



**“Building a new system @ NCO”**

By Doug Bock

Building a new imaging system

In October of 2016, I decided to build a new imaging system here at the Northern Cross Observatory (NCO). This would allow me to utilize the winter months easily whenever it cleared. Observing in the cold weather has become less and less of a

desire for me as I get older. I usually go to my Boon Hill Observatory during the better weather for observing and time lapse photography ((April through October), so that leaves November thru March pretty idle for observing. I had the 14” dob in the observatory for about 4 years, and would use it on clear nights easily from my backyard. The impetus for getting back into imaging was the usable clear weather during the winter. I found it hard to get up the motivation to go out in 10 degree weather to observe. So, I did some research and started ordering parts. First was the Losmandy G11 w/Gemini2 mount which I setup in the garage when it arrived. This has a 60 lb instrument capacity with a total weight limit of 100 lbs including the counter weights.



Losmandy G11 w/Gemini2 mount



Next I had to order an adapter to mount the EQ head to my existing pier, which I bought through Telescope Support Systems (Clay Kessler and Jeff Thrush).



I stuck my little 4” f/10 SCT I’ve had since 1980 on the mount, until my new 10” arrived ☺

## *The Glass Universe* by Dava Sobel

A Review by Jim Forrester

Women have a long history in the sciences in the United States, especially in astronomy. Best known from the first half of the 19<sup>th</sup> century is Maria Mitchell and her discovery as an amateur of C/1847 T1, which soon became known as “Miss Mitchell’s comet.” The discovery led to international acclaim, a gold medal from the King of Denmark and in 1865, the professorship in astronomy at the new Vassar College for Women.



**Pickering and his computers, 1913:** Back row (L to R): Margaret Harwood (far left), Mollie O'Reilly, Edward C. Pickering, Edith Gill, [Annie Jump Cannon](#), Evelyn Leland (behind Cannon), Florence Cushman, Marion Whyte (behind Cushman), Grace Brooks. Front row: Arville Walker, unknown (possibly Johanna Mackie), Alta Carpenter, Mabel Gill, Ida Woods.

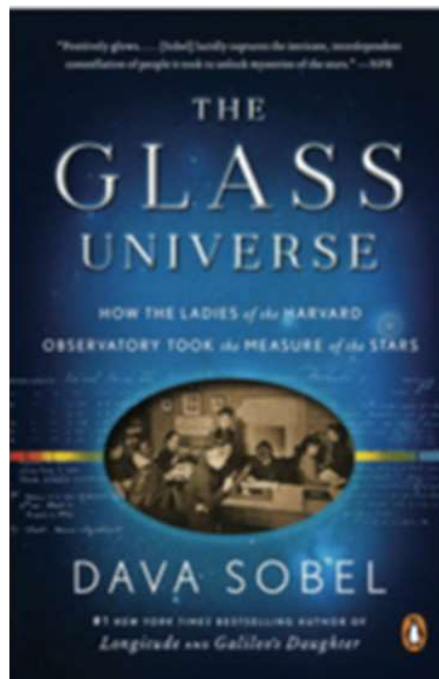
The Harvard Observatory beginning in the 1880s, under the directorship of Edward C. Pickering, became famous throughout the world for the accomplishments of the women who worked classifying stars and their spectra from glass plate photographs of stars in both the northern and southern sky. These efforts led most famously to Annie Jump Cannon's OBAFGKM spectral classification of stars and Henrietta Leavitt's analysis of Cepheid variables that informed Edwin Hubble's discoveries of galaxies far, far away and the expanding universe.

Apocryphal may be the story that Pickering hired his first woman into the Observatory, Antonia Maury, in reaction to the mediocrity and inflated egos of the male researchers available; but from the first hire these women produced first class work. Part of the research was to estimate magnitudes and the part that led to the major discoveries, was to classify the spectra. Pickering developed a photographic technique of placing the prism in front of the objective so that all the stars in a field

would spectrally spread. Instead of a dozen or so, the increase in efficiency allowed for the recording of scores of stellar spectra during every observing run. Hundreds of stars to classify soon turned into thousands and it is this story of the two dozen or so women over 4 decades who did this work that Dava Sobel tells in “The Glass Universe.” In a tale easily diverted to feminist history, Sobel admirably keeps hard to both the science and the enterprise of science, in other words, where does the money come from? Part of what got so many women hired was that they came (relatively) cheap, earning \$1500 annually compared to the \$2500 men got for the same work. The other part, in Harvard's case, is that much of the funding came from a woman. Anna Palmer Draper. She and her physician (and amateur astronomer) husband Henry spent many summer nights photographing the spectra of stars. Early photographic plates, made of glass, had to be spread with a wet emulsion of photo sensitive chemicals just before exposure and the Drapers, using a slit device, collected spectra one star at a time.



