

STEPS NECESSARY TO CAPTURE AN IMAGE AND SAVE TO FILE

1. PROPER SAMPLE PREP (PG 2)

2. OPEN DOOR AND INSERT SAMPLE

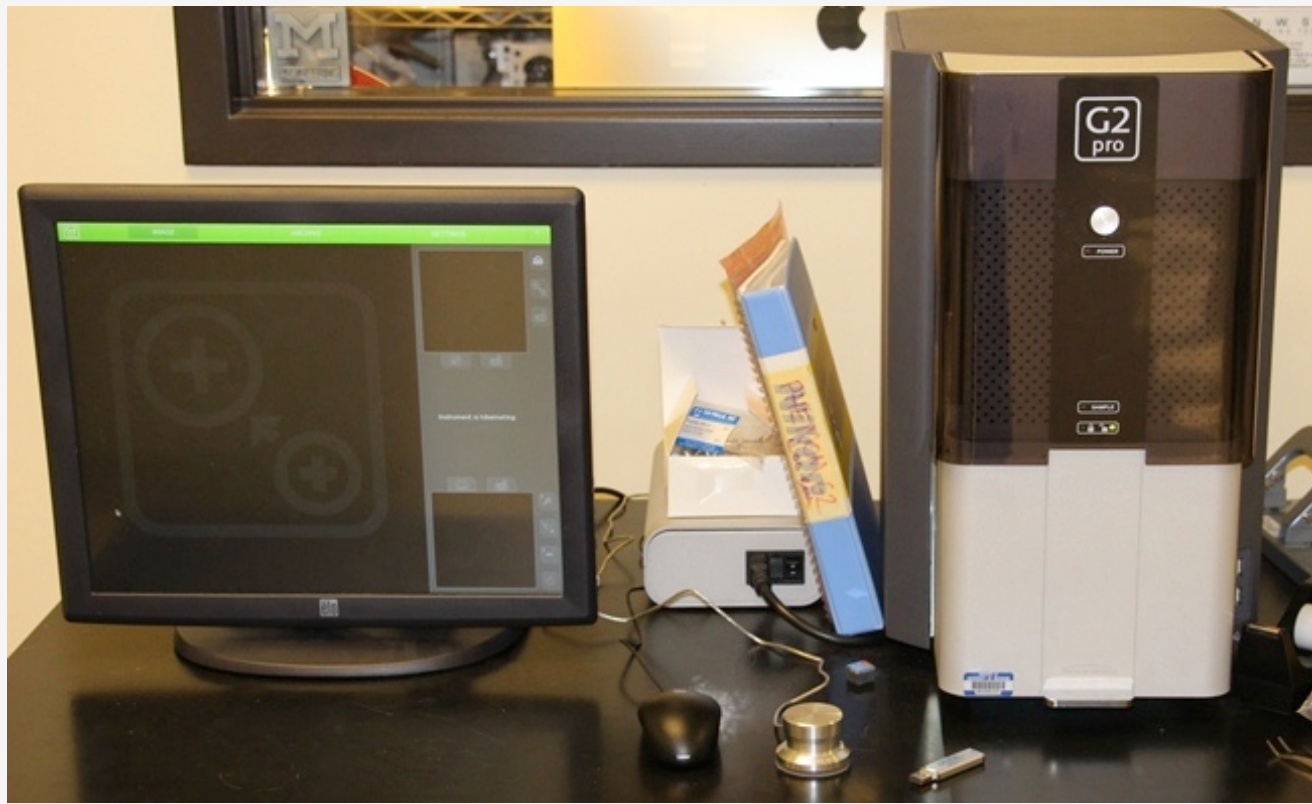
3. INITIAL PUMP TAKES APPROX 5 MIN, AFTERWARDS 30 SECS (PG 3, steps 2-3)

4. INITIAL FOCUS IN OPTICAL IMAGING

5. GO INTO BSE MODE FOR IMAGING

6. CAPTURE SAMPLES ON USB DRIVE

7. PERFORM ADVANCE AND SYSTEM SETTINGS, SUCH AS TAKING MEASUREMENTS



If specimens are nonconductive:

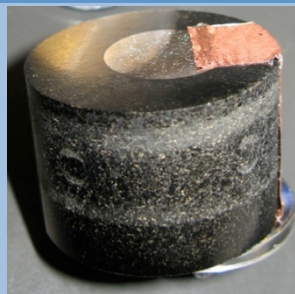
- They should be sputter or carbon coated before beginning placing in the SEM chamber. if samples are coated, you still need to limit beam energy to the sample.
- Alternatively, low voltage can be performed (please discuss with MSE Tech staff regarding this).
- **Please follow the SOP for coating your specimen for more details.**

For free standing metallic samples:

- Need to make a connection with the sample to the aluminum stub.

