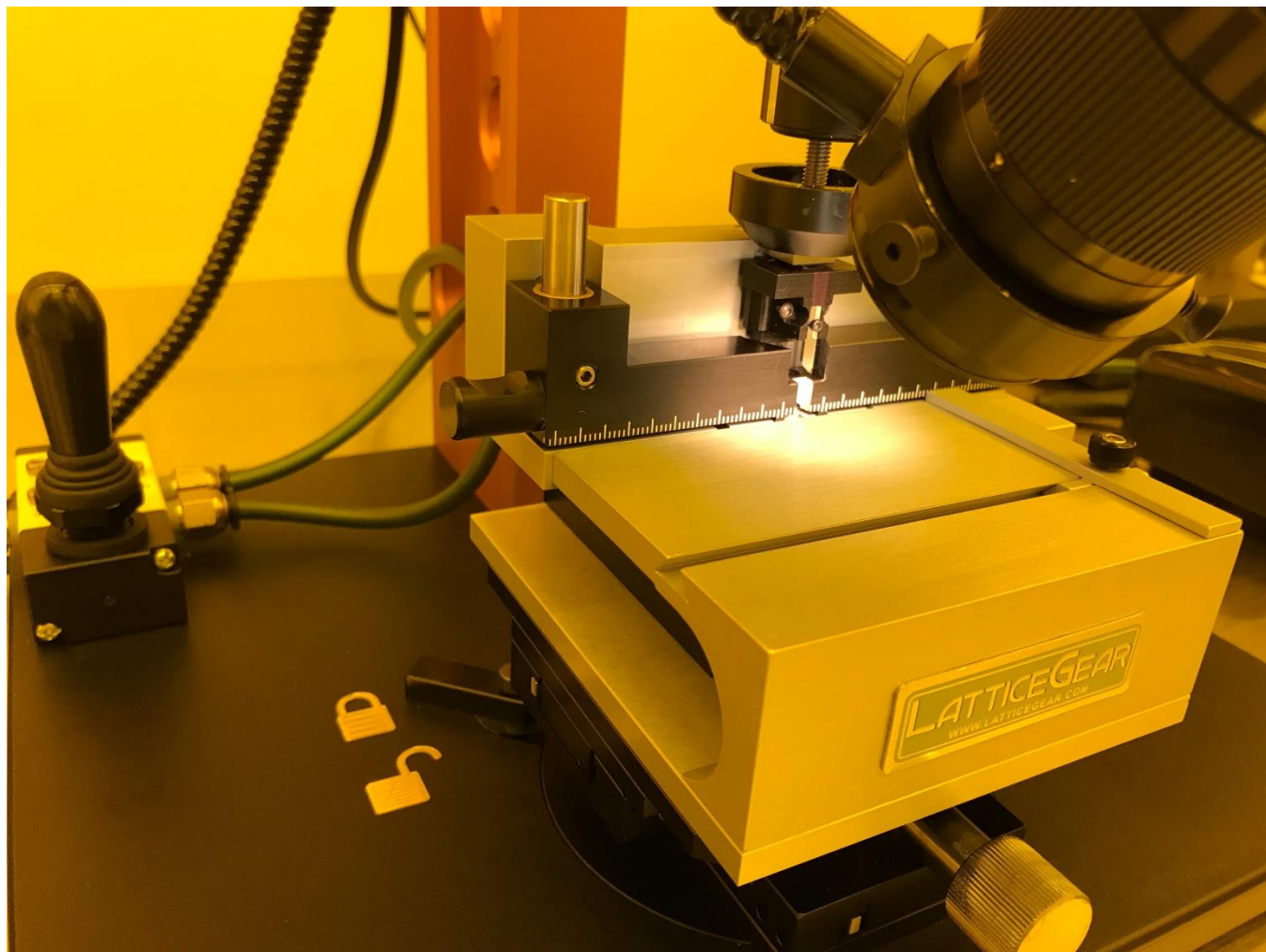
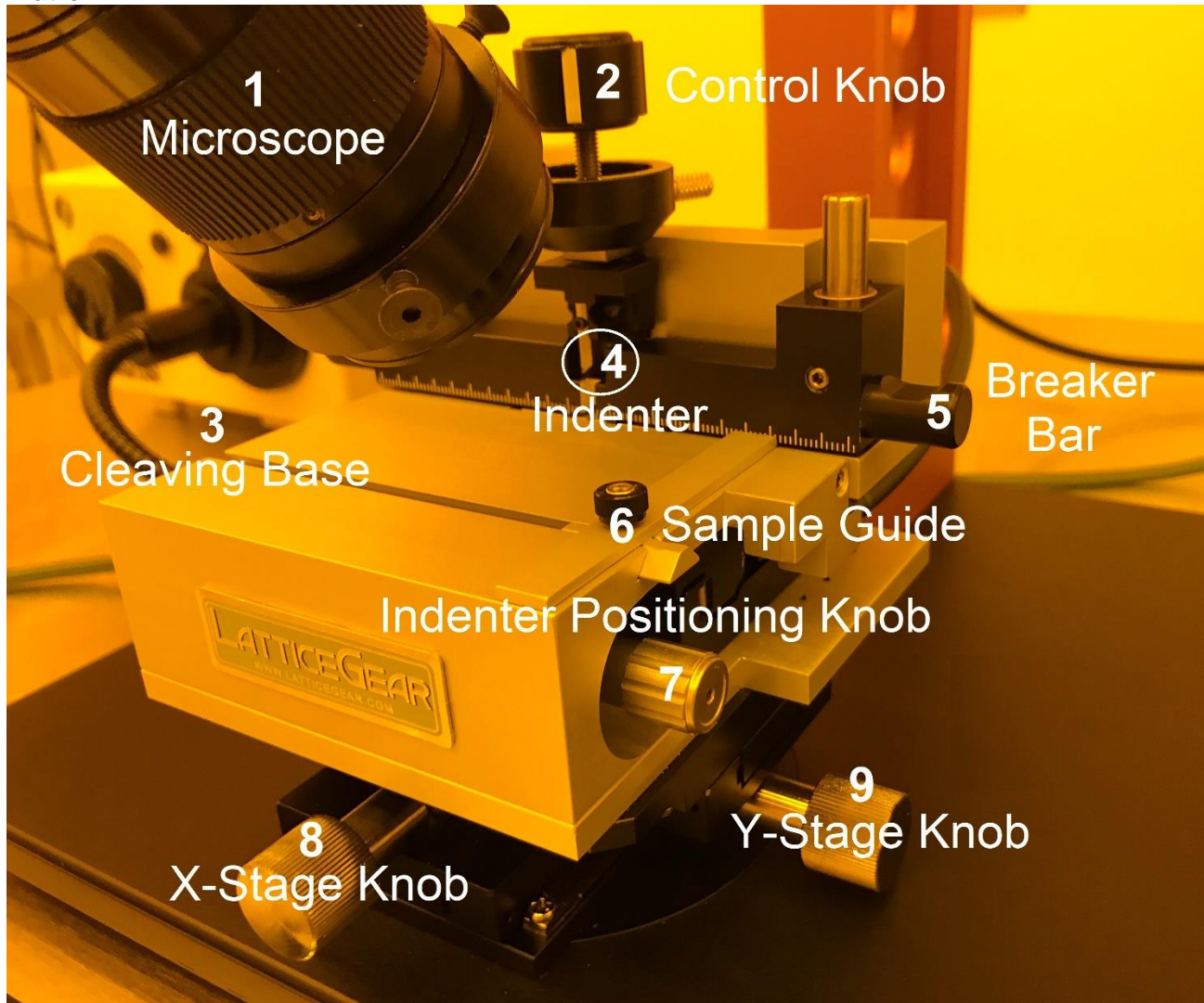