**Left:** A chart page of the Henry Draper Catalog from the *Annals of the Harvard Observatory*. Several years of the *Annals* were dedicated to publishing the Catalog. **Right:** Miss Cannon's notes next to the spectra on one photographic plate. There were thousands of plates.



The Glass Universe: HOW THE LADIES of the HARVARD OBSERVATORY TOOK the MEASURE of the STARS  
By Dava Sobel

\$\$ from whomever or FREE at your public library

Dr. Draper's early death at age 45 left Anna Draper with good photographs of the spectra of 400 stars and an interest in astronomy that had little place to go. She was fortunate in her widowhood on two counts: Both she and her husband came from financially well off families and she and her husband had for many years been friends with Edward Pickering. Palmer donated the plates to Harvard and over the rest of her life made annual donations to the college's observatory and its Henry Draper Memorial Fund to support the work she and her husband had started.

The gifts, varying in amounts over the years with the fluctuating value of underlying investments, came to a total of about \$250,000, or about \$6,000,000 in today's dollars. The result: A catalog of 359,083 stars down to magnitude 9 covering the entire sky, with dimmer stars in selected areas. The long days Cannon, Maury, Leavitt and their co-"computers" spent over crude glass viewing tables set at 45° over a mirror illuminated by a skylight were a hard, exhausting slog. But it was work they understood to be making a great contribution to astronomy.

This is the story Sobel so ably tells. How science works is clearly shown as is the effort needed to obtain useful results. There is little of the technical here, so this is a fine read for all 12 years and older.



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The telescope OTA is a GSO 10" f/8 Riche Chrétien. (RC), which I ordered through High Point Scientific.



I also ordered an OPTEC motorized and computer controlled focuser. This allows automatic focusing as temperatures change or direct focusing using the cameras, automatically.



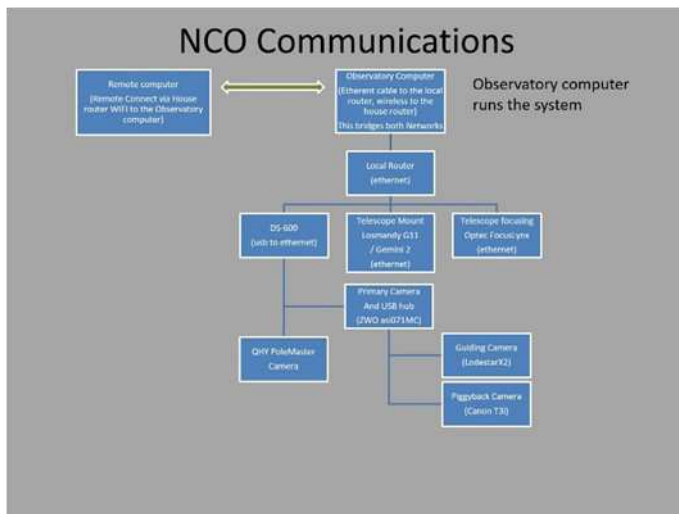
This is a Lodestar x2 guiding camera from Starlight Xpress. This camera would be used to guide through the 10" while imaging through it as well, using the On Access Guider (ONAG) system from Innovation Foresight. The ONAG system is a diagonal, that splits the light at about 7000 Å and above, to pass through to the guider, and everything else (white light) diverted 90 degrees to the imaging camera. This allows both cameras to use the 10" for its field of view



The ZWO asi071 MC cooled imaging camera will be my primary imaging camera on the 10 inch.

I intended to use my Canon on this system, which I did for a few sessions, and it does work, but I found that it required moving the primary forward a couple of millimeters to achieve enough back focus for the Canon. I took some images, which are later in this article. However, I decided to go with a cooled camera for the long run.

Assembling the system was pretty easy. In addition, I had to get all the communications running for my final intent. I automated the system well enough so that I could run it from the Den in my house, where it is toasty warm in the winter. This next image is a simple diagram of the communications between all components of the system. Note that the entire system is routing through an Ethernet router. This means I can connect with one Ethernet cable, or wireless to it all.



