TITLE

Advanced fluorescence microscopy methods

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Teaching staff

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Reception hours:

Program of the course:

Fundamentals of fluorescence microscopy. Image acquisition in optical microscopy. Contrast. Optical Resolution limit. Point Spread Function (PSF) of a microscope. Optical sectioning. Confocal microscopy.

Advanced Fluorescence microscopy methods. Fluorescence Lifetime Imaging Microscopy (FLIM). FLIM acquisition and data analysis. Forster Resonance Energy Transfer (FRET). FRET imaging and applications. Fluorescence-based sensors. Fluorescence methods to measure mobility of molecules: Single-Particle Tracking (SPT), Fluorescence Recovery after Photobleaching (FRAP), Fluorescence Correlation Spectroscopy (FCS) and related techniques.

Optical Super-resolution microscopy. Breaking the diffraction limit (Nobel Prize in Chemistry 2014). Stimulated Emission Depletion (STED) microscopy. Stochastic Optical Reconstruction Microscopy (STORM) and Photoactivatable Localization Microscopy (PALM). Structured Illumination Microscopy (SIM) and related techniques.

Bibliography:

D. Jameson, Introduction to Fluorescence, CRC Press 2014

Valeur, Molecular Fluorescence: Principles and Applications. Wiley-VCH Verlag GmbH 2001.

Pawley, Handbook of Biological Confocal Microscopy, Springer 1995

Articles provided during the course