



Elective Courses for PhD students 2018

Advanced Light Microscopy	
Offered by:	International Max Planck Research School for Cell, Developmental and Systems Biology (IMPRS-CellDevoSys)
Lecturer:	Nicola Maghelli
Date:	4 – 5 June 2018
Time:	9:00 am – 5:00 pm
Location:	CSBD Seminar Room 1 (ground floor)
Target audience:	Ph. D. Students and Postdocs interested in the most recent developments in the field of light microscopy.
No of participants:	Up to 10 participants
Registration deadline:	31 January 2018
Pre-course work:	None
Course requirements (pre-existing knowledge):	Participants should have already attended a LMF course. Basic knowledge of optics would be of advantage, but is not required for the course.

COURSE AIM:

The course will cover topics related to physical optics and microscopy, with a specific focus on the most recent techniques developed for advanced imaging. The aim is to illustrate the principles used in state of the art microscopy in the context of biological imaging.

LEARNING OUTCOME:

The course will allow for understanding the principles by having a “under the hood” look at cutting-edge microscopes. The participants will have a clear understanding the image forming process and have an insight into the underlying physics. A hands-on session will show the participants how the principles translates into practice and highlight the technical challenges one has to face when trying to attain the highest performance from an optical system.

COURSE CONTENT/ METHODS ENCOUNTERED DURING THE COURSE:

Starting from few basic principles, the course will illustrate the image formation process of several microscopes. The participants will learn how to calculate the point spread function (PSF) of different microscopes using numerical simulations, and model the light-tissue interaction within biological samples. The methods which will be used are



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- Geometrical optics
- Physical optics
- Numerical integration

COURSE STRUCTURE:

The course will start with a brief introduction about optics and microscopy, then focus on the physics underlying image formation. The participants will learn how to setup a numerical simulation for computing the PSF of different microscopes. Finally, the simulations will be tested against real data acquired with a microscope.

BACKGROUND READING:

Basic introductory reading about physical optics:

Biobeam <https://maweigert.github.io/biobeam/>