This allows me to start up the system on the laptop in the observatory, and once I verify alignment, I can then take control of the laptop from the house computer, via remote desktop, and run the entire system from the house. The only caveat is if the auto guiding camera doesn't have a star in the field to select, I do have to go back out and move the ONAG system in the X and Y direction to find one.



Thus far, I've had about 40 clear nights since November of 2016, to test, refine and collect data.

Once the system is powered up, I slew to a fundamental star to verify pointing, and if need be, re-sync on it, which means it is good to go for the night. The G11 Gemini2 allows sky modelling to improve pointing accuracy, which I've done on 2 occasions already. However, if you move the polar alignment at all, you need to do that again.

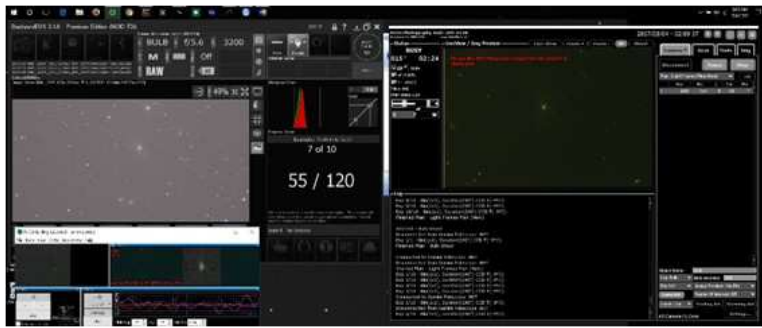
After alignment, I can fire up the software for the 3 cameras. Currently I can use Sequence Generator Pro Tools. I use PHD2 for the guiding camera. I can also use Backyard EOS for the Canon. In addition, there are many programs to run these cameras, so it comes down to personal choice, and functionality you want. I also fire up TheSky X to point and slew the G11 from that program. It's a very nice planetarium program with millions of object database elements. Plus, I can upload the latest comet data anytime.



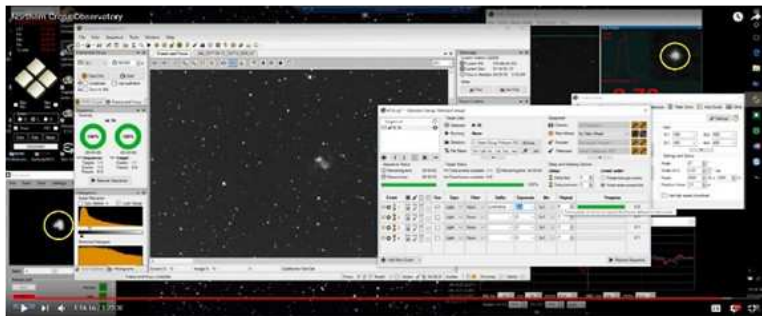
Here is the picture of the cameras, the focuser and the ONAG. I also repurposed the Canon T3i, as a 3<sup>rd</sup> camera on the system for wide field imaging and pointing. Kind of a digital finder.

I then use FocusLynx to run the focuser, but can also control it from SGPro or the gemini HUB. Another piece is FocusLock, which will use the guiding camera to automatically focus the system, and keep it in focus. There are multiple ways of moving the G11, 1) TheSky, 2) physical hand controller which has a DB in it, 3) on-screen controls from the ASCOM drivers G11 HUB. I've already recorded a few sessions on YouTube, which show what is going on, while acquiring data, setting it up, and even some error messages.





APTtools and Backyard EOS



SGPro



The other item is the communications. At the bottom is the router at the right, and a DS-600, which is used to communicate to the USB cameras, but runs Ethernet into the router. This way I have IP addresses for everything, including the 3 cameras. The focuser has an Ethernet port, the G11 has an Ethernet port as well.

As you can see, between all the communications cables, and power cables, it is quite busy.

I have everything plugged into a UPS (uninterruptible power supply), which means it can run on the batteries for an hour or 2, if I lose power. Plus the UPS conditions the power a bit.

The automation in SGPro allows for multi object data acquisition, unattended, with plate solving to center objects and automatically acquiring a guide star.

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## Upcoming Events

Open House at Peach Mt.

Saturday May 12th. Coordinator: TBD

Lowbrow Monthly Meeting

Friday May 18th, 7:30pm Angel Hall

Speaker:

U.M. Professor Sally Oye speaking on local anti-light pollution efforts.

