



# Transmission Electron Microscope

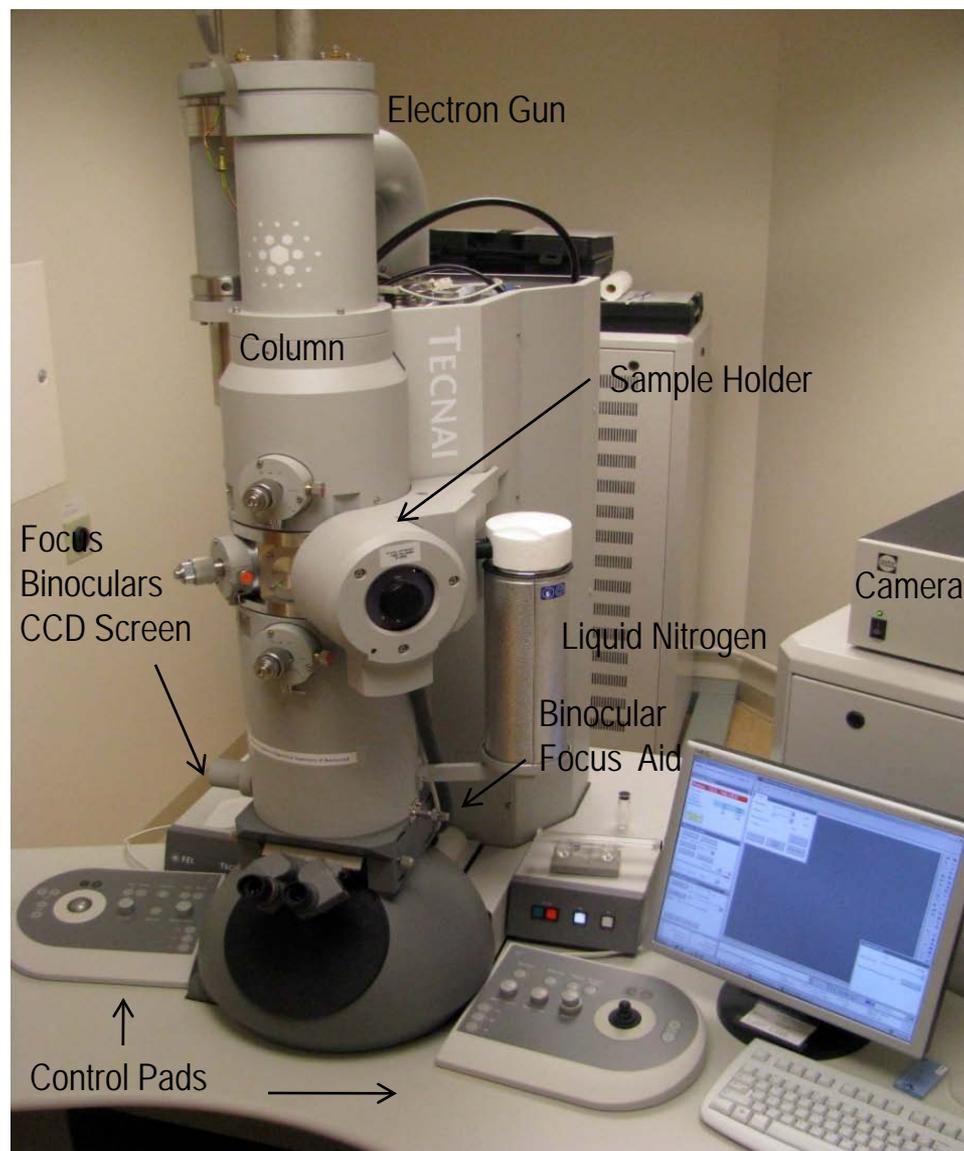
(FEI Tecnai G<sup>2</sup> Spirit)

