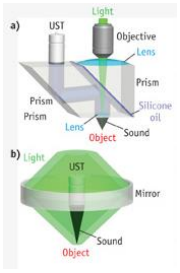
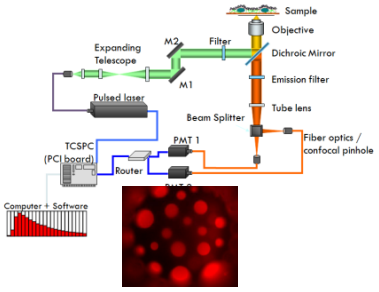
Course number and name: BIOE 514, Quantitative Microscopy
Instructor: Raj Kothapalli, Assistant Professor of Bioengineering
Semester offering: Spring 2020
Meeting times: Tu, Th: 10:35 AM - 11:50 AM
Location: Thomas Bldg 217
 # students max: 25 (Graduate students and upper level undergraduate students)

Brief Description:

This course is intended to help students learn how to use advanced microscopy techniques and how to extract quantitative information from cells and biomolecules. The course will explore the underlying physics of light interaction with matter, and provide a detailed overview of the hardware (e.g. optics, filters, detectors) and software necessary to extract information on positions of molecules, distances between them, and their dynamics of transport and diffusion. Applications to cellular and molecular biology, bioengineering and physiology will be emphasized.

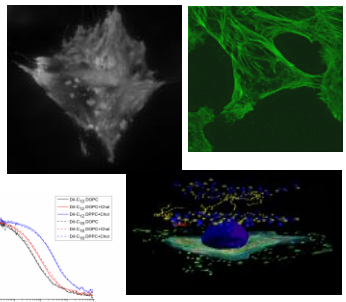




Text: Ammasi Pariasamy: Methods in Cellular Imaging

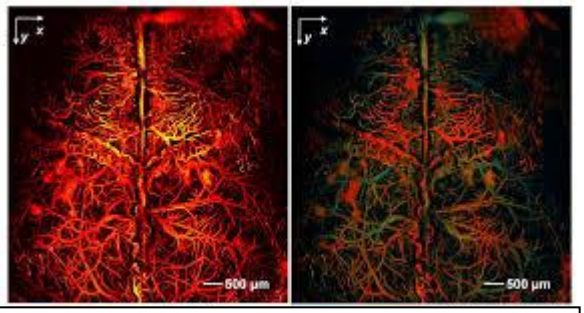
Course Topics:

Week 1: Integrating Student Interests and Course Background
Week 2: Light interaction mechanisms with tissue and cells
Week 3: Endogenous (Intrinsic) and Exogenous (Extrinsic) Optical Contrasts
Week 4: Basics of Phase and Differential Interference Contrast
Week 5: Basics of fluorescence and fluorescence microscopy
Week 6: Confocal (laser scanning) and Multiphoton microscopy
Week 7: Fluorescence resonance energy transfer
Week 8: Fluorescence lifetime Imaging and Correlation Spectroscopy
Week 9: Total Internal Reflection Microscopy
Week 10: Super resolution microscopy (principles and application)
Week 11: Photoacoustic Microscopy (Basic principles)
Week 12: Photoacoustic Microscopy (Applications)
Week 13: Review of other emerging microscopy techniques
Week 14: Special Topics: Microscopy in Neuroscience
Week 15: Special Topics: Microscopy in Cancer and other applications



Suggested Prerequisites:

Cellular and Molecular Biology (Bioe 201 or equivalent)
Physics (Physics 214 or equivalent)



Transcranial Non-Invasive Photoacoustic Microscopy of Mouse brain neural activity