

OBJECTIVE: In this exploration lab, students will investigate the microscopic measurement scale using advanced analytical instrumentation to enhance their understanding of SI units (International System of Units).

ACTIVITY DESCRIPTION: Using the cyber-enabled scanning electron microscope (SEM), students will look at various parts of small specimens. They will locate, measure, and take micrographs (images) of millimeter (**mm**), micrometer(**μm**) , and nanometer (**nm**) portions of the specimen.

MATERIALS:

Scanning Electron Microscope (cyber-enabled)
SEM specimen mount
Carbon Tape or carbon paste
Scissors

Small insect (*i.e.* ant, gnat, mosquito)
Sputtering apparatus (gold or carbon coating)
Tweezers
Latex/Nitrile gloves

PROCEDURE:

1. Put on gloves.
2. Cut a small piece of double-sided carbon tape and place on specimen mount.
3. Use tweezers/forceps to place the small insect on the carbon tape. Be sure not to crush the insect, and try to position it so that the face of the insect can be viewed from above.
 - a. *If using carbon paste:*

Apply a small amount of paste (one small dab) to the specimen mount and use the tweezers to gently set the insect in the paste. Allow the paste to completely dry.
4. Once insect is securely mounted, invert the specimen mount to ensure that the specimen will remain mounted upon introduction to vacuum.
5. Place mount containing specimen in the sputtering apparatus and coat with a layer of conductive material (either Au or C).
6. Once the specimen is coated, transfer it into the SEM and proceed to image.
7. Find a feature/characteristic of the insect that is distinguishable in the **mm range**. *Remember to use the scale bar and ruler measuring tools on the SEM to determine the size of your feature).* **Take a photo!**
8. Find a feature/characteristic of the insect that is distinguishable in the **μm range**. **Take a photo!**
9. Find a feature/characteristic of the insect that is distinguishable in the **nm range**. **Take a photo!**