September 2010

## FEI Tecnai G<sup>2</sup> Spirit

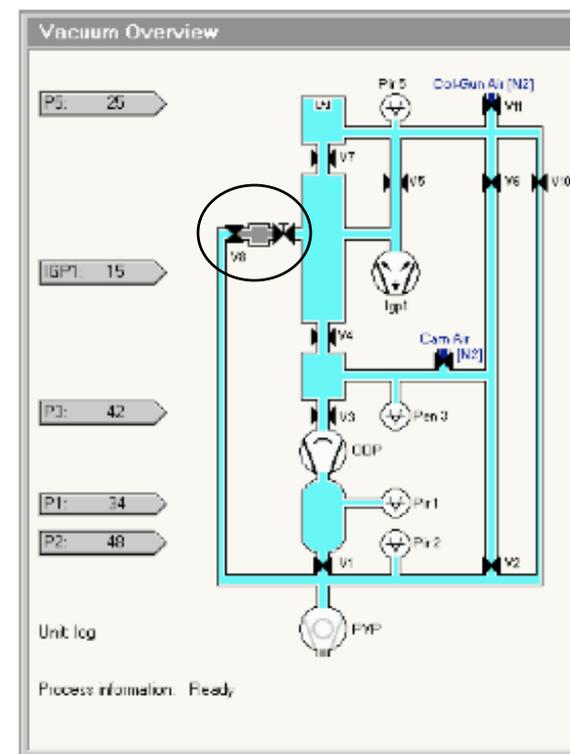
Only **8-hour** and **24-hour** access are permitted to the facility after approval from NRF staff.

No magnetic samples; for inquiries contact [wendtk@seas.wustl.edu](mailto:wendtk@seas.wustl.edu)



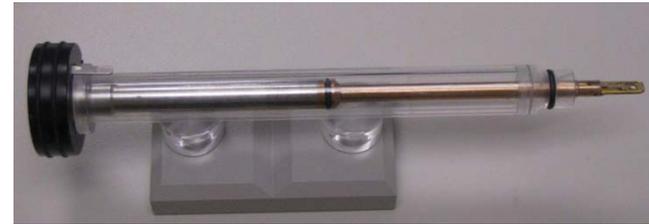
## Remove the Holder

1. Check liquid N<sub>2</sub> levels (should be at least half full). Top off with liquid N<sub>2</sub> if necessary.
2. Open **Vacuum Overview** from popup menu on lower right.
3. With gloved hands, press fingers against the purple plate and pull sample holder straight out until it stops. Turn the holder clockwise until it stops. Let go of the holder.
4. Double check **Vacuum Overview** to confirm V8 is closed.
5. Using fingers as support against purple plate, carefully pull the holder straight out of the chamber.



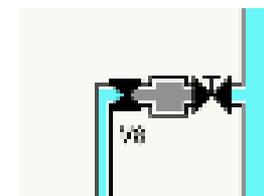
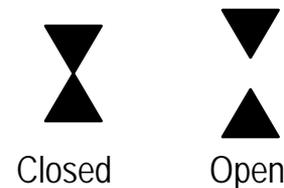
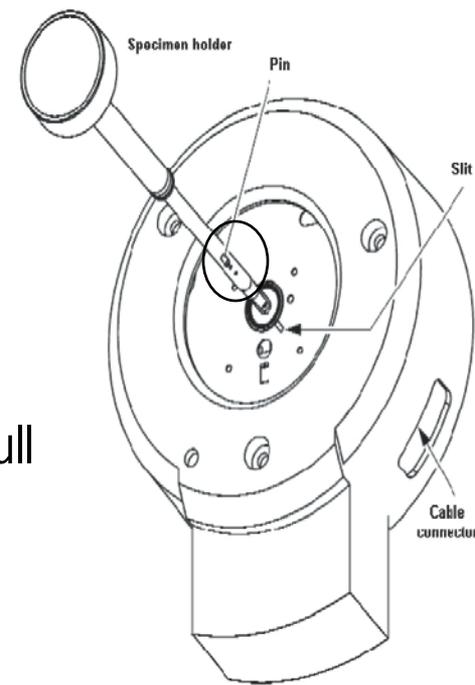
## Load the Sample

1. Place sample holder in the plastic holder.
2. Use small pin to lift the ring and place your sample in the groove.
3. Use the pin to lower the ring over the sample.
4. Secure with tweezers.
5. Turn sample holder upside down with sample inside and tap to confirm sample is secure.



