

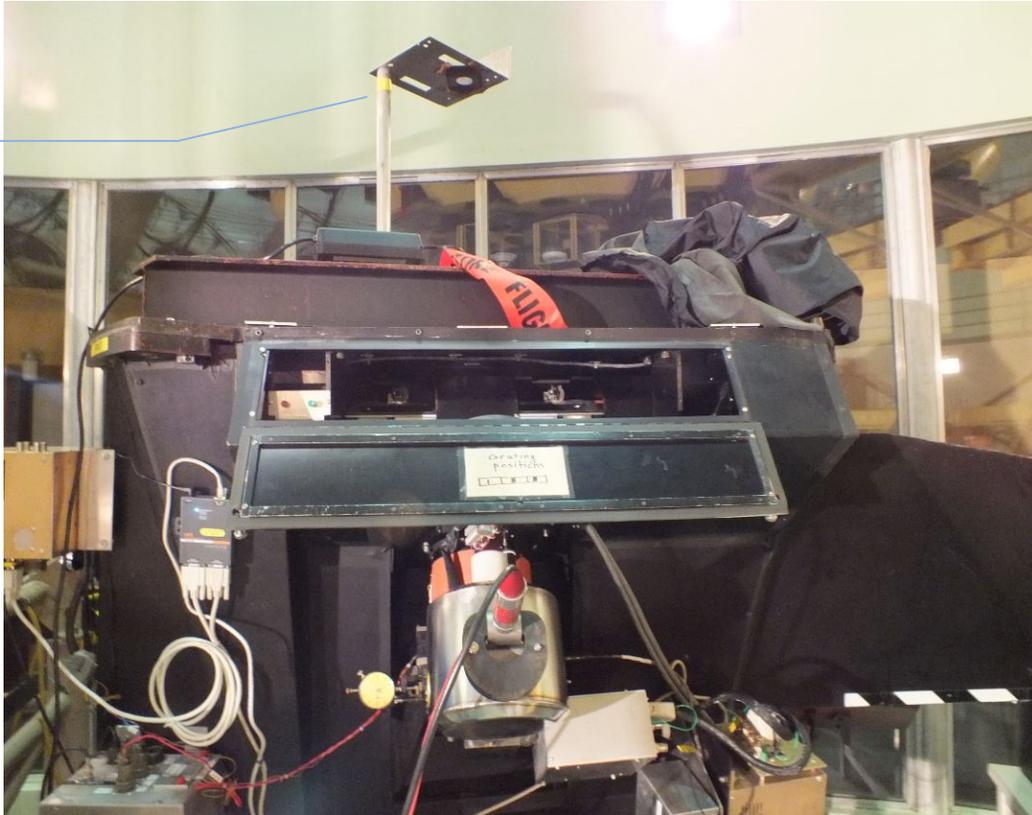
## Mt. Hamilton Optics Cleaning Trip 8/21/13

David Hilyard and Brian DuPraw

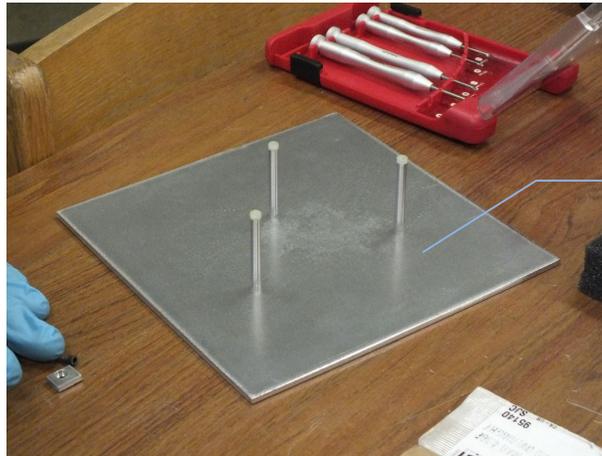
### KAST Gratings Replacement

One of our intended tasks for this trip was to replace two of the KAST camera gratings. We had brought the new ones up with us from Santa Cruz and Ellie had an alignment apparatus ready to go on the dome floor, but upon examination of the grating cells it was found that a special jig was needed to remove and replace the optics. So instead the old gratings were covered and bubble-wrapped and brought back down with us after the rest of the day's optics cleaning was done.