Open House at Peach Mt.

Saturday May 19th. Coordinator: TBD

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I've had a few nights with it now, and here are some results.



Horsehead in Orion



NGC 6946 with S/N 2017 eaw



M3 – Globular Cluster in Canes Venatici.



M42- The Orion Nebula.



Lagoon Nebula



M51 - in Canes Venatici

I've also done some captures of Comets, and noted over the few hours of capture how much they move.



Comet 2016 R2



Comet 2015 V2 (Lovejoy)

Thus far, given the limited sky time, I'm pleased with the results. I still have a bunch to learn in the processing software, but it has given me something to do over this winter.

I'm looking forward to using this system when I'm home, and not out and about at star parties. It is most useful on a clear week-night, where I can start it up and do some integrations over the night, while I'm sleeping, and close it up in the morning before going off to work. (Editor: Doug's full resolutions images can be found at <https://www.flickr.com/photos/141833769@N05/>)

**University Lowbrow Astronomers**

Monthly Meeting Minutes

April 20, 2018

President Charlie Nielsen gavelled the meeting to order at 7:35 PM and introduced guest speaker Father Richard D'Souza of the Vatican Observatory and his talk: "Galactic Archaeology: Or, What Did Your Galaxy Eat for Dinner?"

Fr. D'Souza described the two known ways galaxies grow, either by accumulating gas and dust and creating new stars or larger galaxies "eating" smaller ones that wander too near. A startling example to most of the audience was M32. Several billion years ago, a full blown M32, M32P (about 0.2-0.3 the mass of M31) collided with M31 and had all its outer stars stripped away, leaving the core we see today. M32 is the most dense object known. Also unusual was M31 remaining a spiral galaxy rather than agglomerating into an elliptical galaxy. Advanced imaging techniques show a wide, faint swath of stars extending almost to M33. How did Fr. D'Souza and his collaborators figure all this out? Well, that's why you should have been at the meeting.

**Annual General Business Meeting and Election of Officers:**

All 2017-18 officers were re-nominated and reelected to serve through April 2019:

**President:** Charlie Nielsen**Treasurer:** Doug Scobel**Vice Presidents:** Jim Forrester**Observatory Director:** Jack Brisbin

Adrian Bradley

**Webmaster:** Krishna Rao

Dave Jorgensen

**Newsletter Editor:** Don Fohey

Larry Halbert

**Treasurer Doug Scobel** reported 143 memberships and a Treasury balance of \$6029.14

**Vice President Jim Forrester** reported the ServoCat Drive upgrade to the 17.5" telescope is complete and the scope is now back in the Observatory.

Forrester also reported the club now had a left over Bluetooth/Arduino unit and that members of the Observatory Committee believed equipping the club's 8 inch f/7 Cave Dobsonian with digital setting circles might make that a more useful and popular instrument. The club approved \$300 for the project to make the Cave a "push-to" telescope.

**Vice President Adrian Bradley** reported we now have 679 "likes" on our Facebook page and are accumulating them at a rate of 10-15 per month.

**Vice President Larry Halbert** distributed packets of the club brochures to members for distribution at local libraries and other public places.

**Observatory Director Jack Brisbin** attended a recent meeting of the Michigan Photonics Society, pitching Lowbrow public events and recruiting support for efforts to combat local light pollution.

*Next Month's Speaker* is U.M. Professor Sally Oye speaking on local anti-light pollution efforts.

The meeting was adjourned at 9:15 PM.

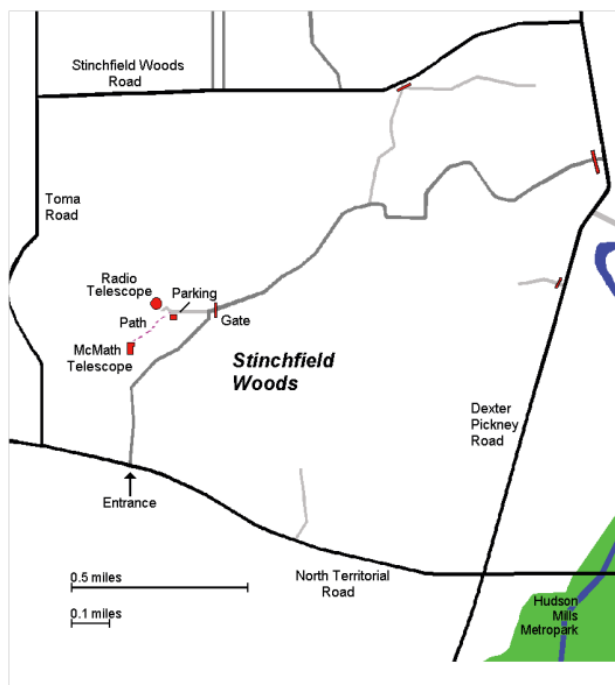
Respectfully submitted by,  
Jim Forrester