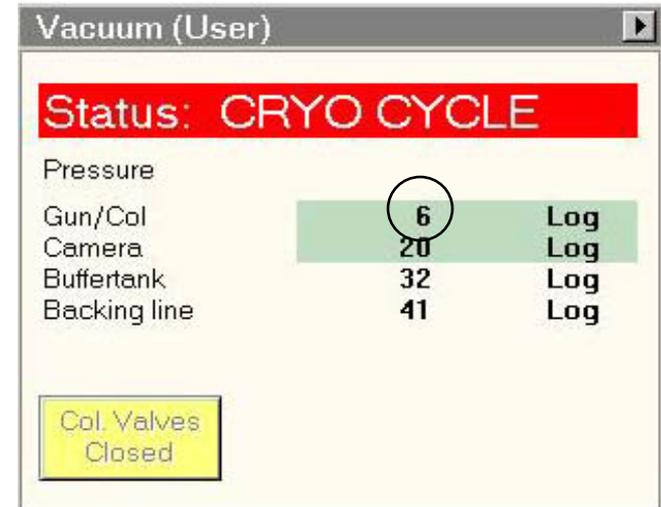
## Replace the Sample Holder

1. Line up the holder so that the pin is at the 3 o'clock position.
2. Guide it into the chamber, and rotate clockwise to ~4 o'clock position, then push in.
3. If you cannot find the notch, continue rotating clockwise in a full circle until you do.
4. Confirm that the holder is seated; you should not be able to move the sample holder clockwise.
5. Wait for V8 to open and close (30 s interval)
6. Turn counterclockwise 90° and slowly guide sample holder into place. Suction created by the vacuum will pull you in.
7. Confirm that the holder is seated and press firmly.



## Turn on Beam

1. Check Gun/Col pressure is below 15.
2. Check camera is  $-25^{\circ}\text{C}$  (Above microscope, on box to the right).
3. Double check vacuum status.
4. Turn on the background light for the control pads, if necessary. Popup  $\rightarrow$  Control Pads  $\rightarrow$  Fluorescent
5. Turn on filament. Setup  $\rightarrow$  Autogun  $\rightarrow$  Light Wait for vacuum status to be green and read: ready. Confirm beam with magnification, intensity, or moving the stage.

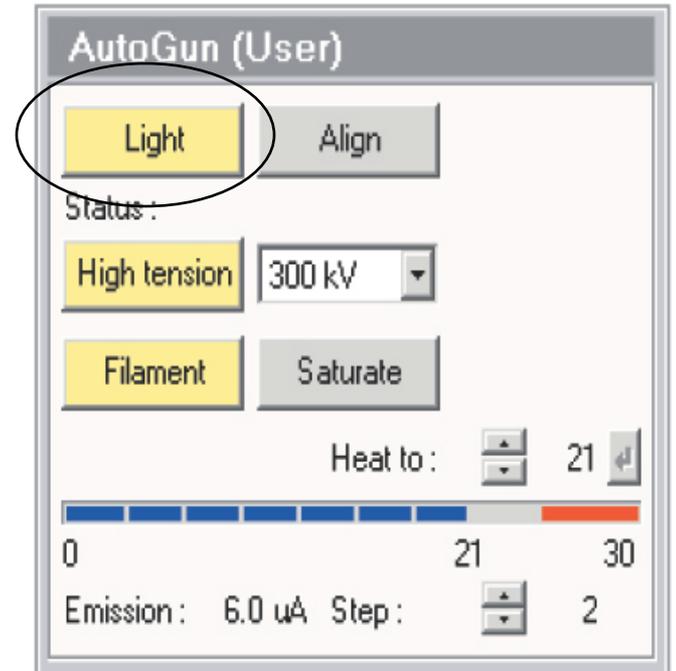


**Vacuum (User)**

**Status: CRYO CYCLE**

Pressure		
Gun/Col	6	Log
Camera	20	Log
Buffertank	32	Log
Backing line	41	Log

Col. Valves Closed



**AutoGun (User)**

Light Align

Status:

High tension 300 kV

Filament Saturate

Heat to: 21

0 21 30

Emission: 6.0 uA Step: 2

## Moving Around

**Joystick:** moves the stage

**Trackball:** centers the beam

**Intensity:** adjusts brightness/how concentrated the beam is and controls exposure times. The most concentrated point is called crossover. Exposure time should be lengthened by adjusting intensity to the right, i.e. the right side of crossover. Use +/- to control intensity step size.