**Conductive samples in metallographic mount:**

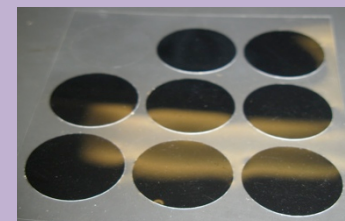
- Need to make a connection from sample to stub by attaching tape to specimen
- For more information on metallographic prep, **please see the SOP for LECO Mounting Press and ATM Grinder/Polisher**



Aluminum stubs are available in 2 sizes: 0.5" and 1"

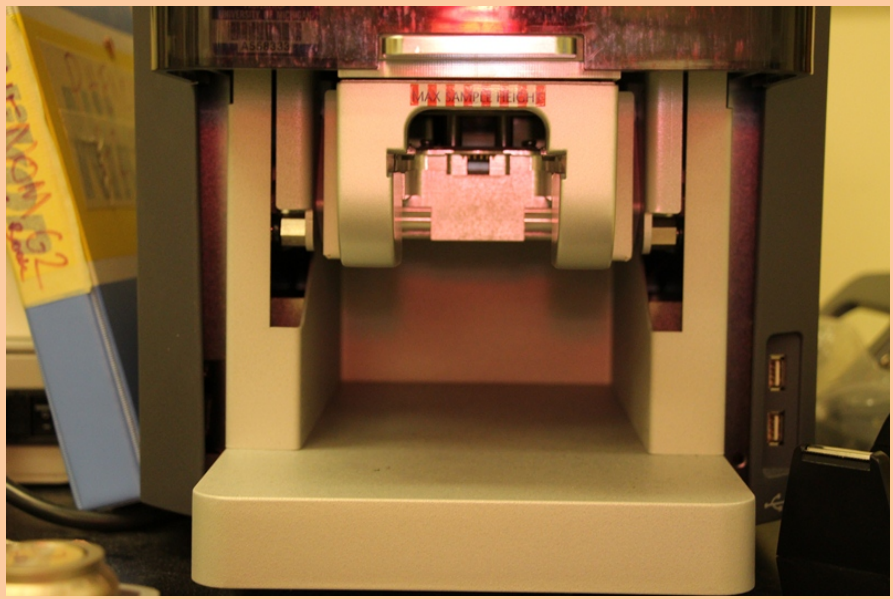


Carbon tabs, carbon paste and copper tape are available to attach samples to stub and to provide a conductive pathway out of specimen.

**TIP:**

For mounted samples, if looking at the edge of the sample either use conductive mounting material or lightly sputter coat to reduce image distortion and charge buildup in the nonconductive mounting material.

Slide the door up to reveal sample holder and insert desired holder with sample

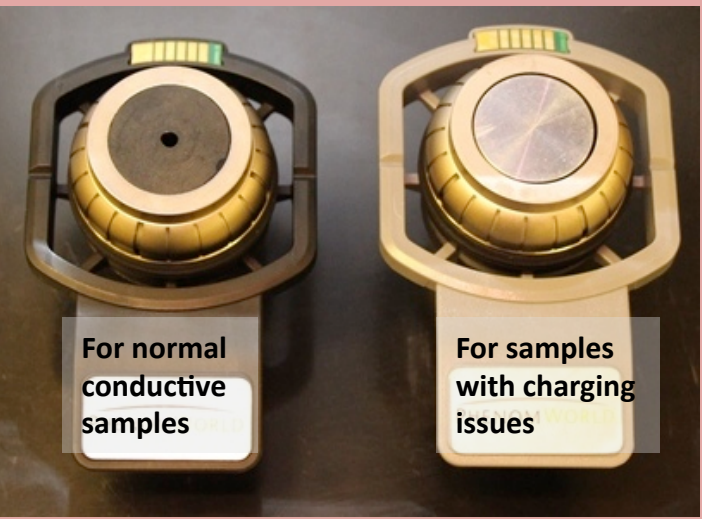


Make certain to have the sample at appropriate height for imaging, data collection and to prevent damage to the SEM's center column:

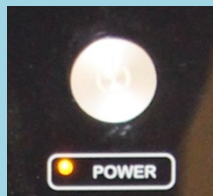
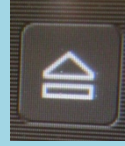
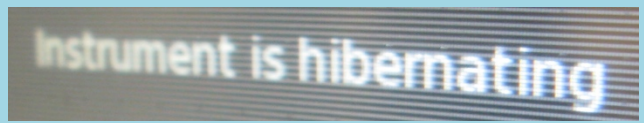
- Position at 2mm (**4 notches**) for most applications
- Further away to achieve a very low magnification image and greater depth of field (furthest is 12mm)

Samples must be less than 1 inch in diameter to fit in holder

Two types of sample holders:



Tip: The SEM goes into hibernation mode when not in use for more than 72 hours. Before preparing specimen, wake the SEM from it's hibernation mode by pressing the Power button



Or by pressing the eject button in the software

This process takes approximately 5 minutes. After initial wakeup, process should take approximately 30 seconds to install new samples and be in SEM mode

After inserting a sample, imaging goes into and depending on working distance(WD), optical mode for imaging less than 400x magnification
- SEM mode is greater than 100 - 400x (depending on WD)

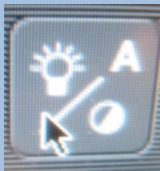
Adjust contrast/brightness, focus in optical imaging to help initial focus when going to SEM mode

- If focus is at minimum or maximum, remove sample and lower specimen further to prevent damage to SEM column and to allow focusing in SEM mode

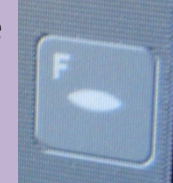
To make any adjustments manually, either the mouse, or scroll knob can be used. The screen is touch sensitive as well. (for touch screen calibration please see MSE tech staff)



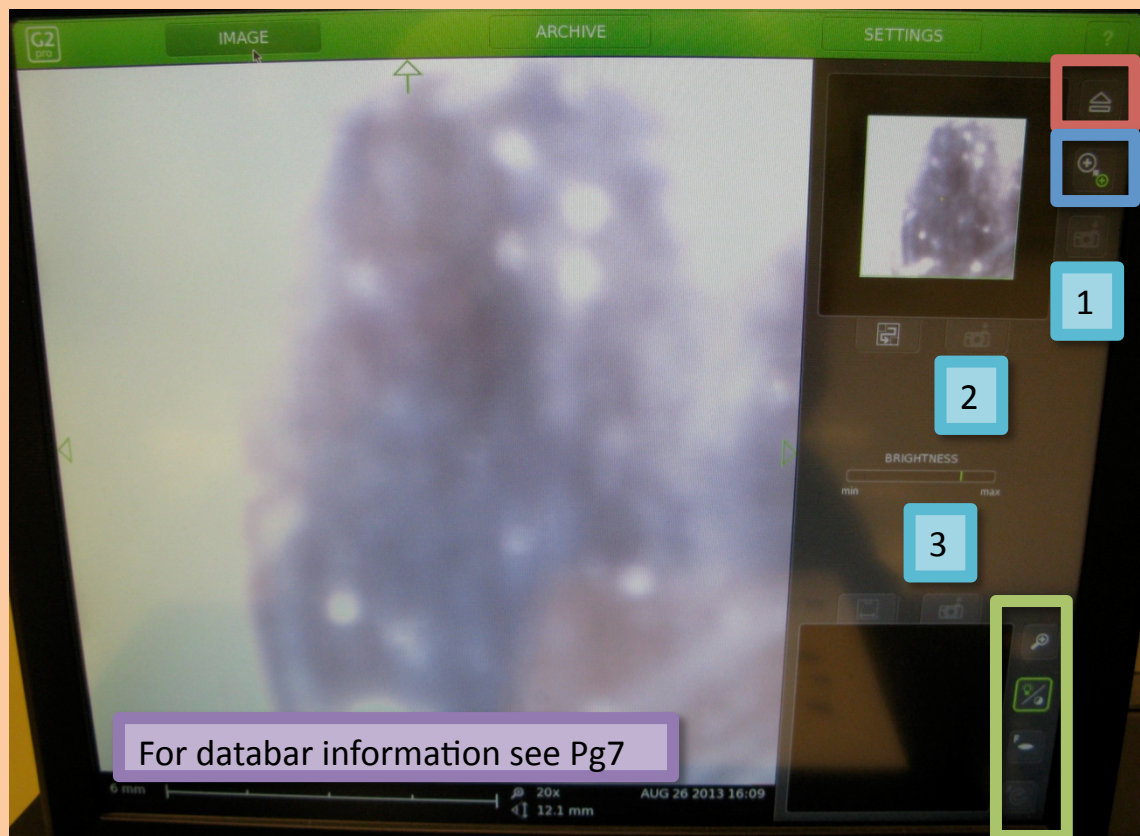
Auto adjustments can be turned on or off, for certain items, by touching and holding the focus or contrast/brightness symbol (whichever is desired) until the “A” symbol appears. Then retouch the button for the auto adjustment.