Grating  
alignment  
apparatus

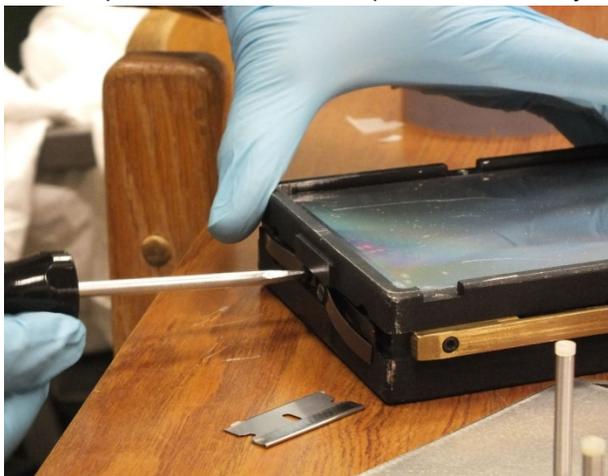


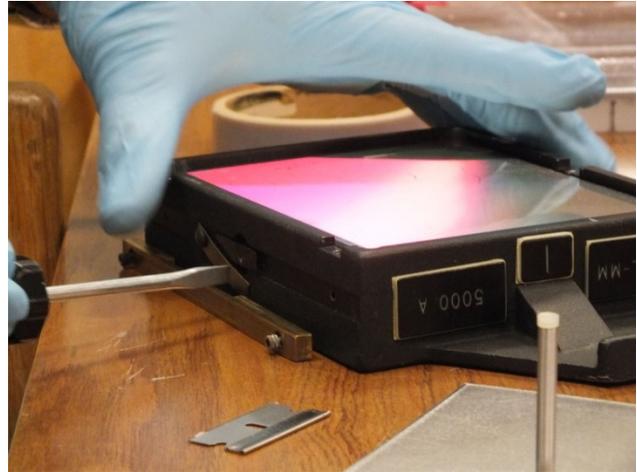
The photos below were taken in Santa Cruz, the day after the Mt. Hamilton trip, after the instrument shop made a special jig for us.



Grating  
removal jig

Dave first checked the orientation of each grating in its cell by shining a flashlight at it from each end and noting how much light was returned in each direction. The new gratings would be installed with the same light return direction preserved. Next, for each grating he backed off the spring clips holding it in place. They were accessible at one end and on one side after a brass guide rail was removed. There was also one adjustment screw that was accessible through a rail slide (with the slide still in place) and he backed that off a little bit. He was careful to note how far he backed it off so that the new gratings would be as close as possible to the correct position once they were installed.





Then he placed each cell on the jig and slowly and evenly lowered it, leaving the grating optic standing on the three posts.





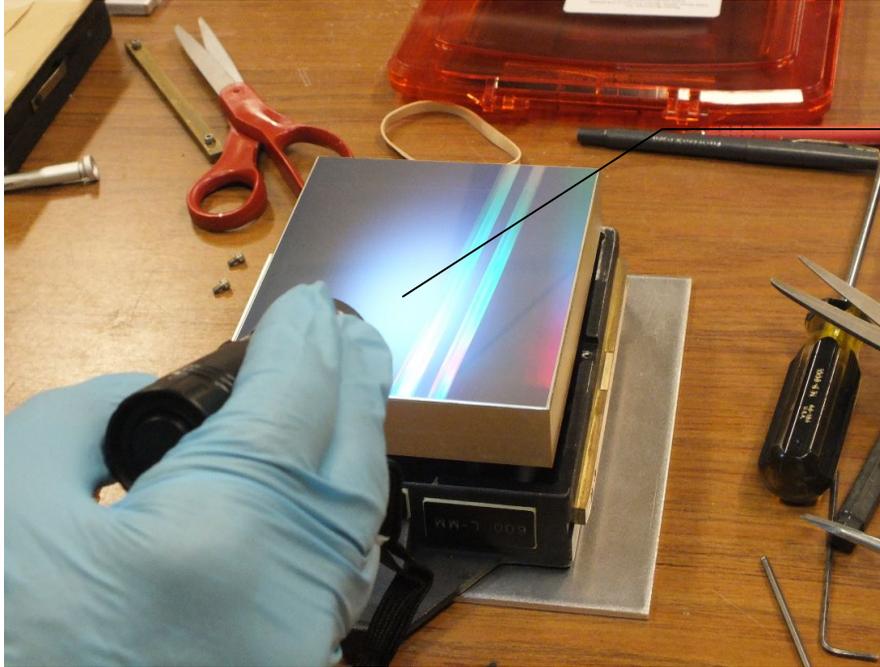
Grating removal jig and cell after grating was removed