Trackball, Intensity, L1-L3



Joystick, Magnification, Focus, R1-R3

SA 2400 x		TECNAI G <sup>2</sup>		Workspace Layout	
SA 2400 x	HT: 120 kV	Exp time XXX	X	116.27 μm	Defocus: -33.42 μm
TEM Bright field	Spot size: 3	Focus step: 2	Y	-83.58 μm	A -0.02 deg
			Z	10.55 μm	B 0.00 deg

## Eucentric Height

1. Center an area you would like to image

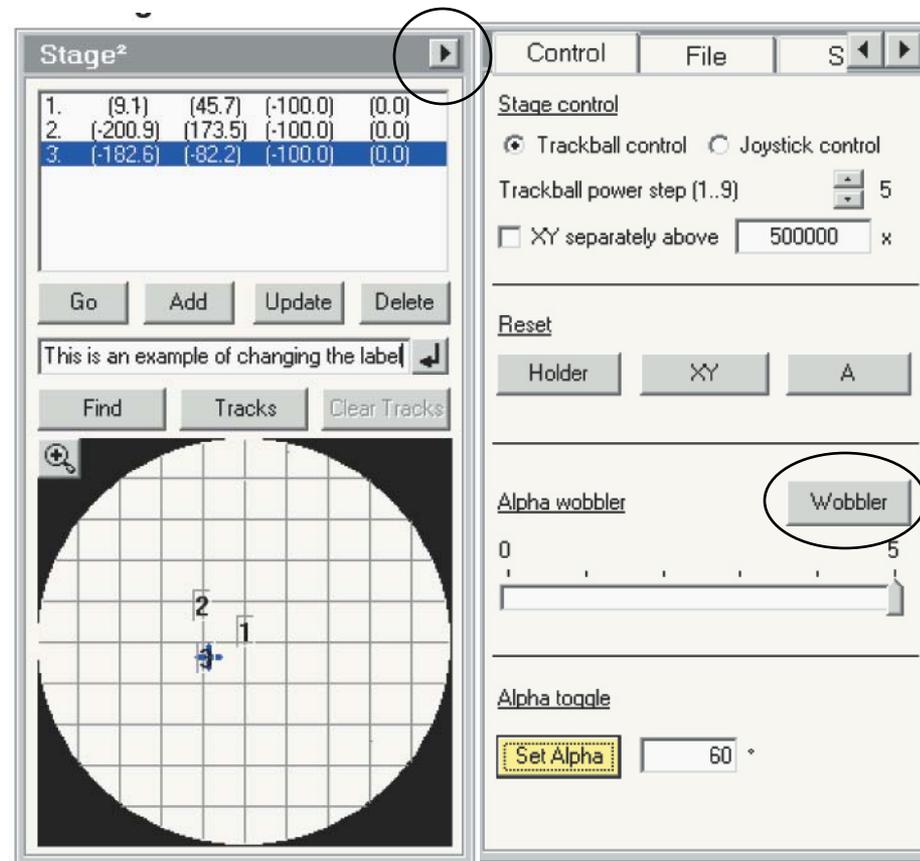
2. Set Magnification to 9,700 SA and place a particle in the center of the screen

3. Turn on the **Wobbler** by pressing R2 or:

Search → Stage (flap out with arrow) → **Wobbler**.