Fine adjustments can be turned on or off, for certain items, by tapping the magnification, focus or rotation symbol (whichever is desired) the “F” symbol appears. Repeat the process to turn back to coarse controls.



Overview image



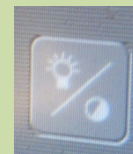
Magnification

- Coarse or
- Fine (F) adjustment



Contrast/Brightness

- Manual or
- Automatic (A)



Focus

- Coarse or
- Fine (F) adjustment

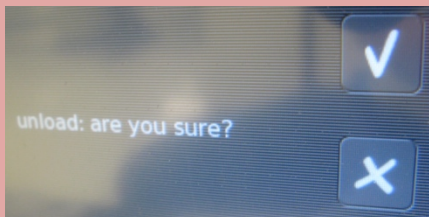
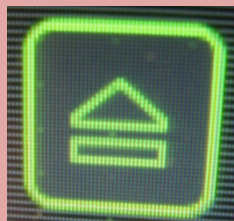


Image Rotation

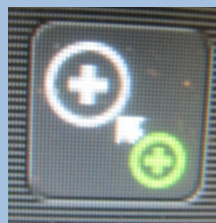
- Coarse or
- Fine adjustment



To eject sample



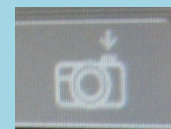
Go from optical to SEM mode



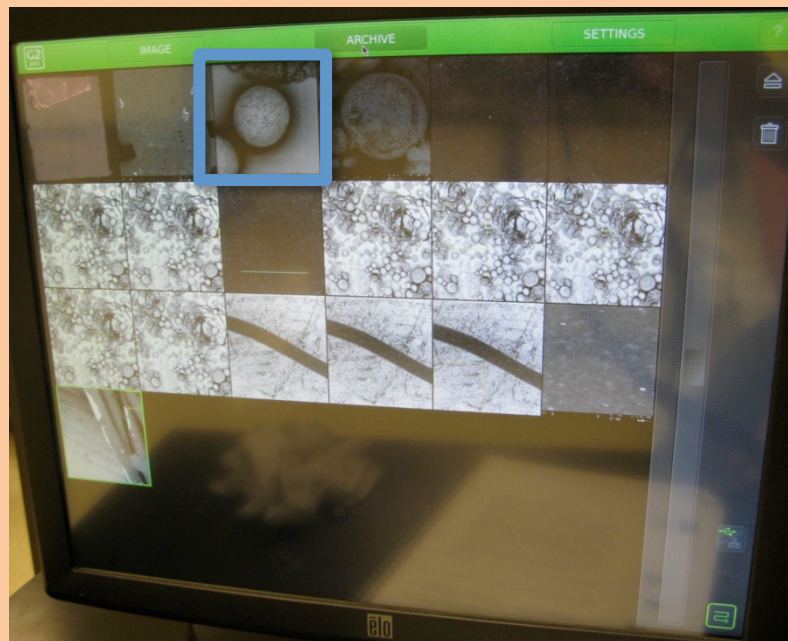
Capture an image

Appears in 3 locations and image type:

1. Image of full frame SEM or optical
2. Overview of optical
3. Overview of SEM mode (need to press the overview button first)



