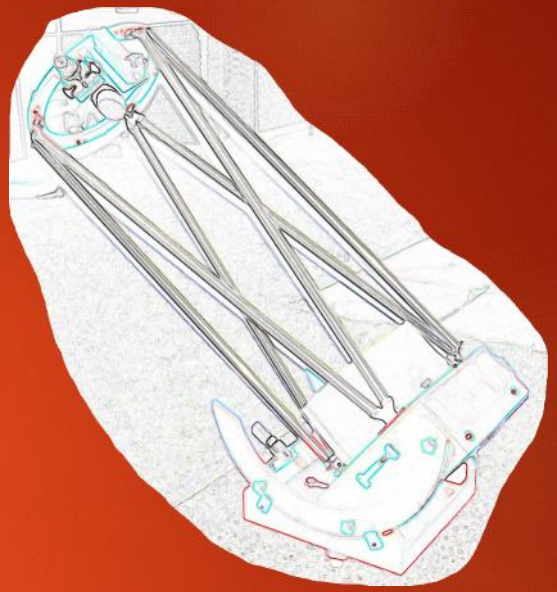


The Molly Project

HOW IT ONLY TOOK 15 YEARS TO BUILD A 16 INCH TELESCOPE

How It All Began

- 2002: After a 15 year hiatus from astronomy, I had a mid-life crisis and had to get back into the hobby.
- I considered getting a large Newtonian in that new fangled Dobsonian configuration but opted for an Celestron 8" SCT because I wanted to take pictures.
- I have never regretted going with my choice but in the back of my mind, the idea of big glass never quite went away.

First a Trickle

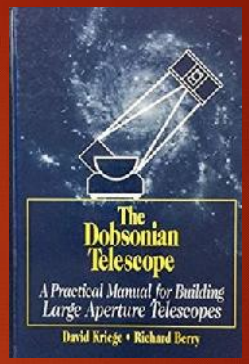
- In 2013, I acquired a 10" f/4.5 Newtonian OTA and decided to make a truss Dobsonian out of it.
- This took a little over a year to do as I kind of lost interest when I upgraded my long serving 8" SCT to 9.25".
- When I finally finished the 10" I was happy with the results but I wanted more.
- I started to collect articles from other ATMers and bide my time until I could get a larger mirror.

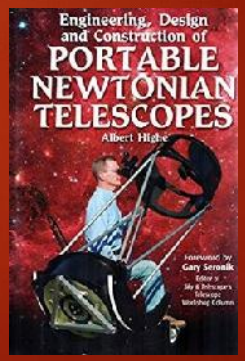
Then a Torrent

- On the day after Thanksgiving, 2016 I was window shopping the Cloudy Nights classifieds when I spotted what might be an awesome "Black Friday" sale item.
- A used 16" f/4.5 mirror from a Meade system that had not been there an hour before but had a posting date of the day before. My guess it was listed on Thanksgiving day but not approved until Friday.
- At $600, this was not going to last so I looked at the photos and the seller's ratings and contacted him before I could change my mind.

And So it Begins

- Shipping was to take a week so I started making plans.
- I didn't want to invest too much time, effort or money until it arrived intact.
- Planning was something I could do for free so I started.
- I'm a firm believer in letting the library keep the books I don't need every day so I requested "The Dobsonian Telescope" by Kriege & Berry and "Engineering, Design, and Construction of Portable Newtonian Telescopes" by Highe.





On your mark, get set, wait.

- The mirror was to be delivered the next Friday which I happened to already have off from work so I made plans and Friday afternoon started cutting my altitude bearings while I waited and waited.
- 30 inch bearings cut from a 2'x4' sheet of plywood so that rocker box sides will come from the scraps.

And wait

- The Sun went down on Friday and after darkness fell, Fedex changed the estimated delivery from Friday to Monday. Monday??!! But I didn't believe that and by Saturday morning the mirror was out for delivery again and arrived around 10.

Something to put the mirror in

- Now that I have a mirror, I built a frame of square aluminum tubing and angle.
- I surrounded that with a mirror box of ½" cabinet grade plywood.
- To this I added a 16" mirror cell made from a remnant cut from the opening of the mirror box. Felt pads added at the correct points for an 18 point support.

Lower Telescope Assembly

- The rocker box, mirror box, and altitude bearings are assembled for the first time.

DIY or Have It Made?

- It's now about mid-December and I had this idea of making my own secondary holder with a pyramid shaped spider that would serve as its own cage to protect the secondary. Neither turned out as well as I hoped so I ordered one custom made from Gary Wolanski.
- I also ordered bicycle clamps from Ebay, threaded knobs and aluminum channel (to make some DIY parts) from McMaster-Carr.
- Aluminum rods were ordered from TexasTowers.com.
- Odds and ends from Home Depot.

Collimation/Support Columns

- The mirror cell in my 10 inch dob rides on three spring loaded rods that also serve to collimate. I quickly figured out the 24 pound 16 inch mirror overwhelmed my springs.
- So I installed these threaded rods as columns on the side, leaving the original springs as additional support.
- Added bonus: Collimation from above rather than below.

Working with Aluminum

- There are various ways to connect truss rods to the lower and upper telescope assemblies. I chose to cut the aluminum channel into these three part connectors.
- The plan is to have six truss rods permanently connected to each other with these and they will slide into the upper and lower telescope assemblies.

Secondary Holder and Spider

- So now it's late January and the secondary holder and spider have arrived. Also, several other items have come in and it's time to start putting it together.

Assembling the Upper Tube Assembly

- Looking at the underside of the UTA ring, the spider and secondary holder are secured above the ring. The mirror hangs below.
- The bicycle clamps, focuser and Telrad will hang below as well.