# STANDARD OPERATING PROCEDURE FOR LATTICEAX 420 CLEAVING SYSTEM



## OVERVIEW

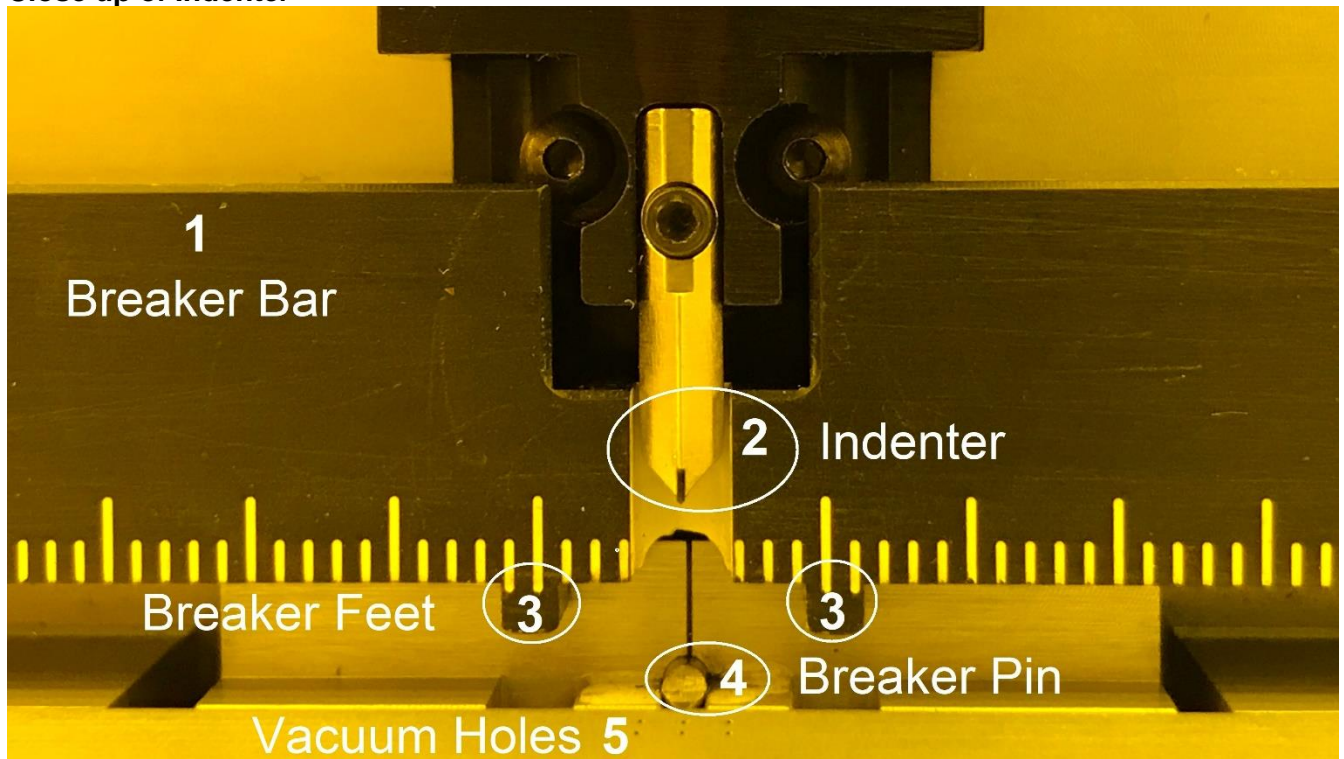
### Platform



1. **Microscope:** The Microscope has 4 $\mu$ m resolution
2. **Control Knob:** The Control Knob is turned clockwise to lower Diamond Tip for indentation.
3. **Cleaving Base (Stage):** Sample is placed on Cleaving Base for indentation and cleaving.
4. **Indenter:** The Indenter is a diamond tip used to indenting samples.
5. **Breaker Bar:** The Breaker Bar can raise to place sample in 'Cleave' position.
6. **Sample Guide:** Turn the Sample Guide clockwise to lock position.
7. **Indenter Position Knob:** Indenter Positioning Knob moves the Breaker Bar and Diamond Tip.
8. **X-Stage Knob:** X-Stage Knob moves Cleaving Base left or right relative to the user.
9. **Y-Stage Knob:** Y-Stage Knob moves Cleaving Base towards or away from the user.



### Close up of Indenter



1. The Breaker Bar is lifted in this image.
2. Close up of the diamond tip Indenter.
3. **Breaker Feet:** The Beaker Feet is used to break the indented sample.
4. **Breaker Pin:** An indented sample will be in the 'Cleave' position when pushed onto Breaker Pin.
5. **Vacuum Holes:** Vacuum holes are to vacuum sample in place.

