Introduction

Fluorescence microscopy is a fundamental tool in biomedical research and also in many other scientific fields. It is at the heart of most current advanced microscopy methods and benefits from the continuous development of optics, detection devices and light sources that keep transforming the field of microscopy. The tutorial aims to provide an overview of the different forms of fluorescence microscopy right up to its most current applications and cover the subsequent quantitative analysis of the obtained data.

The tutorial will consist of two lectures with a break for refreshments and discussion between them and time for discussion afterwards. It is mainly aimed at those getting started in fluorescence imaging. For those familiar with only certain aspects of the topic, it may put those in context and provide an overview of other, more advanced topics.

Lecture 1: Overview of fluorescence microscopy

- The principle of fluorescence
- Development of fluorescence microscopy into its present applications: The interplay of labeling and imaging
- Acquisition methods: From widefield imaging to super-resolution
- Nonlinear excitation phenomena

Lecture 2: Image optimization and data analysis

- Digital image optimization: Sampling requirements and digitization
- Noise considerations
- Basic image processing strategies
- Going beyond the descriptive image: Introduction to quantitative image analysis