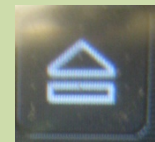
Overview



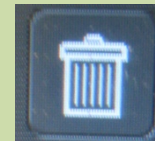
Double tap an image to enlarge it



Eject



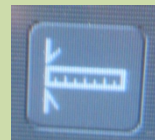
Delete File



Pin image to compare images, then use rotary to switch images



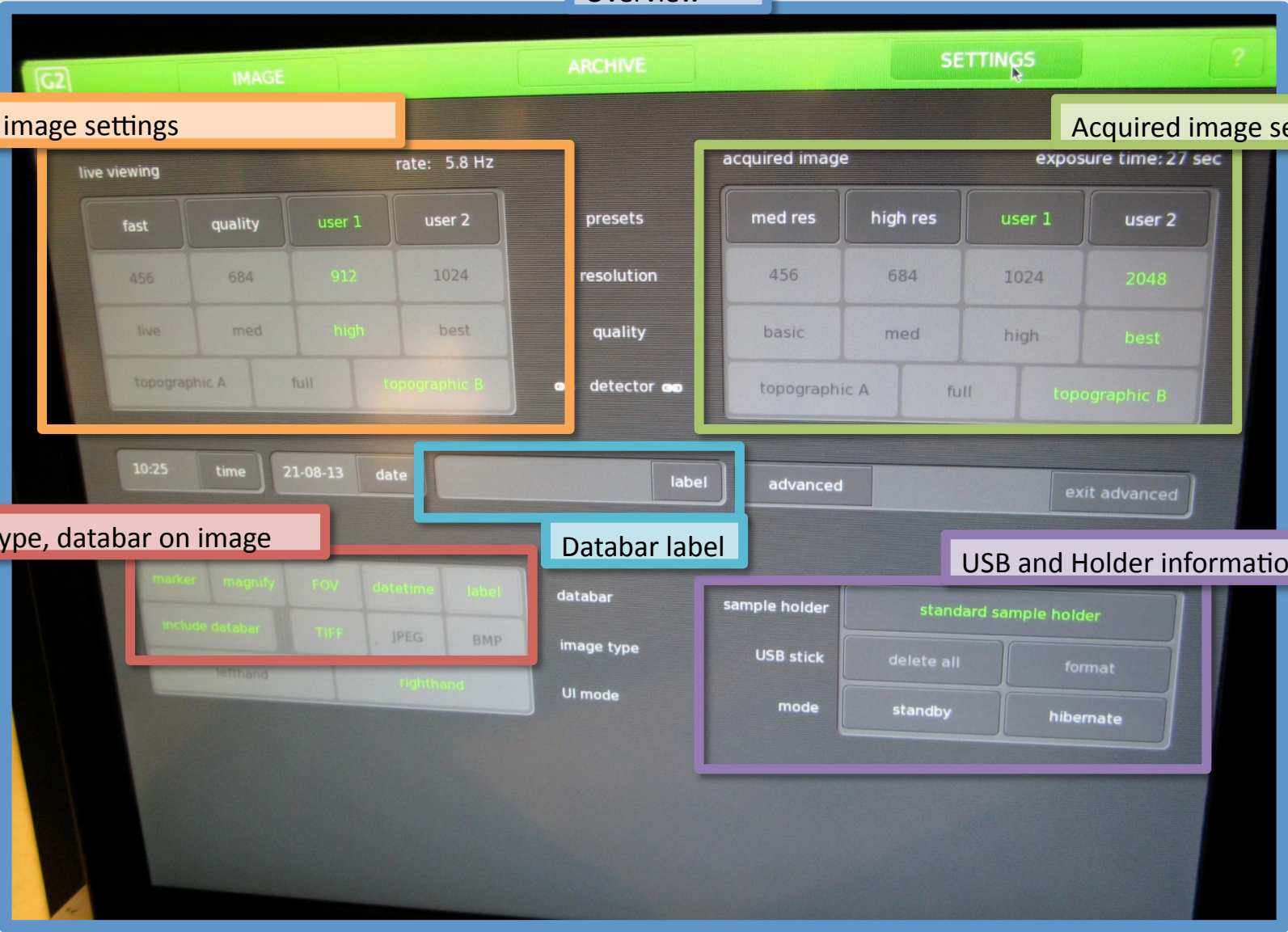
Take measurements on screen



Save any changes to a new file



6. **TIP:** There are alternative directions for saving an image found in the SOP for the EDAX software.