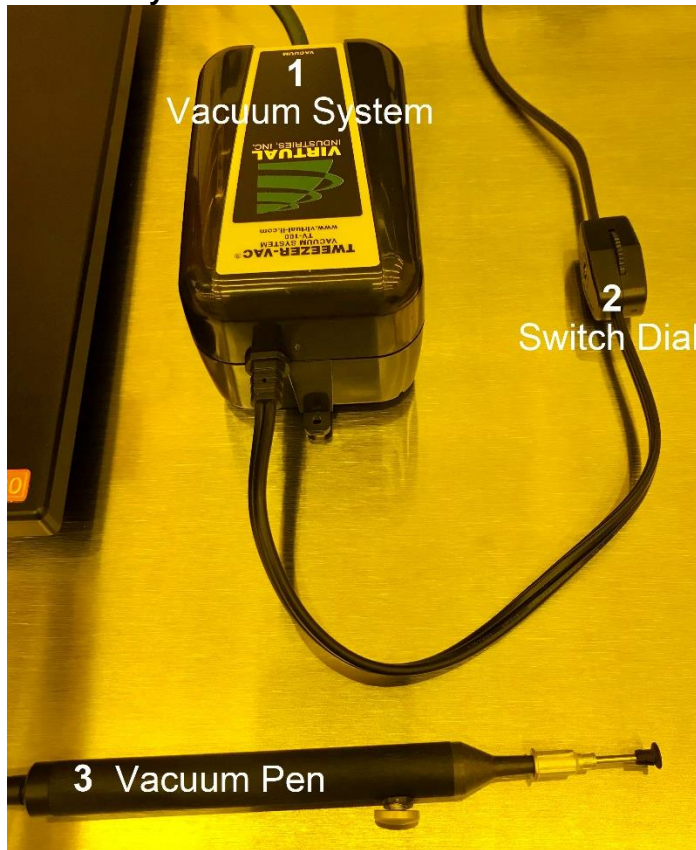
### Microscope



1. **Magnification Dial:** User should begin with lowest magnification for easiest focusing of sample throughout cleaving process.

2. **Focus Dial:** Focus image of the sample by adjusting the bumpy Focus Dial. Use X- and Y- Stage knob to center area of interest.

### Vacuum System



1. **Vacuum System:** The Vacuum System will provide vacuum to either the Vacuum Pen or the 6 Vacuum Holes on the Stage.
2. **Switch Dial:** The Switch Dial is rotated to turn on/off the Vacuum System. The Vacuum system will vibrate while on.
3. **Vacuum Pen:** The Vacuum Pen is used to position or retrieve samples.

### Clock Dial



1. Indent depths are controlled by varying the number of turns of the Indenter Knob. The number of turns is typically less than 1/4 turn or '3 hours.'
2. **Clock Dial:** The Clock Dial is turned independently from the Indenter Knob and is used for referencing the number of turns required to indent a particular sample.
3. **Long 'hour' line:** Each long line on the Clock Dial is considered "1 hour" apart.
4. **20 'minute' line:** Each small line on the Clock Dial is considered "20 minutes" apart.