### Places & Times

Monthly meetings of the University Lowbrow Astronomers are held the third Friday of each month at 7:30 PM. The location is usually Angel Hall, ground floor, Room G115. Angell Hall is located on State Street on the University of Michigan Central Campus between North University and South University Streets. The building entrance nearest Room G115 is the east facing door at the south end of Angell Hall.

Peach Mountain Observatory is the home of the University of Michigan's 25 meter radio telescope and McMath 24" telescope which is maintained and operated by the Lowbrows. The entrance is addressed at 10280 North Territorial Road, Dexter MI which is 1.1 miles west of Dexter-Pinckney Rd. A maize and blue sign marks the gate. Follow the gravel road to the top of the hill to a parking area south of the radio telescope, then walk about 100 yards along the path west of the fence to reach the McMath Observatory.



### Public Open House / Star Parties

Public Open Houses / Star Parties are generally held on the Saturdays before and after the New Moon at the Peach Mt. Observatory, but are usually cancelled if the forecast is for clouds or temperature below 10° F. For the most up to date info on the Open House / Star Party status call: (734) 975-3248 after 4pm. Many members bring their telescope to share with the public and visitors are welcome to do the same. Mosquitoes can be numerous, so be prepared with bug repellent. Evening can be cold so dress accordingly

### Lowbrow's Home Page

<http://www.umich.edu/~lowbrows/>

### Membership

The University Lowbrow Astronomers membership dues are \$30 per year for individuals or families, \$20 per year for students and seniors (age 55+) and \$5 if you live outside of the Lower Peninsula of Michigan. Membership entitles you access to our monthly Newsletters on-line at our website and use of the 24" McMath telescope (after some training). A hard copy of the Newsletter can be obtained with an additional \$18 annual fee to cover printing and postage. Dues can be paid at the monthly meetings, by PayPal, or be check made out to University Lowbrow Astronomers and mailed to:

**The University Lowbrow Astronomers**  
**P.O. Box 131446**  
**Ann Arbor, MI 48113-1446**

Lowbrow members can obtain a discount on these magazine subscriptions:

**Sky & Telescope - \$32.95/year or \$62.95/2 years**

**Astronomy - \$34.00/year, \$60.00/2 years or \$83.00/3 years**

For more information about dues or magazines contact the club treasurer at: [lowbrowdoug@gmail.com](mailto:lowbrowdoug@gmail.com)

### Newsletter Contributions

Members and non-members are encouraged to write about any astronomy related topic. Contact the Newsletter Editor: Don Fohey [donfohey@gmail.com](mailto:donfohey@gmail.com) to discuss format. Announcements, articles and images are due by the 1<sup>st</sup> day of the month as publication is the 7<sup>th</sup>.

### Telephone Numbers

President: Charlie Nielsen (734) 747-6585  
 Vice President: Adrian Bradley (313) 354 5346  
 Jim Forrester (734) 663-1638  
 Larry Halbert  
 Dave Jorgensen  
 Treasurer: Doug Scobel (734) 277-7908  
 Observatory Director: Jack Brisbin  
 Newsletter Editor: Don Fohey (734) 812-3611  
 Key-holders: Jim Forrester  
 Jack Brisbin  
 Charlie Nielsen  
 Webmaster Krishna Rao

**A NOTE ON KEYS:** The club currently has three keys each to the Observatory and the North Territorial Road gate to Peach Mountain. University policy limits possession of keys to those who they are issued. If you desire access to the property at an unscheduled time, contact one of the key-holders. Lowbrow policy is to provide as much member access as possible.

### Email to all members

[Lowbrow-members@umich.edu](mailto:Lowbrow-members@umich.edu)



## University Lowbrow Astronomers



Member Club



Astronomical League Member Society  
#201601, Great Lakes Region

University Lowbrow Astronomers  
P.O. Box 131446  
Ann Arbor, MI 48113

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