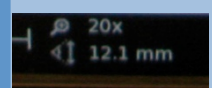
Live image settings

Acquired image settings

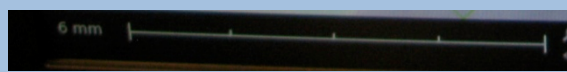
File type, databar on image

Databar label

USB and Holder information



Shows height viewable in entire image and magnification

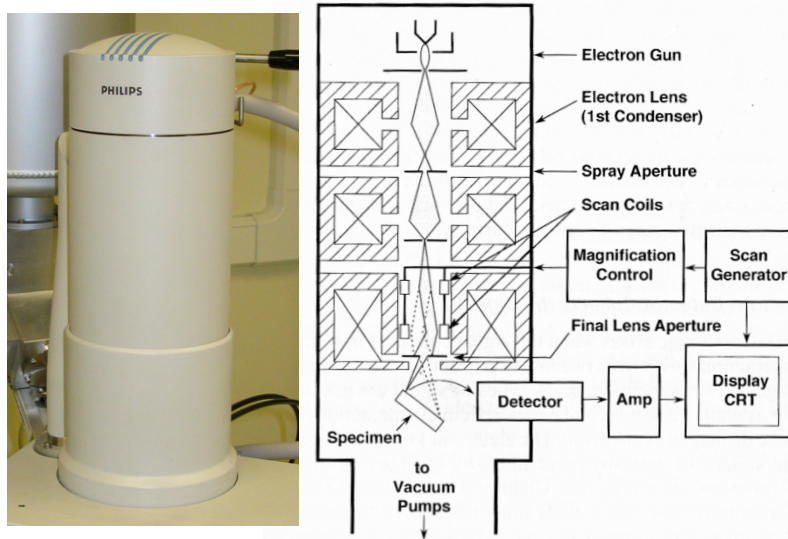


Shows scale bar

Databar details

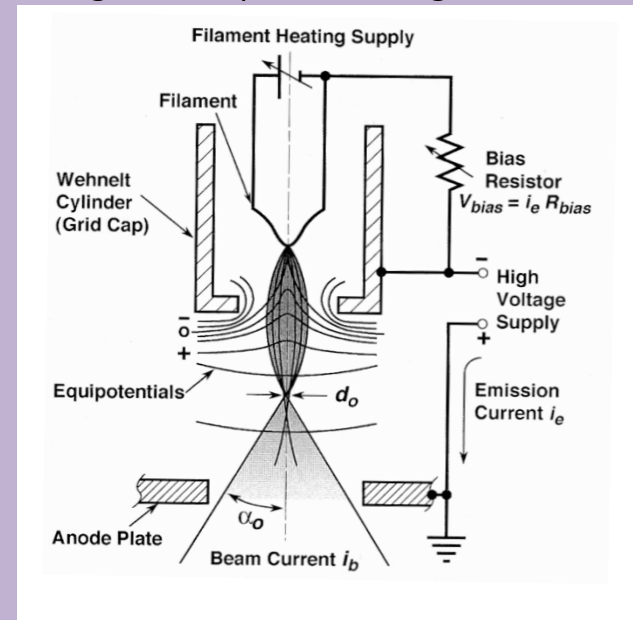
1. **JEOL's Introductory Guide to the SEM** provided to us by EMAL can be found on the online SOP for the XL30 SEM and in the logbook next to the unit

3. Schematic of SEM electron column*:

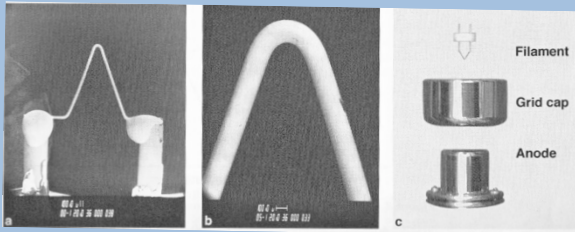


2. A more comprehensive study of the SEM and EDAX analysis can be found in the text book, ***"Scanning Electron Microscopy and X-Ray Microanalysis"** by Goldstein, Newbury, Joy, Lyman, Echlin, Lifshin, Sawyer and Michael. This book can be found in 2224B, Justin Scanlon's office.

4. Schematic diagram of the conventional self-biased thermionic tungsten hairpin electron gun*:



5. Image showing tungsten hairpin. The electron source is 30-100 microns*.



6. **TIP: Practice makes perfect.** The more usage of the SEM you take advantage of, the more comfortable with the controls and you will be able to get the desired images.