### PREPARATION

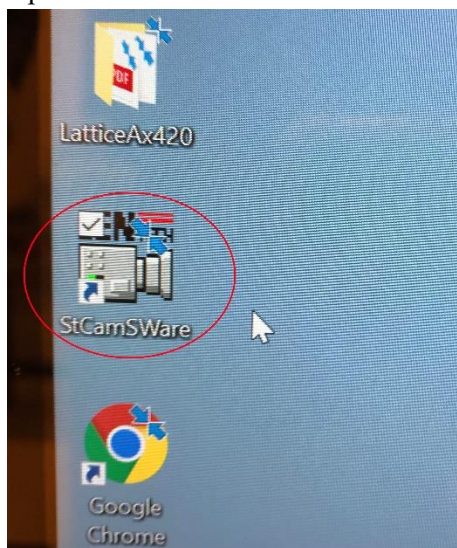
1. Press the power button located on the back of the computer.



2. Press the button on illuminator to power on.

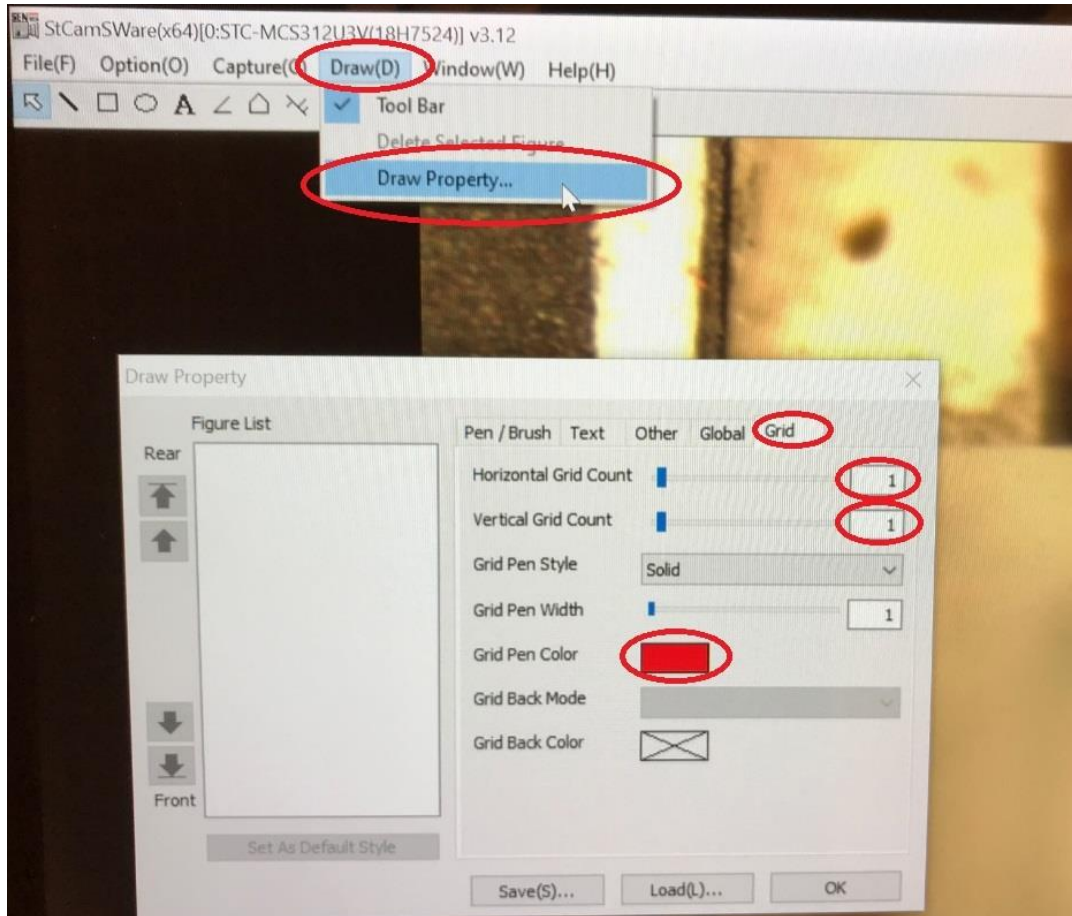


3. Turn on the Intensity dial clock-wise to illuminate sample.
4. Open the 'StCamSWare' software.



5. To display Crosshairs on image, click Draw (D), Draw Properties Dialog. Select Grid Tab and Use the Slider to select 1 for Horizontal Grid Count and 1 for Vertical Grid Count. Select color for Crosshairs.