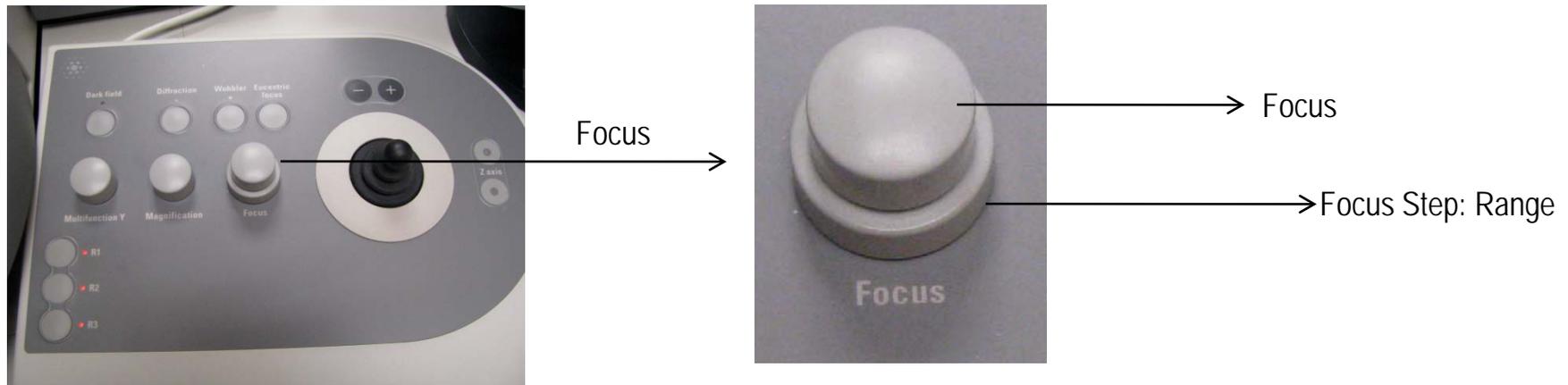
4. Adjust Z using the buttons on the far right hand side of the control pads until there is no side to side motion.

5. Press **Wobbler** again to turn it off.



## Focus on your Sample

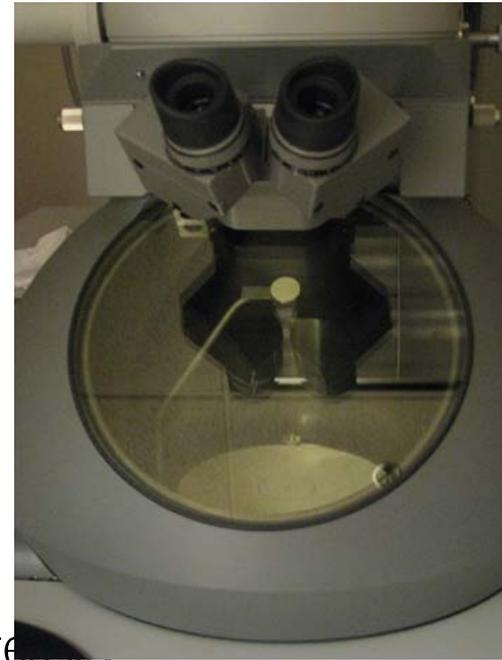
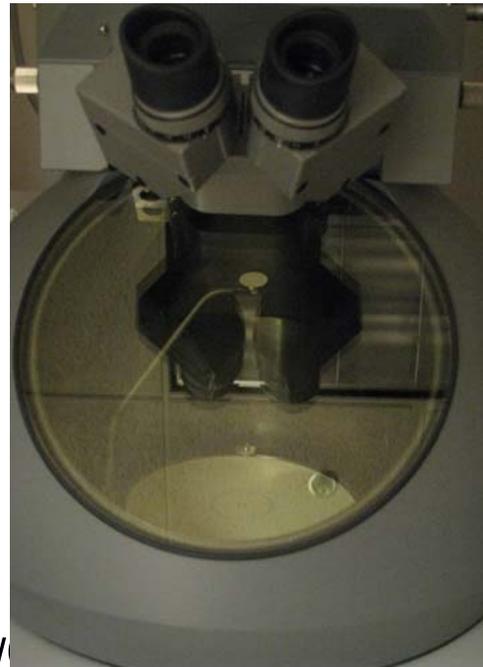
**Magnification** and **focus** knobs are on the right control pad. The bottom half of the focus knob changes the step size (see bottom of screen). 4-6 is good for rough focusing and 2-3 is good for fine focusing.



SA 2400 x		TECNAI G <sup>2</sup>		Workspace Layout	
TEM Bright field	HT: 120 kV	Exp time: XXX	X	116.27 μm	Defocus: -33.42 μm
	Spot size: 3	Focus step: 2	Y	-83.58 μm	A -0.02 deg
			Z	10.55 μm	B 0.00 deg

## Focus on your Sample

You can bring up a small screen with the lever on the left side of the chamber to aid in focusing. Binocular focus aid on right.



←  
Binocular  
Focus  
Aid (Turn  
toward you  
and push in  
to release)

you may need to recenter your image if the intensity is too low.

