

The Observer

The Official Publication of the Lehigh Valley Amateur Astronomical Society

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June, 2018

Volume 58 Issue 6



ad astra*****

It's true, British people never stop talking about the weather but seriously how can you blame me? I was all excited about MegaMeet because the May sky is overflowing with fascinating objects, but unfortunately the clouds rolled in and we had to cancel it. I'm pointing the blame at a really famous Royal couple who had placed "dibs" on all the good weather.

There is, however, no need to be too disappointed, we have rescheduled

MegaMeet for the weekend of **July 13th-15th**, a great weekend for planetary observing. For more information visit: <https://lvaas.org/staticpages/index.php?page=megameet>

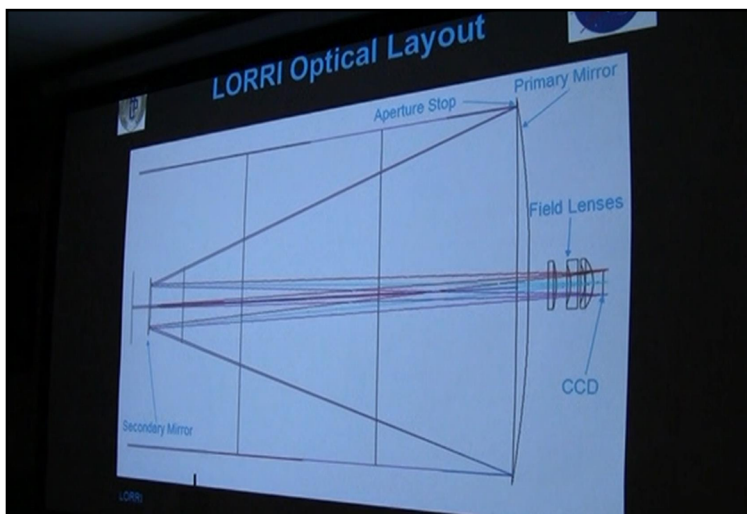
Now if you had a really big telescope and a very dark sky, you would also be able to see Pluto as well as Saturn in Sagittarius. Yes, I know Pluto is a dwarf planet and although I have never seen it through a telescope, they say it just looks like a very dim star - its current magnitude is 14.26. However, the photographs taken by the camera on board the New Horizons spacecraft are spectacular and to my surprise, the optical layout of the camera is essentially that of a Ritchey-Chretien telescope - a specialized variant of a Cassegrain telescope.

This was just one of the many things I discovered as I listened to Steve Conard's talk at last month's General Meeting. Steve was the lead engineer of the team that built and tested the New Horizons Long Range Reconnaissance Imager - the camera that collected all those beautiful images. I often wonder how some people end up working in "dream jobs." Steve explained that it was his enjoyment for telescope making as a teenager that led him into a career in optics.

Here is a photograph of Steve giving his talk with me glued to his every word!



Image credit: Dave Raker



A schematic diagram of the Optical Layout of Camera on board New Horizons



The team installing the camera onto New Horizons

Luckily, for all those who could not attend last month's meeting, Dave Raker videoed Steve's talk. There is now a really nice DVD in the library which can be taken out on loan - **Thank you, Dave!**



Image credit: NASA

On a sad note, you've probably heard that Astronaut Alan Bean, a member of the Apollo 12 crew and the fourth person to walk on the moon, died on Saturday, May 26th, at the age of 86. He was also Commander of Skylab 3 and spent 59 days in orbit around the Earth. When he retired he became an artist. I remember seeing him at an event celebrating the 40th anniversary of the Apollo 11 mission held in the National Air and Space Museum in Washington in 2009. He had a big smile on his face as he showed visitors some of his art work. To create texture in his paintings, he mixed some of the paint with moon dust that he scraped off the spacesuit he wore during the mission. To view some of his art work visit <http://www.alanbean.com/>.

Another person who passed away last month was the American journalist, Tom Wolfe. He was the author of "The Right Stuff," a book published in 1979 and adapted to film in 1983. It tells the story of the military test pilots who were selected to be astronauts for Project Mercury, the first manned spaceflight by the United States. In 2013, the film was selected for preservation in the United States National Film Registry. If you haven't seen it, why not treat yourself to a copy of the DVD and watch it on a night when the astronomy gods aren't cooperating.