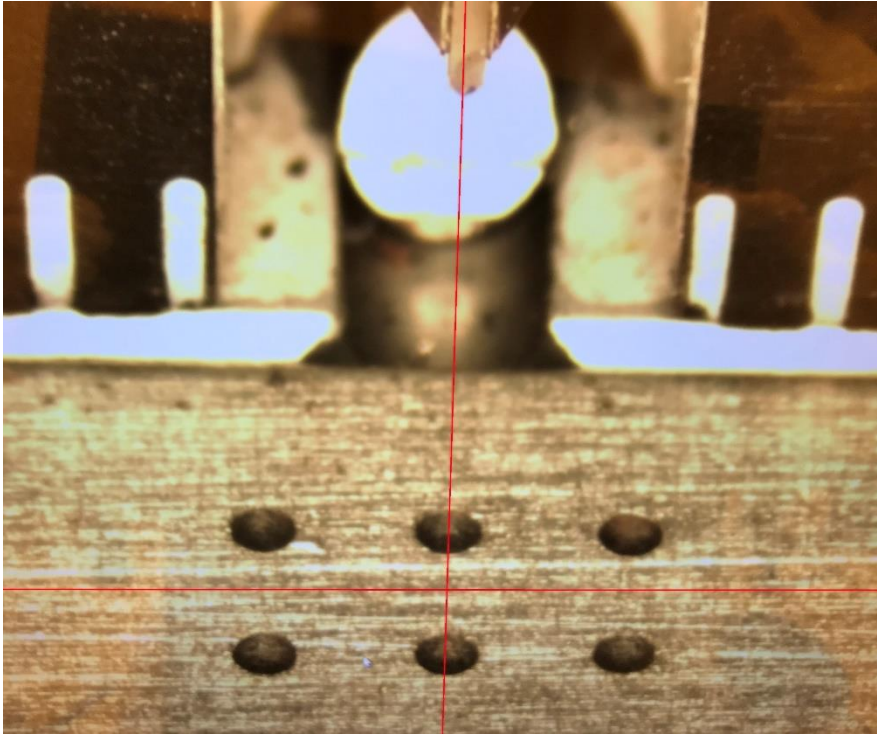


6. Clean the Stage and under Cleaving Bar with compressed air, a brush, or a swab. Isopropanol may be necessary.

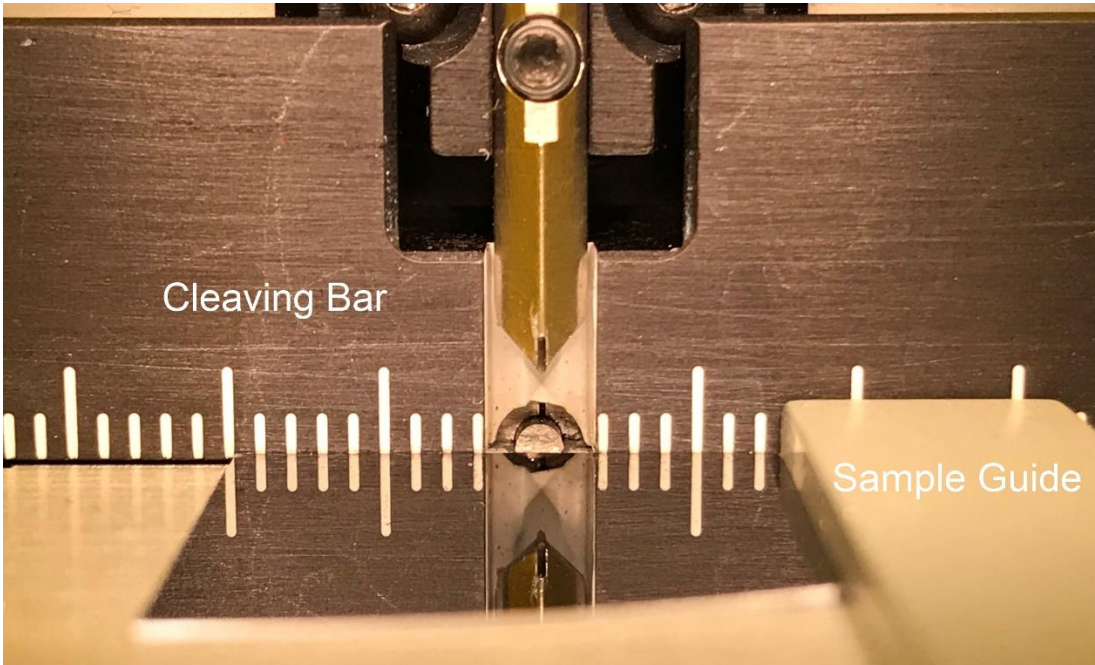
## PROCEDURE

### Positioning

1. Lift the Cleaving Bar Up
2. Use a nitrogen gun or brush to clean the surface.
3. Move Cleaving Bar down.
4. Use X- and Y-Stage Knobs to center the 6 Vacuum Holes on the screen

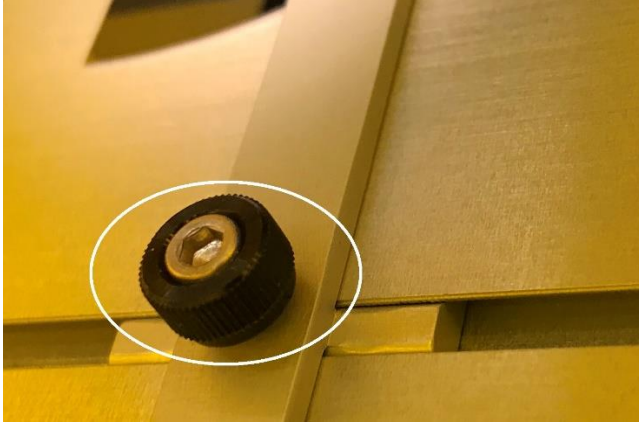


5. Set to the lowest Magnification and use Focus Dial to focus the 6 holes in the center of the image.
6. Manually place the sample on the stage.
7. Position the target in front of the Indenter.
8. Move Sample Guide to the sample and position the sample against the Cleaving Bar and Sample Guide.

