

# 2.5-day BioVoxel Workshop

## "Comprehensive Image Processing and Analysis"

### Basics in Microscopy and Imaging

- Correct Illumination
- Signal-to-noise and background
- Pixels and voxels
- Resolution and its limit
- Imaging artifacts
- Correct image sampling

### Digital Images

- Image formats
- Image compression and artifacts
- Metadata handling
- Bit-depth
- Human vision and digital images
- True-color and pseudo-color images

### Introduction into the ImageJ/Fiji software

#### Scientifically Correct Image Adjustment

- The image histogram
- Correct contrast adjustments
- Image transformation (size, rotation,...)
- Background subtraction methods
- Image filters

### Image Segmentation

- Basic image pre-processing
- Feature extraction (grayscale)
  - e.g. from fluorescent images
- Post-processing to improve analyses
- Feature Extraction from Color Images
  - e.g. Histological Sections
  - Color spaces

### Higher Dimensional Images in Fiji

- 3D, 4D, 5D images
- Visualization of n-dimensions
- Creating Image Montages (Figures)

#### Image Annotation/Labelling

- Labeling with overlays
- Time-stamps
- Image scaling (setting units like  $\mu\text{m}$ )
- Scale bars
- Calibration bars

#### Publication Figures

- Documentation and ethics
- Image data integrity preservation
- Do's and Don't's during figure preparation

### Automatic Counting and Measuring

- Automatic counting of objects applying different methods
- Quantification by distinction of size and shape
- Area and area fraction measurements

#### Quantitative Intensity Analysis

- Prerequisites for intensity quantification
- Image intensity calibration
- Correct intensity measurements
- Analysis of histological staining

#### Insight into Process Automation

One specific analysis technique according to participant interest and dependent on time schedule

### Specific Analyses Techniques according to participants needs, such as...

- Densitometry of Western blots
- Statistical co-localization analysis
- Automated tracking of moving objects

- 3D reconstruction for visualization
- 3D Segmentation (object extraction)
- Quantification in 3D (volume, surface,...)
- Image Stitching

(selected topics from the ones listed here)

2.5-day intensive workshop (~20 hours)