BIOLOGY 556: SCANNING ELECTRON MICROSCOPY FALL 2009
Solo use of Facility equipment is based on successful completion of proficiency examinations for each instrument.

Your goal in this course is to learn to prepare a variety of specimens for scanning electron microscopy, and to image those samples at high resolution in the SEM. Using various detectors, you will be able to image a sample based on morphology, atomic number, and chemical composition at the surface. You will be able to diagram the various related pieces of sample preparation instrumentation and design preparation protocols for a variety of samples. You will learn basics of imaging. For the final portfolio, you will apply your knowledge of sample preparation and instrument operation to image 15 samples of your own choosing.

Initially students will work together in groups, but after the SEM practical each student **will work independently** on individual samples.

This course will take a minimum average of 3 hours per week in the laboratory. Students are not permitted to work in the laboratory outside of 8:30 am-5 pm M-F without express permission of Dr. Barlow. Students must log all their time in the laboratory and submit their weekly records along with their lab reports. At the start of the semester, each student will arrange time to meet weekly with the instructor.

This class can fill a large portion of your life, so be sure you have the time for this class.

REFERENCES AVAILABLE IN THE LABORATORY

ELECTRON MICROSCOPY, J. Bozzola and L.Russell (1992)
BIOLOGICAL ELECTRON MICROSCOPY M. Dykstra (1992)
SCANNING AND TRANSMISSION EM Flegler et al. (1993)
WORKING WITH A SEM S. Chapman (1986)
Principles and Practice of X-Ray Microanalysis Oxford Instruments 1999

GRADING (1000 points total): Late assignments incur a late penalty.

Instrumentation practicals	required for solo use of equipment	cr/ncr	
Scope Test	SEM solo exam	cr/ncr	By three pm, 10/2
Imaging Basics	Making images look better	50 points	By three pm, 10/2
Lab report I	Working Distance	90 points	By lab class, 10/7
Lab report II	Tilt Comp	90 points	By lab class, 10/14
Lab report IIB	Dynamic Focus	90 points	By lab class, 10/14
Lab report III	Resolution & spot size	90 points	By lab class, 10/21
Lab report IIIB	Resolution & Working Distance	90 points	By lab class, 10/21
Lab report IV	Accelerating voltage	90 points	By lab class, 10/28
Lab report V	BSE & X-ray spectrum	90 points	By lab class, 11/18
Lab report VI	BSE & X-ray maps	90 points	By lab class, 12/2
Lab report VII	SEM Image portfolio	90 points	By lab class, 12/9
Lab report VIII	Image portfolio Class presentation	cr/ncr	By lab class, 12/9
Lab report IX	Lab worklog of time and purpose	50 points	By lab class, 12/9
Instrumentation Final Exam (Must pass to pass course)		90 points	12/2 to 12/11

Lab reports will consist of labeled images and discussion highlighting each of the techniques discussed. Additional guidelines/deadlines will be given in lab.

The lecture is Wednesday afternoon from 13:00-14:50 in LS 132. Wednesday afternoon lab (3:05-5:40 pm) will be a laboratory demonstration and student practice session in the EM Facility (Physical Science room 1). Until the solo exam, all students, in pairs, will meet weekly to practice on the SEM. Upon successful completion of the SEM solo exam, students will sign up for independent time on the scope as needed to carry out the laboratory exercises. Students will also maintain a log of equipment and preparation time in the lab, to be used as part of the final grade.

Tentative Schedule:

Week 1	9/2	Introduction to the EM Facility laboratory
Week 2	9/9	Introduction to the SEM
Week 3	9/16	Scope review, imaging
Week 4	9/23	Computer image capture, Working distance
Week 5	9/30	Tilt compensate, Dynamic focus
Week 6	10/7	Resolution, spot size
Week 7	10/14	Accelerating voltage, backscatter
Week 8	10/21	Fixation
Week 9	10/28	Critical point drying
Week 10	11/4	X-ray 1
Week 11	11/11	Veterans Day holiday
Week 12	11/18	X-ray II
Week 13	11/25	Thanksgiving
Week 14	12/2	TEM and sectioning demo
Week 15	12/9	In class presentation