Determining the Proper Length

- I knew the nominal focal length of the mirror – 72 inches – but there is nothing like measuring to know how long something should be.
- So I set up this rig at the River Ridge Observatory to view the other mountain ridge to the south moving the mirror back or forth until I determined the optimal distance between the two components.
- I also determined that you should be careful carrying a 16 inch mirror in sunshine because you might blind yourself.

No Do-Overs

- Now that I know the length, it's time to cut the truss rods. One inch longer. Then another measuring session at the RRO and another cut super double careful this time to insure all rods were the same length.
- Now that we're close to completion, it's time to cut and apply the Ebony Star Formica. Like the truss rods, if I mess this up then I have to get new laminate.

Truss Rods

- The truss rods are cut and then joined together with the three part connectors mentioned earlier and these tube inserts.
- Everything was made as identical as I could make them but that means probably 1/32 inch tolerance at least.
- That's a lot of Angstroms so one connection is designated The Alpha Connection and it goes in the front first to hopefully reduce collimation issues from set up to set up.

Putting Most of it Together

- Still a lot of details to go, I am able to assemble the pieces together for the first time.
- Though I have to stand on tiptoe I can look through the eyepiece while pointed at zenith without assistance.

Points of Interest

- So called bicycle clamps make for easy securing of truss rods.
- Easy grip knobs for collimation from above although they are still more than an arm's length from the eyepiece.
- Push button to turn the cooling fan on or off.

Points of Interest

- Big knobs on the altitude bearings and upper assembly make tightening easy.
- Elastic band to provide a variable counterweight to top heavy telescope. I was disappointed when it turned out to be top heavy but design constraints don't allow for moving the bearings much.

Points of Interest

- I lined the inside of the rocker box curve with "Poly-Panel" from Home Depot to provide a slippery surface between mirror and rocker boxes. The same stuff is used for the azimuth bearing. Altitude bearings ride on Teflon.
- On the outside are furniture glides to help keep the altitude bearings where they should be and provides a low friction surface to glide across.

Points of Interest

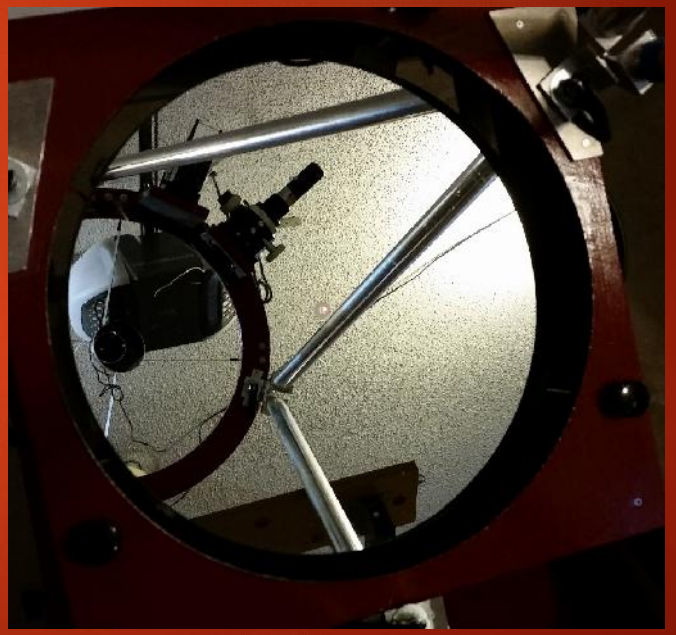
- Weight -
  - Mirror Box w/Altitude Bearings - 42 pounds
  - Rocker Box and Ground Board - 12 pounds
  - Upper Telescope Assembly - 8 pounds
  - Truss Rods - 8 pounds
  - Total weight assembled - 70 pounds

Ready to Travel

- When not in use or when traveling, 8 inch struts replace the 5 foot truss rods so that the scope can fit in a car or a corner of the garage. The secondary mirror is safe in its cage as are the focuser and finder which rotate inward.

Optical Train

- The physical alignment of the optics with a site tube so that I could see the entire mirror and first laser collimation happened on March 11, 2017.



First Light

- Molly had first light on March 15, 2017 during a short 30 minute window before clouds rolled in.
- She came to focus, yay! Those measuring trips paid off.

Debut

- Molly had her public debut at the River Ridge Observatory on March 25, 2017.
  - We looked at staples like the Orion Nebula, galaxies M81 & M82, and globular cluster M79. I was amazed at how bright M81 and M82 were.
  - I also managed to snag the International Space Station and was able to follow it for a distance.

What might I have done differently?

- Using six truss rods with a four-vaned spider made for some "busy" areas in the upper ring. 8 1-inch rods instead 6 1.25-inch rods might have worked better.
- Given the six rods, I would have made the mirror box longer than it is wide to better accommodate a triangle of rod connectors.
- I probably should have gone with traditional stain instead of paint.
- Visited Lowe's more often. The nearest is 20x farther than Home Depot but I discovered they had better plywood for the same price.

What might I still do?

- Lighten the upper assembly for better balance.
- Replace the current solid 18 point mirror cell with a floating point cell.
- Alter the altitude bearings so that they fold up when not in use and take up less room.
- Wheels and handles for travel from car to set up.
- Replace the fan button with a lighted version so I can tell when the ultra quiet fan is on.
- Tilt focuser and secondary to lower maximum eyepiece height.

The End for Now

- But first, I will just use it.
- That's all
- P.S., I now have a 10" handmade Dobsonian telescope for sale if anyone is wanting one.