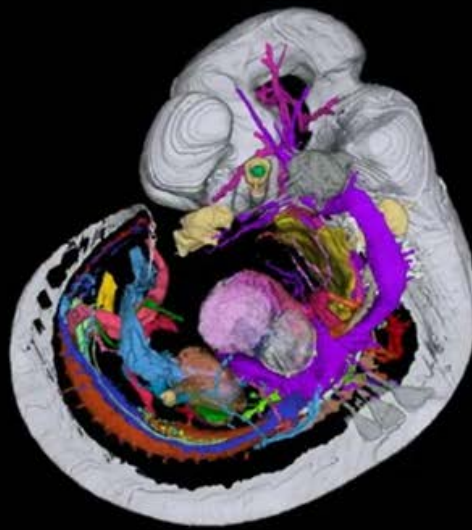




Summer Course

Module II



Mouse Imaging



Sept. 27th – Oct. 5th 2021

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 27th - October 5th, 2021**, the third 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, 2021. Accepted participants will be informed early in September.



Co-funded by the
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Monday September 27th

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 / moderator: Yann HERAULT

Break 15'

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

Lunch

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

An advanced workshop on your own samples is scheduled on Oct. Tuesday 4th (Not mandatory – under registration)



Tuesday September 28th

Optical imaging, X-rays and μ CT imaging

9:00-09:50 Bone imaging: from X-Rays, passing through CT, to specialized microscopical imaging

Jesus RUBERTE / moderator: Yann HERAULT

Break 5'

09:55-10:30 Application of microCT analysis with a specific focus on Teeth

Jan PROCHAZKA / moderator: Yann HERAULT

Break 15'to 30' (tbd)

11:00-12:00 Intravital Microscopy: applications of Multi-photon Microscopy in *vivo* mechanisms of (pro)platelet formation

Catherine LEON / moderator: Ghina BOUABOUT

Lunch

14:00-14:50 Embryo phenotyping and HREM

Olivia WENDLING / moderator: Rosie BUNTON-STASYSHYN

Break 5'

14:55-15:45 Embryo phenotyping and X-rays OPT

Rosie BUNTON-STASYSHYN / moderator: Olivia WENDLING

**Workshop HREM & tomography- scheduled on Oct. Monday 4th
(Mandatory)**



Wednesday September 29th

Optical imaging, Echography, Opto-acoustic imaging

09:00-09:50 Introduction to Micro-ultrasound for preclinical imaging
Ghina BOUABOUT / moderator: Dieter FUCHS

Break 10'

10:00-10:50 Short overview of applications and the next evolution of ultrasound
Dieter FUCHS / moderator: Ghina BOUABOUT

Break 10'

11:00-11:50 Opto-acoustic imaging for oncology
Stéphanie LERONDEL / moderator: Pierre SICARD
***live session Cancelled* - Videos of the 2020's intervention**

Lunch

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

Break 15'

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

An advanced workshop to analyze echography imaging is scheduled on Tuesday 5th (Not mandatory – under registration)



Thursday September 30th

Nuclear imaging and Magnetic Resonance Imaging (MRI)

09:00-09:30 Introduction to Magnetic Resonance Imaging
Markus KRAIGER / moderator: Frank KOBER

09:30-10:00 MRI and image analysis
Christelle PO / moderator: Frank KOBER

Break 15'

10:15-10:45 *In vivo* molecular imaging from pathology to clinic: illustrations
Ho-Young LEE / moderator: Frank KOBER

Break 5'

10:50-11:40 Molecular Imaging: Nuclear Imaging SPECT/PET -CT
Thomas VIEL / moderator: Frank KOBER

Lunch

14:00-14:50 Nuclear Imaging in animal research at ImAbio: micro PET-TEMP and microCT and recent application for diagnosis
David BRASSE / moderator: Olivia WENDLING

Friday October 1st

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

11:00-11:50 Ontologies for imaging analysis in Mouse Pathology
Paul SCHOFIELD / Moderator: Hugues JACOBS

Lunch

14:00-14:50 Gross Pathology & Routine Histology; It all starts with a
good necropsy and a good tissue section
Colin McKERLIE / Moderator: Hugues JACOBS

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 / Moderator: Hugues JACOBS

15:45-16:00 Conclusions- End of the first week
Elodie BEDU

Monday October 4th

Animal research workshop

10:00: 12:30

(Break included)

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

Isabelle GONCALVES

Frank KOBER

Lunch

HREM & Tomography workshop

14:00: 16:30

(Break included)

Demonstration and workshop: HREM, CT and OPT

Olivia WENDLING

Hugues JACOBS

Tuesday October 5th



Optical clearing

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

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
(Not mandatory – under registration)
Ghina BOUABOUT
Philippe TROCHET













Lunch














14:00: 16:00 Advanced Image analysis with Image J
Your own sample analysis
(Not mandatory – under registration)
Bertrand VERNAY

This course is also sponsored by



List of speakers

NAME	FIRST NAME	INSTITUT	LOGO
BOUABOUT	Ghina	PHENOMIN-ICS (CERBM)	 phenomin CS EXCELLENCE IN MOUSE PHENOGENOMICS
BRASSE	David	IPHC, Strasbourg	 IPHC Institut Pluridisciplinaire Hubert CURIE STRASBOURG
BUNTON- STASYSHYN	Rosie	MRC Harwell	 MRC Harwell Institute
CHEDOTAL	Alain	Institut de la Vision	 INSTITUT DE LA VISION PARIS
TROCHET	Philippe	Fujifilm	 VISUALSONICS FUJIFILM
FUCHS	Dieter	Fujifilm	 VISUALSONICS FUJIFILM
GONCALVES	Isabelle	PHENOMIN-ICS (CERBM)	 phenomin CS EXCELLENCE IN MOUSE PHENOGENOMICS
HERAULT	Yann	PHENOMIN-ICS (CERBM)	 phenomin CS EXCELLENCE IN MOUSE PHENOGENOMICS
JACOBS	Hugues	PHENOMIN-ICS (CERBM)	 phenomin CS EXCELLENCE IN MOUSE PHENOGENOMICS
KRAIGER	Markus	GMC	 GMC German Mouse Clinic
KOBER	Frank	Center for Magnetic Resonance in Biology and Medicine (CRMBM)	 CRMBM CRMBM-CBEMEREM UMR 7339
LEE	Ho-Young	Seoul National University - KMPC	 SEOUL NATIONAL UNIVERSITY KMPC KOREA MOUSE PHENOTYPING CENTER

LEON	Catherine	EFS, Strasbourg	
LERONDEL	Stéphanie	PHENOMIN-TAAM (CNRS)	
McKERLIE	Colin	TCP	
PO	Christelle	ICUBE, Strasbourg University	
PROCHAZKA	Jan	IMG	
RUBERTE	Jesus	UAB	
SCHOFIELD	Paul	UCAM	
SICARD	Pierre	PHYMEDEXP	
VERNAY	Bertrand	IGBMC	 
VIEL	Thomas	Université de Paris, PARCC.	 
WENDLING	Olivia	PHENOMIN-ICS (CERBM)	



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