

Biology 428: Scanning Electron Microscopy Workshop

Fall 2019

Lecture and Lab CBB 326 and CBB 376

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Office hours: By appointment

Lab Manual Sol Seipsenwol. 2018. Scanning Electron Microscopy Handbook. Required, purchase from the University Bookstore

Prerequisites Biology 101 (General Biology), Biology 130 (Introduction to Plant Biology), Biology 160 (Introduction to Animal Biology) or my permission

Course Description and Learning Outcomes

This workshop covers the whole procedure from a living tissue/organism to analyses of its scanning electron microscope (SEM) images, with focuses on these three aspects: 1) principles and lab procedures of the collection, fixation, dehydration, critical point drying and sputter coating of specimens; 2) principles and operation of a conventional SEM; and 3) analyses of SEM images. The following learning outcomes are expected to be achieved through this workshop:

1) Master the basic methods for preparing biological samples (e.g., plant, insect and animal tissue) for SEM, using conventional methods of alcohol or aldehyde fixation, ethanol dehydration, critical point drying and sputter coating.

2) Master the principles of SEM alignments and be able to operate UWSP's Hitachi S3400N-II SEM.

3) Understand basic principles of photomicrography by identifying and taking digital images of your samples with a stereo light microscope (LM).

4) Be able to create digital SEM images, 3D stereo pairs and digital color anaglyphs from the images and use them in a post-workshop PowerPoint presentation.

After the basic training in the workshop, students will be eligible to use the SEM for faculty-sponsored research projects.

Requirements for the Course

Each student needs to demonstrate his or her mastery of the basic techniques by presenting:

1) At least two dehydrated, well-mounted, sputter-coated specimens

2) Twelve or more digital images: at least 3 at low magnifications (below 200X), and at least 3 at high magnifications (above 500X), and at least 4 stereo anaglyphs.

3) Both LM and SEM images, with organisms properly identified at least to the level of Family, in a PowerPoint presentation

Special needs

If you need course adaptations, accommodations or any other special arrangements due to disability and/or other medical conditions, please visit the Student Disability Office first to establish a record. After that, please make an appointment with me as soon as possible.

Emergency response guidance

In the event of a medical emergency, call 9-1-1 or use Red Emergency Phone. Offer assistance if trained and willing to do so. Guide emergency responders to victim. In the event of a tornado warning, proceed to the lowest level interior room without window exposure. Avoid wide-span structures (gyms, pools or large classrooms). See www.uwsp.edu/rmgt/Pages/em/procedures/other/floor-plans.aspx for floor plans showing severe weather shelters on campus. Get to know at the start of the semester the locations of red emergency phone and severe weather shelters closest to our lecture hall and laboratory. In the event of a fire alarm, evacuate the building in a calm manner. Meet at an instructed location 200 yards away from building. Notify instructor or emergency command personnel of any missing individuals. In the event of active shooting, run/escape, hide or fight. If trapped, hide, lock doors, turn off lights, spread out and remain quiet. Call 9-1-1 when it is safe to do so. Follow instructions of emergency responders. See UW-Stevens Point Emergency Procedures at www.uwsp.edu/rmgt/Pages/em/procedures for details on all emergency response at UWSP.

Tentative Schedule

Sample collection: Two sample collection trips will be offered before the workshop lab training. Plant and insect samples will be collected under my supervision from the Biology greenhouses and the Schmeeckle Reserve, respectively. Students are required to attend one trip according to the samples they plan to collect.

Sample identification and photographing: Students will identify their collected plant and/or insect samples with biology faculty and take images of the samples with a stereo light microscope in CBB 326. Two 3-hr sessions will be offered and students are required to attend one session.

Workshop lab training (Note: each student only needs to attend ONE 4 hr hands-on SEM tutorial session)

10/18 (Friday)

1:00 – 2:00 pm (CBB 326): Preparation of material for SEM, Introductory lecture

2:00 – 5:00 pm (CBB 326): Sample dehydration

5:00 – 7:00 pm (CBB 326): Critical point drying of samples

10/19 (Saturday)

8:30 – 9:30 am (CBB 376): Lecture on principles of scanning electron microscopy

9:30 – 10:30 am (CBB 376): Sample mounting on SEM stubs

10:30 – 11:30 am (CBB 326): Sputter-coating of samples

11:30 – 1:00 pm (CBB 326): Basic alignment, operation and photography of the SEM

1:00 – 2:00 pm: Lunch break

2:00 – 6:00 pm (CBB 326): Hands-on SEM tutorial session I

6:00 – 10:00 pm (CBB 326): Hands-on SEM tutorial session II

10/20 (Sunday)

8:00 – 11:00 am (CBB 376): Lecture/demonstration

1) Making 3D anaglyphs of SEM images with 3D Stereo Image Factory

2) Making PowerPoint slides

11:00 – 12:00 pm: Lunch break

12:00 – 4:00 pm (CBB 326): Hands-on SEM tutorial session III

4:00 – 8:00 pm (CBB 326): Hands-on SEM tutorial session IV

10/21 – 25 (Monday – Friday)

Hands-on SEM tutorial sessions V and VI will be scheduled

10/21 – 25 (Monday – Friday)

The SEM lab will be open for students to process images and make slides for their PowerPoint presentations

10/28 – 11/01 (Monday – Friday)

Time and place (to be determined): A post-workshop PowerPoint presentation will be scheduled for students to present their workshop images