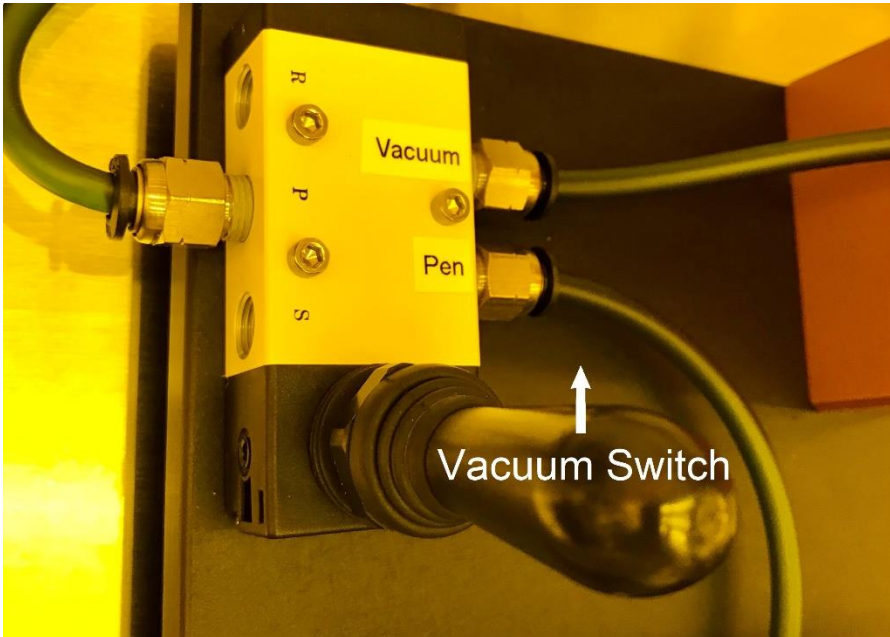


9. Lock the Sample Guide by turning the Sample Guide knob clockwise.





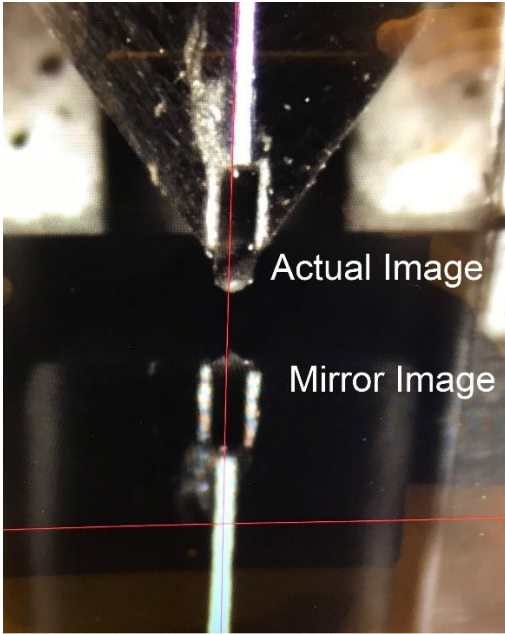
10. Turn the Vacuum Switch to the 'Vacuum' Position



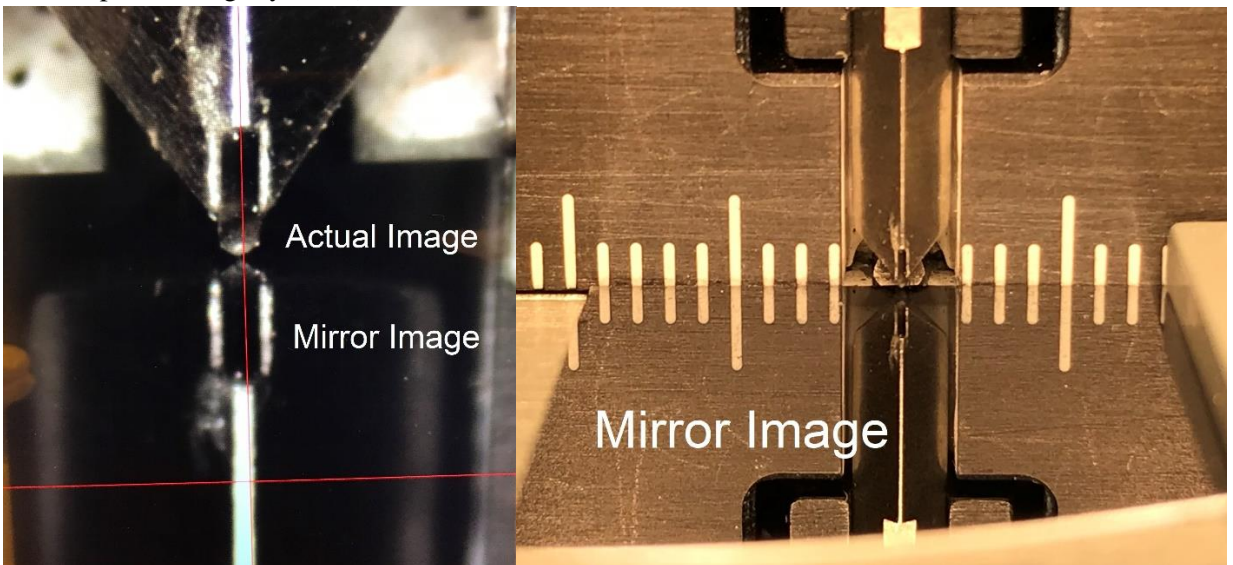
11. The sample is now considered in the 'Indent' position and is ready for indentation.

