMEDEXP	
VERNAY	**Bertrand**	IGBMC	
WENDLING	**Olivia**	PHENOMIN-ICS	