

## Fluorescence Microscopy Short Course

December 16-19, 2024 Microscopy and Imaging Center, Texas A&M University

All lectures are in ILSB 1143

### **Monday, Dec 16:**

- Theory of Image formation; limits of resolution (Vitha)
- Properties of microscope objectives, numerical aperture, aberrations (Vitha)
- Principles of Fluorescence; Fluorophores, filters, cameras (Vitha)

***Lab session (ILSB, Rms 1119, 1122): Group A: 1pm to 2:30 pm; Group B 2:30pm to 4 pm***

- Wide-field fluorescence imaging on upright and inverted microscopes
- MINI-WORKSHOP: Leica THUNDER Computational Clearing
- Comparison of color and monochrome cameras.
- sCMOS vs. machine vision CMOS cameras

### **Tuesday, Dec 17**

- Confocal microscopy – point scanning and spinning disk confocal systems (Griffing)
- Detectors for confocal imaging: PMT, HyD, SPAD, SiLVR.. (Vitha)
- 3D Image restoration – deconvolution of wide-field and confocal images (Vitha)

***Lab Session: 1pm to 2 pm: ILSB rm. 1117, 1122; 2:30-4 PM BSBW Rm. 025)***

- Olympus FV1000 and/or Leica SP8 laser scanning confocal systems (ILSB 1122, 1117)
- Evident (Olympus) FV4000 laser scanning confocal system (ILSB 1127)
- Nikon AXR point scanning and SD Spinning Disk confocal microscopes; (BSBW Rm. 025)

### **Wednesday, Dec 18:**

- Light Sheet Microscopy (Gibbs)
- Multi-photon fluorescence microscopy and SHG (Gibbs)
- Fluorescence Lifetime Imaging (FLIM) (Vitha)
- Superresolution microscopy (Vitha)

***Lab session: : 1pm to 2:15 pm: ILSB rm. 1117, 1128; 2:30-4 PM BSBW Rm. 025)***

- Zeiss Z1 Light Sheet Microscope (ILSB 1128)
- Leica SP8 FILM/STED/ confocal system – demonstration of FLIM, STED superresolution (ILSB 1117)
- Nikon nSPARC confocal superresolution system (BSBW 025)

## **Thursday, Dec 19:**

- Quiz (~30 minutes)
- Introduction to Image processing and analysis: file formats, preserving data integrity, metadata. Ethical guidelines (Vitha/Gibbs)
- ImageJ/FIJI basic concepts, image adjustments and filtering, thresholding and measurements (Vitha/Gibbs)
- Introduction to Imaris (Gibbs)
- Basic workflow from Image capture to Publication, using (mostly) free software tools (Fiji, GIMP, Scribus, ..) (Vitha/Gibbs)
- Short Course Certificates are issued

## **Lab session: ISLB 1143, 1135)**

- ImageJ/FIJI use (on participant's laptop computers)
- Individual or small group sessions with Imaris, LASX FLIM, ...
- Q/A, topics of interest
- Optional: additional Leica SP8 confocal/FLIM/STED/Lightning deconvolution, and Leica Thunder computational clearing demonstration