## Using the Camera

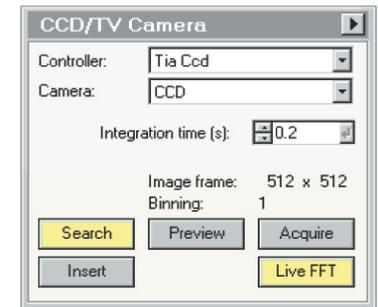
1. Spread beam clockwise from crossover with **Intensity** on left control panel, so illumination is low. Exposure time 2-3 sec
2. Lift the screen with **R1**. Either turn off all lights in room or cover the viewing chamber first to avoid stray light hitting the CCD under the screen.

3. Click on one of three buttons under Camera → CCD:

**Search:** low res, fast response, live → find sample, rough focus

**Preview:** higher res, slow response, live → fine focus

**Acquire:** high res, static → capture image



4. Right click on the image and select "Export Data". The best format to save in is "PC TIFF w/scale bar."

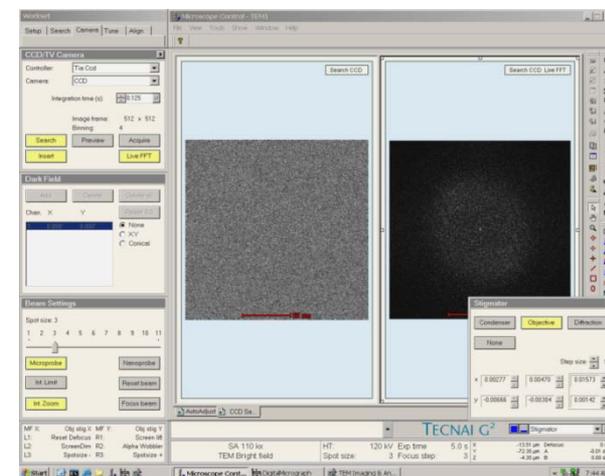
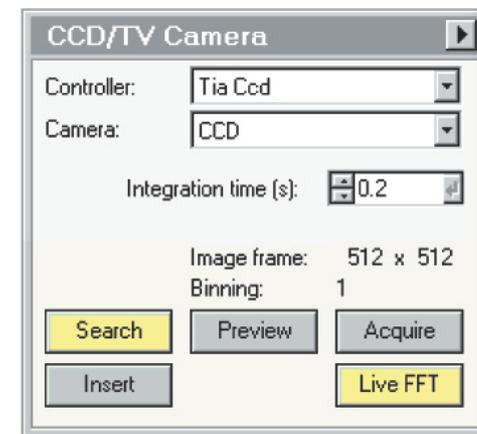
**IMPORTANT:** Do not make large changes in magnification with the screen up! Put the screen down with R1. Make sure none of three modes are yellow, i.e. the camera is not active. Clicking on them again will turn them off if they are yellow.

## End of Session/Exchange Sample

1. Check  $A=0$  (0.01 is ok) in the bottom right of the screen. If not go to **Search** → **Stage** (flap out tab with small arrow) → **Reset A**. (This ensures the holder is not tilted when you remove it).
2. **Check screen is down.**  
Go to a low magnification (~2400x).
3. Click **Search** → **Stage** (flap out menu with arrow) and **Reset Holder**
4. Press: **Setup** → **Autogun** → **Light** and wait for the button to turn grey. This closes the column valves and turns off the filament.  
Remove your sample and replace holder (see instructions for holder removal).

## Objective Aperture Stigmatism

1. Copy current stigmatism to another window.
2. Choose an amorphous region. Select "Preview"
3. Press "Live FFT" on Camera tab and take image out of focus so you see a cloud.
4. Press the stigmator button on the left control pad.
5. Objective should be highlighted.
6. Adjust the MF X and Y knobs until the cloud in the center is a circle, not an ellipse. Press "Live FFT" again. Turn off stigmator.



## Last User of the Day: Run Cryo

1. Turn off the High Tension by pressing the button under **Setup** → Autogun. It should be grey when off.
2. Remove the liquid N<sub>2</sub> holder and put some paper towels under the wires. Dump the remaining liquid N<sub>2</sub> into the styrofoam cooler – never back into the dewer.
3. Click **Setup** → Vacuum (press triangle to show tab) → Cryo → Cryocycle to start the 4 hour cryo cycle.