### **Indenting**

12. Slowly turn the Indenter Knob clockwise to move Indenter tip down.
13. Watch the screen until mirror image is close but not touching actual image.



14. Use Indenter Positioning Knob to align tip to target area for indentation.
15. Continue turning the knob until the indenter barely touches the surface (mirror image meets actual image and sample will slightly move).



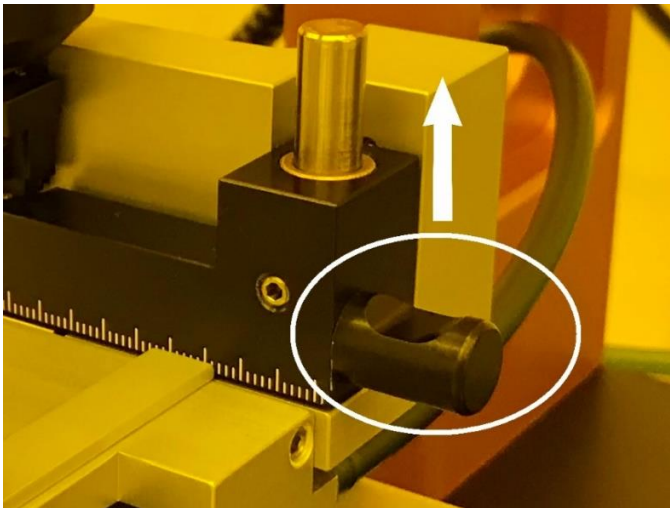
16. Do NOT use Indenter Position Knob when tip touches surface. This action will scratch the surface.
17. For repeatability, unlock the Clock Dial and align to the Long 'hour' line to the Vertical Line on the Indenter Knob.
18. Lock the Clock Dial and use position as a Reference Position.



19. Indent by turning the Indenter Knob clockwise.
20. For repeatability, note number of turns from the Reference Position needed to indent this sample.
21. Turn off Vacuum Switch to 'Pen' position to release sample.
22. Do **NOT** unlock the Sample Guide yet.

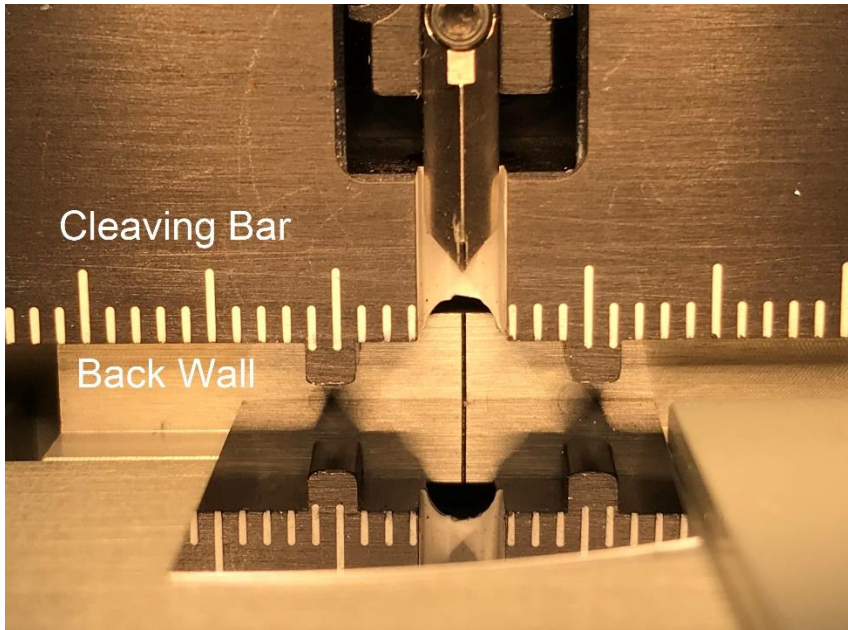
### **Cleaving**

23. Raise the Indenter by turning the Indenter Knob counterclockwise.
24. Manually raise the Cleaving Bar by lifting the two handles found on each side of the Cleaving Bar until the Back Wall Line is visible.
25. Use Y-Stage Knob to move Breaker Pin and Back Wall Line into microscope view.