Grating angle adjustment screw (one only)

The new grating was put on the jig with the orientation mark (arrow) in the same direction as the old one. As a double-check he verified that the amount of light returned was the same as with the old grating when a flashlight was shone at it from each end.



Grating orientation in cell



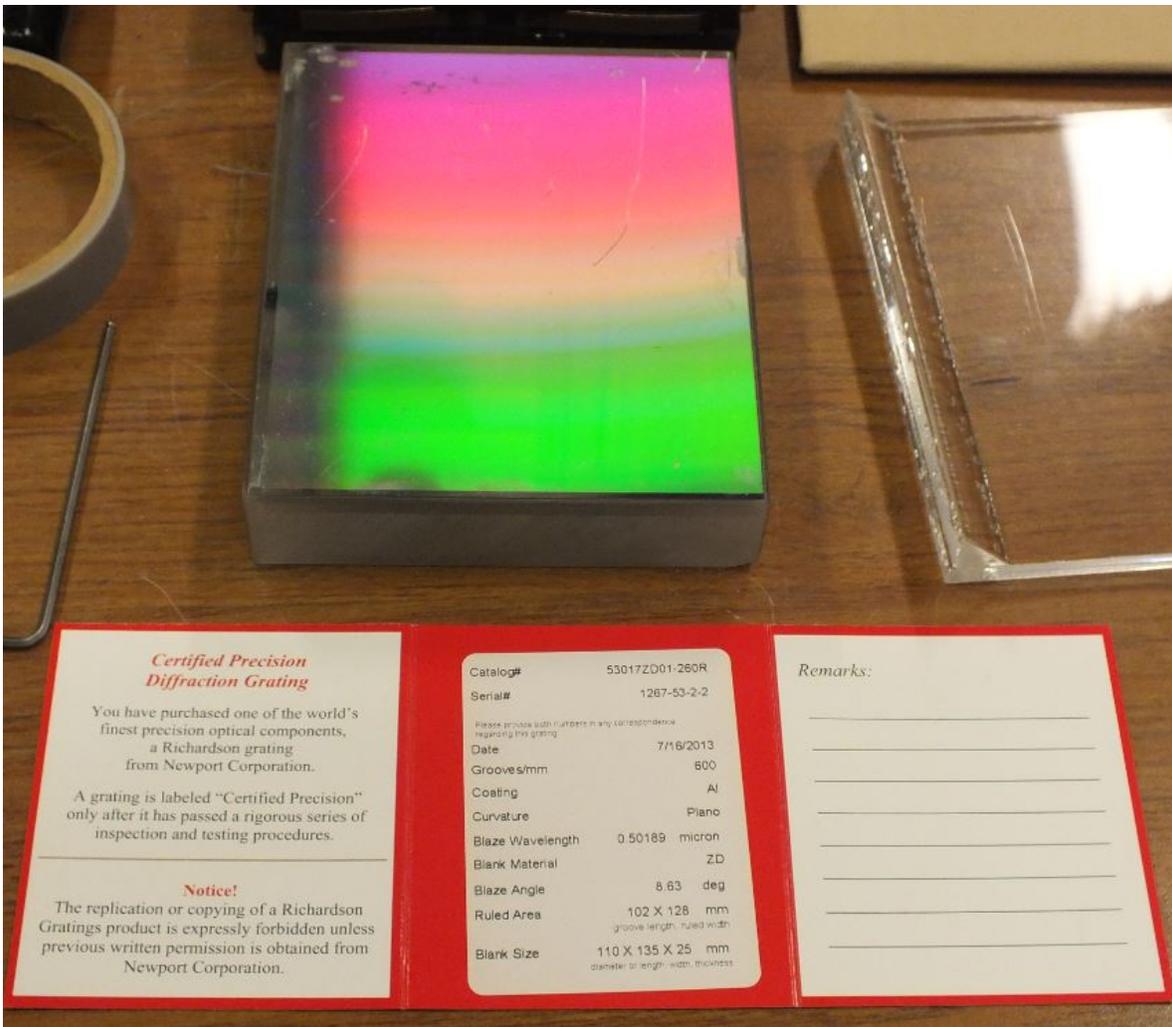
Checking light return of new grating



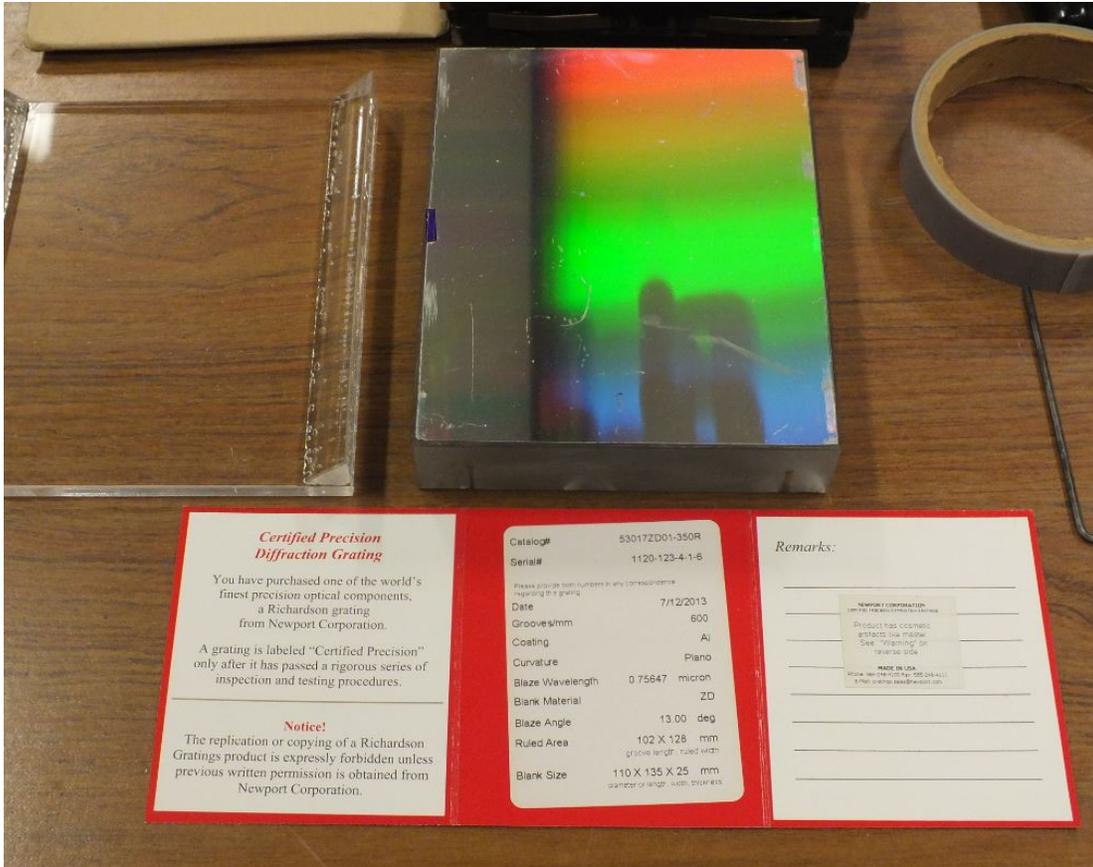
KAST grating replacement paraphernalia

Crested Precision Diffraction Gratings		
Part No.	4885 (251-000)	Remarks:
Material	100% ALUMINUM	
Finish	304 STAINLESS	
Coating	AL	
Grating	100%	
Blaze (degrees)	0.7500°	
Blaze Height	0.0010"	
Blaze Angle	0.0017°	
Material	100% AL	
Blaze Size	1.0000" x 2.0000"	

Crested Precision Diffraction Gratings		
Part No.	4885 (251-000)	Remarks:
Material	100% ALUMINUM	
Finish	304 STAINLESS	
Coating	AL	
Grating	100%	
Blaze (degrees)	0.7500°	
Blaze Height	0.0010"	
Blaze Angle	0.0017°	
Material	100% AL	
Blaze Size	1.0000" x 2.0000"	



**KAST old grating and replacement data sheet**

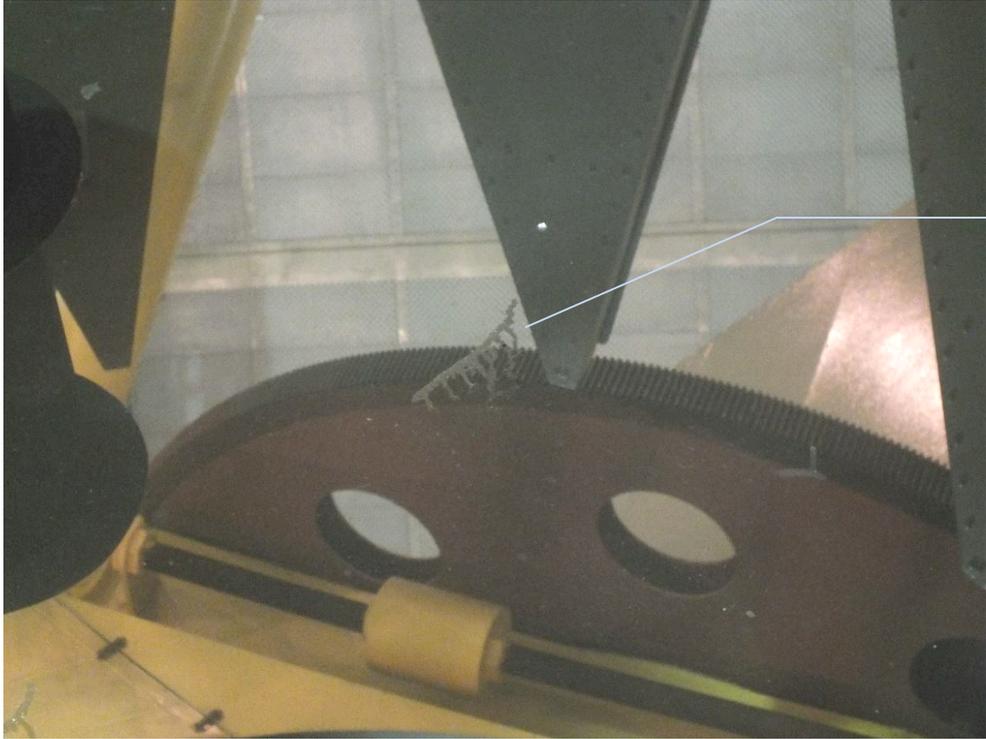


**KAST second old grating and replacement data sheet**

## 120 Inch Primary

We looked at the 120" primary mirror and found it to have an overall dirty look, in keeping with the fact that they have not been able to do CO<sub>2</sub> cleaning for months due to scaffolding safety issues. In addition, there were several oil spots that had not been there on our last visit – two of which were several inches in length. They were too far from the perimeter to reach for cleaning. We measured 80% reflectivity with the blue filter and 82% with the red, relative to our reference mirror.





