

<i>Title:</i>	Principles of Light Microscopy
<i>Lecturer:</i>	Peter Evennett & the Light Microscopy Facility of MPI-CBG
<i>Date:</i>	11 - 15 September 2017 <i>18 September 2017 voluntary "hands on sessions" on advanced imaging systems (13:00 – 18:00)</i>
<i>Time:</i>	9:00 – 18:00 (full time)
<i>Location:</i>	MPI-CBG Galleria, 2nd floor
<i>Target audience:</i>	All who use or plan to use Light Microscopy for their work Preference will be given to Predocs in the PhD Program
<i>No of participants:</i>	12
<i>Registration deadline:</i>	Monday, 31 July 2017
<i>Pre-course work:</i>	It is highly recommended to watch the on-line open iBiology Microscopy Course: http://www.ibiology.org/ibioeducation/taking-courses/ibiology-microscopy-course.html
<i>Course requirements:</i>	Self evaluation upon registration

COURSE AIM:

To introduce "Principles of light microscopy" to people who feel like beginners in the field of light microscopy. The course will be very practically oriented, such that it might also help practically experienced microscopy users or image processing people who never had any formal microscopy training before. People who have a good education in physics or computer science but never touched a microscope in practice might also profit from this course.

COURSE CONTENT:

The course will cover:

1. Basics of bright field microscopy.
2. Contrast techniques (phase contrast, DIC, dark field, polarized light, basics of fluorescence).
3. Digital imaging using scientific cameras (CCD, sCMOS) will be covered along with a very basic introduction to confocal microscopy and other optical sectioning methods. Please see the more detailed overview of the topics in the overview below.

As the course concentrates on "principles of microscopy", we would like to point out that advanced imaging applications such high performance confocal, 2-photon, FRAP, FRET, FLIM, TIRF and super resolution light microscopy will shortly addressed on Friday.

COURSE STRUCTURE:

All students will work together with teachers, forming one group, in a round table setting. Theoretical parts will be followed by practical "hands on" sessions at teaching microscopes. We plan to keep a ratio of 2 students per one teaching microscope always supported by one local tutor. During practical parts and demonstrations we will form small subgroups of students working together with teachers.

PRELIMINARY OVERVIEW OF THE COURSE TOPICS

Monday

- Resolution, Contrast, Magnification, Lenses: how they work and what they can do. Importance of Numerical Aperture
- Geometrical optics
- Illumination methods
- Choice of optical components
- Summary of setting up the microscope illumination
- Lens aberrations and their correction

Practical:

Model microscope on an optical bench, identifying components of the microscope, setting up Koehler illumination

Tuesday

- Diffraction and Image formation
- Demonstration of Abbe's diffraction experiments
- Methods of enhancing contrast (1): bright field, dark field, phase contrast

Practical:

Dark field microscopy, phase contrast microscopy

Wednesday

- Methods of enhancing contrast (2): Polarised light, Differential Interference Contrast (DIC)
- Introduction to fluorescence

Practical:

Polarized light microscopy, DIC

Thursday

- Methods of enhancing contrast (3): Fluorescence microscopy
- Introduction to digital imaging using scientific cameras (CCD, sCMOS)

Practical:

Fluorescence microscopy, digital imaging using scientific cameras

Friday

- Basic introduction to advanced optical sectioning methods and deconvolution (laser scanning confocal microscopy, two photon microscopy, spinning disk confocal microscopy, TIRF microscopy, light-sheet microscopy, super resolution light microscopy)
- What you need to know about planning your imaging experiments
- Round table course discussion and evaluation

Practical:

Demonstration of key components of advanced imaging systems

Monday following week (voluntary 13:00 – 18:00)

Practical: Voluntary "hands on sessions" on advanced imaging systems