

CBIO 8050
Techniques in Modern Microscopy

Instructors

Charles H. Keith Department of Cellular Biology and Center for Ultrastructural Research 361 Biological Sciences Building 706-542-3331 chkeith@cb.uga.edu	John P. Shields 156 Barrow Hall 706-542-4080 jshields@cb.uga.edu
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This course is designed to give you a practical introduction to a wide variety of microscopic imaging techniques that are available on the UGA campus, and that you may use in your research. We will cover a variety of light and electron microscopic imaging techniques, as well as photographic and digital imaging, image processing, and a variety of other topics. The idea behind the course is both to make you aware of the variety of microscopic techniques that are available, as well as to make you a critical reviewer of images presented in the scientific literature. The course is designed to be highly practical and hands-on. It has been scheduled as a lecture-lab course, with the lecture portion from 2-3:15 and the lab portion from 3:30-4:45 on Tuesdays and Thursdays. Please take these as approximations, rather than exact times.

Texts:

Basic Methods in Microscopy: Protocols And Concepts from Cells, a Laboratory Manual (Paperback)

by [David L. Spector](#) (Editor), [Robert D. Goldman](#) (Editor)

Microscope: Basics and Beyond. Mortimer Abramowitz (.pdf on www.uga.edu/~caur)

Electron microscopy: principles and techniques for biologists

by John J. *Bozzola*, Lonnie D. Russell.

Electronic Resource through UGA library:

<https://gil.uga.edu/cgi-bin/Pwebrecon.cgi?v1=3&ti=1,3&FT=%2Bbozzola&CNT=25%20records%20per%20page&PID=3SC92NnOQ3TWcqxWKIevIrrjE02&SEQ=20070105095941&SID=1>

Molecular Expressions web site: <http://www.molecularexpressions.com/index.html>

Examinations and project:

There will be two examinations in this course – a mid-term and a final. These will consist of a variety of short-answer questions: definitions, fill-in-the blanks, etc. Additionally, students will be required to do a project, which will consist of a set of images documenting biological structures, done with the techniques covered in the course. These

plates are to be created as figures appropriate for submission to a journal in the student's area of study, with complete figure legends (captions describing the figures). You will be expected to provide copies on the *Instruction to Authors* section of the journal chosen.

Schedule of course

Date	Lecture (Instructor)	Laboratory (Instructor)
January 9	Research Ethics (JPS)	Tour/safety (CHK & JPS)
January 11	Tomographic Imaging (CHK)	MicroCT (JPS)
January 16	Brightfield and phase microscopy (CHK)	Brightfield and phase microscopy (CHK)
January 18	Polarization and DIC Microscopy (CHK)	Polarization and DIC Microscopy (CHK)
January 23	Electron microscopy (JPS)	Negative Stain (JPS)
January 25	Fixation and prep for thin section (JPS)	Fixation and prep for thin section (JPS)
January 30	Thin section (JPS)	Thin section (JPS)
February 1	Filters and fluorescence (CHK)	Widefield fluorescence (CHK)
February 6	Immunoelectron microscopy (JPS)	Immunoelectron microscopy (JPS)
February 8	Lasers/ Confocal (CHK)	Confocal (CHK)
February 13	IR Lasers/ Multiphoton (CHK)	Multiphoton (CHK)
February 15	Reflection confocal (CHK)	Reflection confocal (CHK)
February 20	SEM (JPS)	VP and environmental SEM (JPS)
February 22	SEM sample prep (JPS)	SEM (JPS)
February 28	Detectors (CHK and JPS)	Detectors (CHK and JPS)
March 1	Exam 1	Project discussion
March 6	Image processing – point operations (CHK)	Image processing – point operations (CHK)
March 8	Image processing – convolution (CHK)	Image processing – convolution (CHK)
March 20	Image processing – Fourier and other transforms (CHK)	Image processing – Fourier (CHK)
March 22	Image processing – SVD and SOARS (ATS)	Image processing – SVD and SOARS (ATS)
March 27	Electron and X-ray diffraction (CHK,JSW)	Electron diffraction (JSW)
March 29	High resolution TEM and STEM (JSW)	HR TEM and STEM (JSW)
April 3	CryoTEM and tomography (JSW)	CryoTEM and tomography (JSW)
April 5	Cryo SEM (JPS)	CryoSEM (JPS)
April 10	X-ray emission (JPS)	EDS (JPS)
April 12	AFM (Stickney)	AFM (Stickney)
April 17	Preparation of project reports, photoshop basics (JPS/CHK)	Preparation of project reports, photoshop basics (JPS/CHK)
April 19	Converting reports into PDFs/Ethics of image manipulation (JPS)	Work on reports
April 24	Work on reports	Work on reports
April 26	Replicas/Freeze Fracture (JPS) Reports due	Freeze fracture (JPS)
May 8	Final Exam (3:30-4:30)	