Oil Spot on  
120" primary  
mirror surface

## Coude Secondary

We measured the reflectivity of the Coude secondary mirror to be 84% of our reference using both red and blue settings. There were numerous spots in the  $\frac{1}{2}$ " to  $\frac{3}{4}$ " diameter range, but cleaning with ethanol didn't help.



### Coude Auxiliary Telescope (CAT)

The CAT mirror M1 in the out-building next to the dome had been dusty but not too bad. Dave cleaned it by spraying H<sub>2</sub>O and squirting Orvus/acetone/H<sub>2</sub>O mix, then blotting it off. After cleaning we measured 88% relative reflectivity with the blue filter and 89% with the red.



The next CAT mirror, M2, faced downwards at a 45 degree angle, so it wasn't too dirty. Dave cleaned it and we measured 83% with the blue filter and 88% with the red. There is some severe paint chipping from the housing that can be seen in the photo; it could and probably does fall down from that level to the primary mirror below.

Paint  
chipping

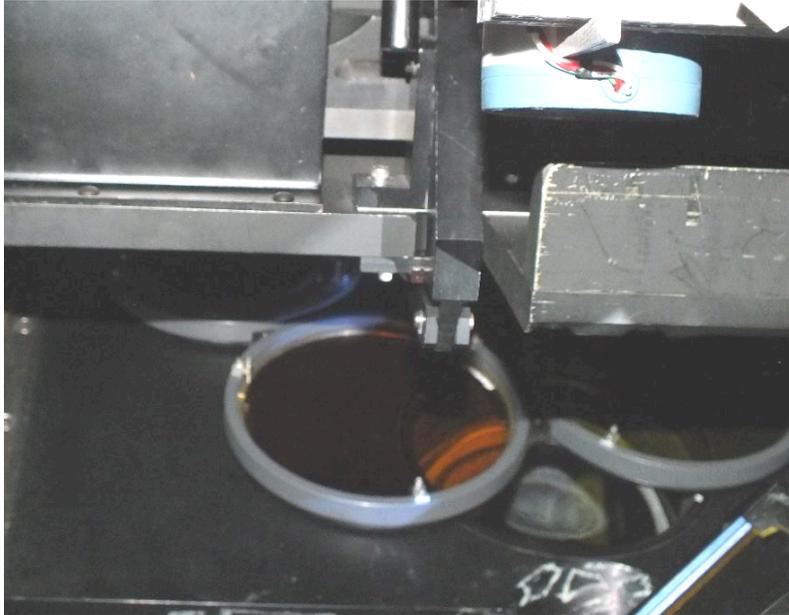


Dave cleaned the upward facing CAT primary mirror, M3, with air, then water, then ethanol. It is too risky to try to get the reflectometer into the tiny access hole in the surrounding shield.

