Advanced Graduate Course in Functional Imaging - 2020
(Dept. Neurobiology and Behavior #239)

Course Description: Imaging techniques have developed rapidly in recent years, and that development is profoundly affecting virtually all aspects of neuroscience research. The course provides an overview of both the technical and applied aspects of imaging techniques for investigation of the nervous system. The emphasis will be on three areas: cellular/subcellular level imaging of nervous system function (microscopic level), systems-level brain imaging (macroscopic level), and human brain imaging; highlighting similarities among imaging methods and their applications. Students will also present relevant journal papers during the course. It is expected that upon completion of the course students will be able to critically read the literature and be able to choose the best technique(s) appropriate for their research interests.

Course Lecturers: Drs. Ian Parker and Ron Frostig, each faculty in the Department of Neurobiology and Behavior.

Time: Thursday, 9am – 12 pm

Place: MH 1201

Required Reading Material: Instructor resources (handouts, PowerPoint files, etc.)

Evaluation: Students will be evaluated on the basis of an 8-page (minimum), double space (not including references, tables, figures, or footnotes) term paper, and class presentation of that paper at the last meeting of the class. The paper may deal with any topic within the area of imaging of the nervous system, and must be approved by one of the faculty according to the appropriate level of inquiry (i.e., microscopic, macroscopic or human imaging). Papers will be due on Thursday, March 5th. Paper topics should be approved no later than February 20th. The final grade will be determined on the basis of the paper and on the basis of its class presentation.

CLASS SCHEDULE

Jan 9th: (IP) Introduction to optical imaging: light, optics, lasers, detectors

Jan 16th: (IP) Microscopes and how they work; from Leeuwenhoek to confocal

Jan 23rd: (IP) New microscopies: 2-photon and TIRF + lab demonstrations

Jan 30th: (IP) New microscopies: superresolution and lightsheet + lab demonstrations

Feb 6th: (RF) Brain activation: physiology and metabolism + Imaging fundamentals

Feb 13th: (RF) From Video-based to CCD-based and CMOS-based imaging

Feb 20th: (RF) Applications + Lab visit

Feb 27th: (RF) Human imaging (PET, MRI, fMRI)

March 5th: (RF) Student presentations of journal papers.

Mar 12th: (IP + RF) **Student final presentations of their papers**