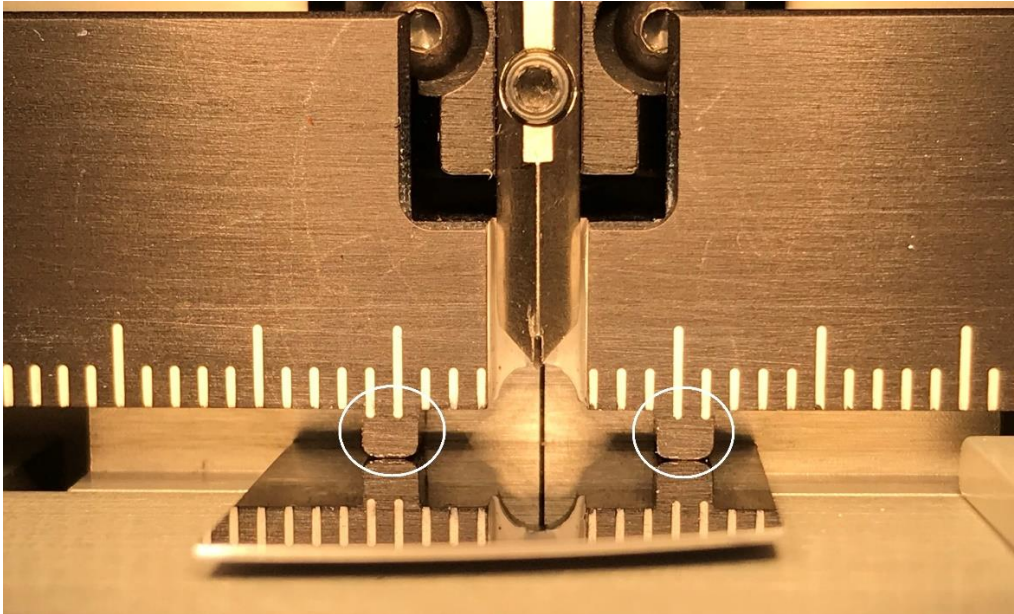


26. Slide sample against the Back Wall and Sample Guide (Sample guide should still be locked). The back end of the sample will sit on top of the Breaker Pin.

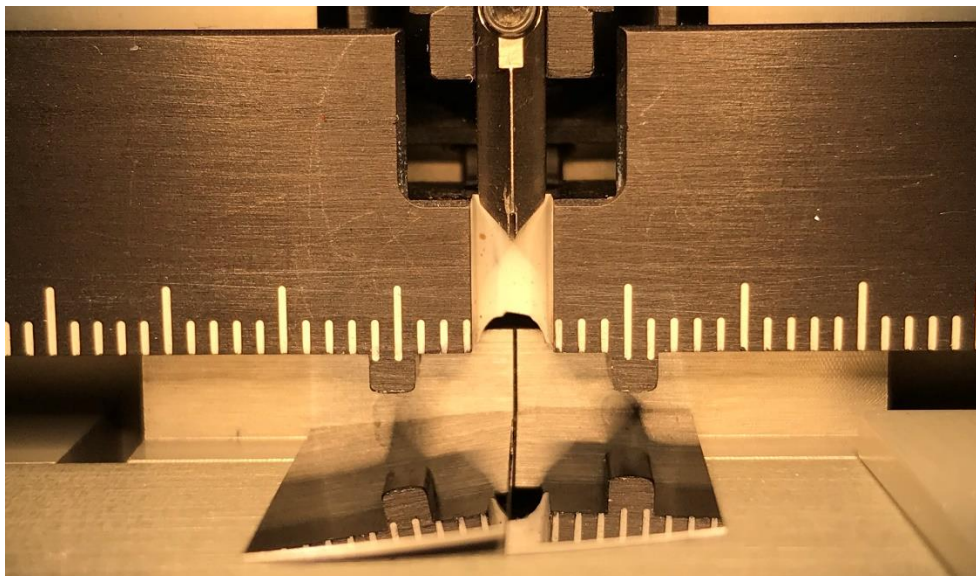




27. Ensure Indenter is perfectly aligned with backwall line.
28. The sample is now considered in the 'Cleave' position.
29. Turn the Indenter Knob to move cleaving bar down until Feet on Breaker Bar are on the sample surface.
30. **STOP** when Feet are on sample surface. Do **NOT** cleave yet.
31. **ONLY NOW** release the Sample Guide and slide guide away from sample.



32. Slowly turn the Indenter Knob to cleave the sample.
33. Raise the Indenter by turning the Indenter Knob counterclockwise.
34. Raise the Breaker Bar.



35. Use Vacuum Pen to remove sample for inspection.

**Power Down**

1. Rotate Illuminator Dial counterclockwise to power down.
2. Press power button to turn off Illuminator.
3. Rotate Vacuum Switch Dial to turn off Vacuum System.
4. Make sure vacuum has no vibration to ensure it is off.
5. Close StCamSWare software.
6. Shut down the computer.

<b>Contributors</b>	<b>Revised Date</b>
Joey Vo	06/11/2021