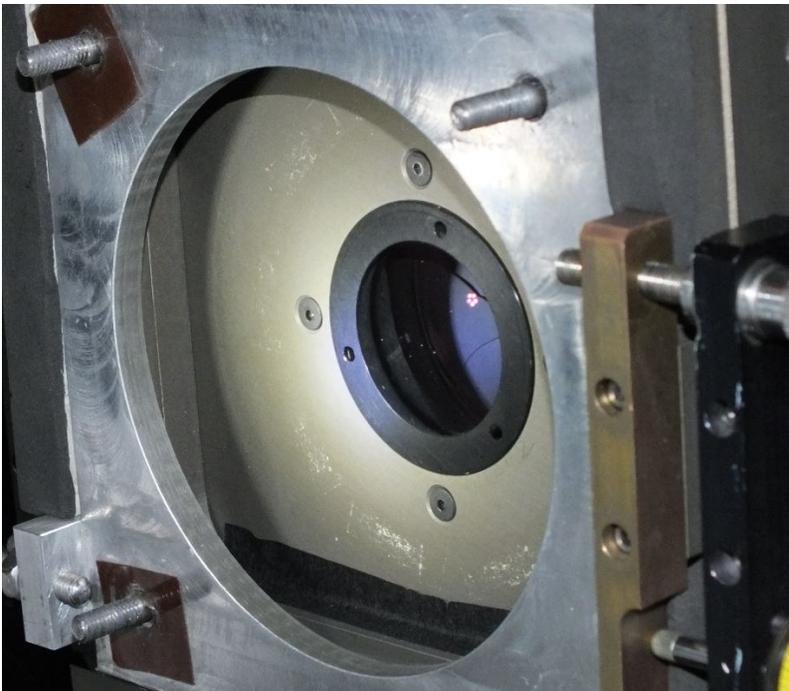


## KAST Camera

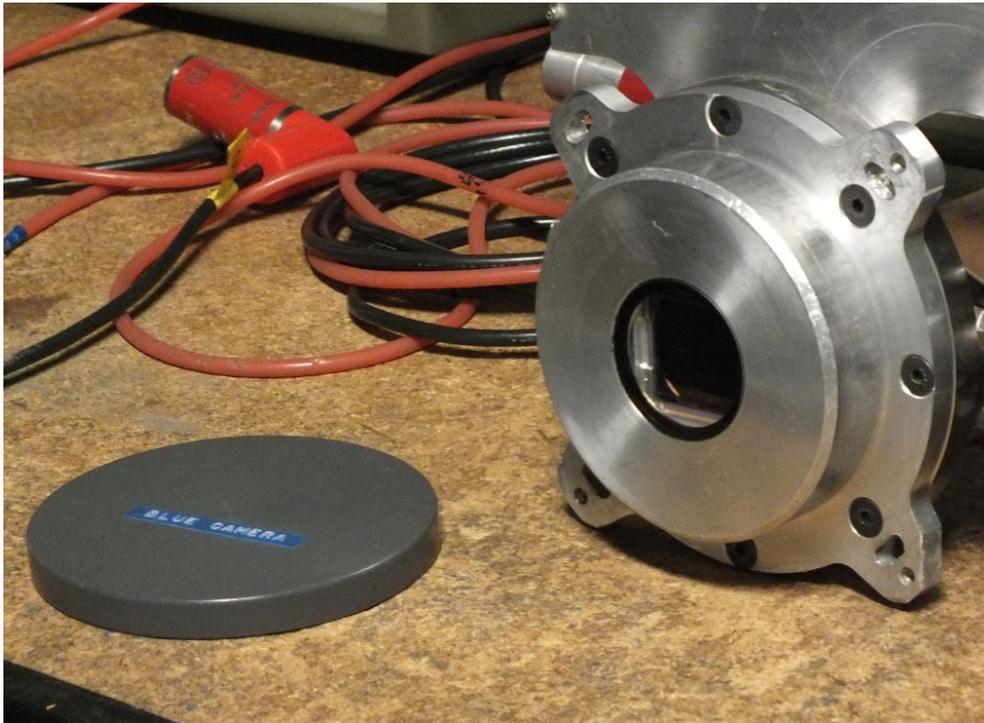
One of the filters (orange colored) had water spots that Dave was able to clean with de-ionized water (ethanol had no effect). Dave also cleaned the dichroic and a dusty mirror; the collimator didn't need to be cleaned.



Dave removed the cover of the red side camera lens and cleaned the slightly dusty lens with air and ethanol.



We visited the “nursery,” where Dave cleaned the KAST blue camera Dewar window.



When Dave returned to the mountain a few days later to bring up the newly installed gratings he also cleaned the diagonal mirror (with the elliptical hole). No pictures were taken that day.

## Dome Samples

I took pictures of the 2" disks that have been exposed to the dome atmosphere for many months, now. Eight of them face upwards at an angle and eight face downward. I only took pictures of the up-facing ones. Of these, #4 and #6 appeared to have the best reflectivity. #3, #5 and #7 were specular but with nucleation sites of surface degradation. #1, #2 and #8 all had a gray scattering look.



