

Microscopy and Quantitative Histology for Biomedical Research Schedule for Bonn September 2019

The goal of this workshop is to combine formalized lectures on the principles of microscopy and quantitative histology (stereology) with practical sessions on the use of microscopes and post-acquisition analysis. Upon completing this short course, the participants should be able to efficiently operate their research instruments, obtain optimal image resolution and quality, and understand the design of a quantitative stereological study.

Lectures on Theoretical Principles

Monday 2 September, 2019

- Lecture 1 Principles of Experimental Design and Reproducibility of Data
- Introduction
 - Participants' introduction and project objectives
 - Experimental Design and Specimen Preparation
 - Rigor and Reproducibility in Science

Lunch

- Lecture 2 Principles of Microscopy
- Microscope optics
 - Magnification and Resolution
 - Widefield Microscopy for Biological Sciences

Break

- Lecture 3 Principles of Fluorescence Detection
- Fluorophores
 - Spectral separation
 - Fluorescence microscopy
 - Confocal microscopy

Tuesday 3 September, 2019

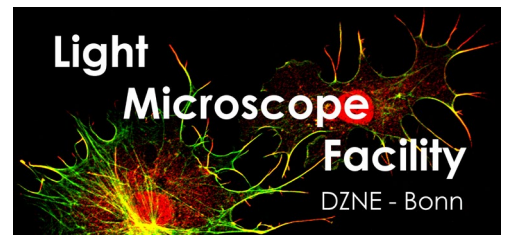
- Lecture 4 Principles of Image Acquisition
- Digital image detection
 - Dynamic range of signal
 - Imaging standards and ethics
 - Post-acquisition image processing

Lunch

- Lecture 5 Introduction to Systematic Sampling and Design-Based Stereology
- Complete Enumeration and Statistical Sampling
 - Independent Random and Systematic Random Sampling (SRS)
 - Quantitative Histology (Stereology) of 2-D and 3-D Imaging

Break

- Lecture 6 Estimation of Cell Number, Volume and Length in Tissue
- Model-Based and Design-Based Probes
 - Development of the Optical Disector Probe
 - Probes for Volume and Length Estimation
 - Assessment of Sample Variance and Efficiency



Small Group “Hands-on” Tutorials on Microscopes

Directed group tutorials at the **Nikon C2 confocal microscope**

- Orientation to equipment and light path for scanning confocal microscopy
- Principles of image acquisition
- Strategies for saving and managing images
- Collecting image stacks and determining colocalization

Directed group tutorials at the **Zeiss Apotome microscope**

- Orientation to equipment and light path for structured illumination
- Principles of image acquisition
- Strategies for saving and managing images
- Collecting image stacks and determining colocalization

Directed group tutorials at the **MBF Bioscience Stereology Workstation**

- Principles of Systematic Random Sampling (SRS) for stereology
- Overview of Design-Based sampling probes
- Practicum in the Optical Fractionator and Data Analysis

Wednesday 4 September, 2019

09:00-12:30

Group A Nikon C2- Confocal Microscopy
Group B Zeiss Apotome- Structured Illumination
Group C MBF Bioscience- Stereology

Lunch

13:30-17:00

Group B Nikon C2- Confocal Microscopy
Group C Zeiss Apotome- Structured Illumination
Group A MBF Bioscience- Stereology

Thursday 5 September, 2019

09:00-12:30

Group C Nikon C2- Confocal Microscopy
Group A Zeiss Apotome- Structured Illumination
Group B MBF Bioscience- Stereology

Lunch

13:30-17:00

All Groups Extra time/advanced topics with Nikon, Zeiss, or MBF Bioscience

Tutorial on Post-Processing of Images for Scientific Analysis and Publication

Friday 6 September, 2019

Uniklinikum Nord, Bldg. 11, 1st Floor, Rm 601

09:00-12:30

Creating Publication Images from Raw Images Group A and Group B (half)

Lunch

13:30-17:00

Creating Publication Images from Raw Images Group B (half) and Group C