

Discovering microscopy and imaging: from molecule to tissue

- ✓ **Target audience:** all PhD students
- ✓ **Prerequisites:** none
- ✓ **Teachers:** T. Astruc (INRAE, QUAPA), N. Brunel-Michac (UCA, PIAF), S. Dessel (INSERM, GRED), V. Legué (UCA, PIAF), P. Pouchin (INSERM, GRED), C. Peirs (INSERM, Neurodol), L. Theron (INRAE, QUAPA), C. Vachias (UCA, GRED),
- ✓ **Duration:** 4 days (20 h)
- ✓ **Time period :** 3-6 July 2023
- ✓ **Maximum number of participants:** 20
- ✓ **Validation:** attendance at the entire course.
- ✓ **For more information:** V. Legué (Valerie.legue@uca.fr) and Sophie Dessel (sophie.dessel@uca.fr)

OBJECTIVES

The aim of this course is to provide PhD students with training in the various fields of molecular, cellular and tissue imaging. The theory and principles of photonic microscopy and electron microscopy are presented. For each of these microscopies, the particularities, constraints and advantages as well as their complementarity are detailed. During the workshops, fluorescence and chemical imaging experiments are carried out to show concrete applications of these methods in biology and the analysis of the associated data. This training is also an opportunity to identify the appropriate imaging methods to answer a scientific problem. It also allows students to become familiar with the basic concepts of image processing and analysis. This course benefits from access to microscopy systems, located on the CLIC and CICS platforms in Clermont-Ferrand. The teaching will be carried out by a teaching team composed of biologists, specialists in scientific imaging.

CONTENT

Presentation of the different microscopy techniques (3 h): Definition and properties of image - The different parts of a microscope - The different type of microscopy: photonic, super-resolution, electronic and chemical imaging.

Characterization of cellular structures (3 h): Preparation of samples for *in situ* observation: from fixation to obtaining sections - Types of staining.

Illustration of techniques around 3 workshops to choose from:

Workshop 1: Identification and localization of nucleic acids: *In situ* hybridisation technique (FISH) and observation by confocal microscopy.

Workshop 2: Chemical imaging: Infrared imaging techniques (FT-IR), MALDI-TOF mass spectrometry

Workshop 3: Dynamic imaging (in vivo): Observation in in vivo conditions - Light sheet microscopy (SPIM)

Workshop 4: Multiphoton imaging ex vivo - Observation of neural networks ex vivo - 2-photon microscopy

MÉTHODES

- Day 1: Theoretical training + Visit to CLIC platform
- Day 2: Theoretical training + Visit to CICS platform
- Day 2: Use of ImageJ on a machine
- Day 3: Three practical workshops of your choice (after registration)
- Day 4: Restitution of the workshops