So what is there lined up for this month?

At our next general meeting on Sunday, June 10th, it will be my turn to give the talk. I've chosen to present an updated version of a talk entitled **"The Microscopic World of Lunar Dust"** that I gave over 8 years ago when I first joined the society. At that time, I had only studied Apollo 11 soil. Since then, however, NASA kindly gave me access to soils from all the other landing sites apart from Apollo 12. If you attended the star party on "International Observe the Moon Night," you will have heard a lot of the material before, but for those of you who didn't then why not come along to find out more about the fine powder that covers the entire surface of our nearest neighbor.

The following weekend (June 14th-17th) several LVAAS members will be heading up to Cherry Springs, a state park renowned for its dark skies, for a star party organized by Harrisburg's Astronomical Society. Unfortunately, I can't make it this year. However, I did take a look at the website (www.cherrysprings.org) and couldn't help laughing out loud when I read "The Ten Commandments for Amateur Astronomers." If you do attend this meeting, please come back and tell us all about it, and take some photographs.

The next LVAAS star party will be held on June 24th. If the sky is clear, for some of our visitors it will be the first time they see Saturn through a telescope - something they will never forget! Its rings will be tilted 26° to our line of sight so we should be able to see the Cassini Division, the dark gap between the outer A ring and the brighter B ring, quite easily with all of our telescopes.

My goal this month is to take a photograph of Mars, Saturn and Jupiter, and the Milky Way rising up from the spout of the teapot in Sagittarius in the same frame. Mind you, I am not a very good photographer, so if anyone else manages to take this photograph, I'd love to see it and maybe you would allow it to be published in next month's Observer.

ad astra,

Carol Kiely, Director

LVAAS General Meeting

Public Welcome!

Sunday, June 10 7:00 p.m.

Grady Planetarium, South Mountain Headquarters
620-B East Rock Road, Allentown, PA, 18103

The Microscopic World of Lunar Dust

presented by

LVAAS Director, Carol Kiely



“Magnificent Desolation” Those were the words uttered by Apollo 11 astronaut Buzz Aldrin as he allowed his eyes to take in the starkness and monochrome hues of the lunar surface. The scene was a pristine desert landscape, but instead of the familiar beige-colored sand, the entire surface was covered in a fine, charcoal-gray powder.

Carol is an accomplished research scientist and science journalist. She obtained her Ph.D. in 1984 from the University of Newcastle upon Tyne and is now based in the Department of Materials Science at Lehigh University.

Minutes for the LVAAS General Meeting - May 6, 2018

The May 2018 LVAAS General Meeting was held on May 6, 2018 at the LVAAS facility on South Mountain in Lower Saucon Twp. The meeting was opened by Carol Kiely, Director, at 7:02 p.m. Attendance: 35+.

The talk for the night was "Building the New Horizons LORRI Imager: A 20cm Ritchey-Cretien for Pluto." The speaker for the event was Steve Conard of John Hopkins University Applied Physics Lab, lead engineer for LORRI since 2003, but who has worked on LORRI since 2000, during the proposal phase. He has been working on space hardware for over 35 years. The New Horizons spacecraft was launched in 2006, did a flyby of Jupiter (for gravity-assist and to test its equipment) then rendezvoused with Pluto in 2015, and is scheduled to intercept a Kuiper Belt Object (KBO) in January of 2019. LORRI, which stands for Long Range Reconnaissance Imager, is one of three optical instruments on the spacecraft: (1) ALICE - FUV imaging Spectrometer, (2) RALPH - Vis and IR color imager and IR imaging spectrometer, and (3) LORRI - panchromatic visible imaging (monochromatic, no filters.) New Horizons was the first of the New Frontiers missions and had the fastest Earth departure ever, passing the Moon in 9 hours and passing Mars in 2 months. Unlike the other imagers and sensors, LORRI was inside the spacecraft, which was maintained at near-room-temperature (20 °C) while the objects to be imaged were at 3K. The specs for the imager were as follows: (1) To obtain images 90 days out that were at least as good as Hubble, (2) Able to collect images of Pluto's other hemisphere 3 days out (the fast flyby would only allow the imager to see one side of Pluto) (3) Resolution of 100 meters at closest approach, with a signal-to-noise ratio between 20 and 100 and (4) Able to use images for navigation, so would need to image a magnitude 17 object (KBO) in 10 seconds. The best design to meet all these criteria turned out to have a 205 mm aperture, 2630 mm focal length, Field of View of 0.3°, and a camera with a 1024 x 1024 sensor chip, capable of imaging in 0.02 to 0.5 sec (max 30 sec.) The primary and secondary mirrors are hyperbolic and there is no focusing mechanism. Temperature gradients were a problem. The solution to connecting all the parts of the imager together turned out to be Silicon Carbide, which gave a good mix of thermal expansion and conductance. The optical tube assembly, both mirrors, and the mating structures were all made out of SiC. The baffle tubes were made out of composite and the entire assembly was wrapped in insulation. The CCD needed to be cold (-90°C) but was in the warm heart of the spacecraft, so it was connected via a beryllium rod (an excellent conductor) to a radiator on the outside of the spacecraft. The imager was built and tested in a clean room against vibration and acoustics more severe than at launch, thermal/vacuum tested to simulate space, and electromagnetic tested to determine if there was any interference from any of the other instruments.

Luckily, only one problem was found early on and corrected. As a note, the imager had to be focused and calibrated in the lab, since there would be no way to do that in space. The protective cover on the imager was designed to be opened once and never closed, so once the instrument was tested during the flyby of Jupiter, it was open for the remainder of the mission. The flyby boosted the craft's speed to 50,000 mi/hr. The flyby of Pluto was tricky because the plane of rotation of the moons is at a 60° angle to the ecliptic, meaning the craft would fly through the plane of rotation. To obtain the published color images, the low resolution color images from the other imagers were overlaid on the high resolution B&W images from LORRI. An added bonus was, after passing Pluto, LORRI was able to successfully look back at the sun through Pluto's atmosphere, even though there had been no requirement for this capability! The images obtained were more than satisfactory! The next target, KBO 2014MU69, was discovered in Hubble images, and has never been imaged from the ground. It has an apparent magnitude of 27! Since the spacecraft is scheduled to start its approach on Dec 25th, and has its closest approach on Jan 1, he stated that he will probably miss all the Christmas and New Year's Eve parties this year. Closest approach will be 3000 km ($< 1/3$ the Pluto approach), and the object is 10-40 km in diameter (estimated from its albedo.) This created a dilemma, since at that distance, a 10 km object will be slightly smaller than the FOV of the imager, but a 40 km object will require a mosaic to image the entire object. Based on occultation data of the object taken recently in South America, it appears to be roughly 30 km x 15 km, either oval or a contact binary object, possibly with a small outlying moon. To further complicate matters, tracking a 30 km object at a speed of 14 km/sec will mean that it will be a point until the last day. Although there are no future targets for New Horizon (always a possibility if one is discovered in the vicinity) an identical imager has been chosen to fly on another solar system mission - LUCY.

The talk and questions were completed at 8:12 p.m. and was followed by a short break. The meeting resumed at 8:27 p.m. with Carol giving a brief summary of NEAF.

Scott Fowler, Membership Chair, welcome our new members: Dennis Decker, Kelly Craig, Jason Zicherman, and Brian Long had their second readings and are now full members of LVAAS. Jerry Dobrowski had his first reading. Scott also reminded everyone who has not already done so to please pay their dues at the meetings or by mail (form available on website.) Membership cards for those who have paid their dues are now available.

Dave Raker, Librarian, noted that there were still some free items (books and videos) on the table in the meeting room, as well as items for sale in the Library and the Red Shift. Also, books and DVDs are always available for loan from the Library. Dave also records all the General Meeting presentations, so they are available on DVD.

Tom Duff noted that the last meeting of the Astroimaging Group was held on May 3 and featured three beginner level videos. The group will reconvene in September, hopefully with lots of images to share. Tom also noted that MegaMeet was scheduled for May 11-13. See website for more information. A go/no go decision will be made by Thursday, May 10.

Carol noted that the next Star Party will be held on May 19th, with Gary Becker doing both planetarium shows. Chuck Kunesh will talk on the search for extrasolar planets.

The next General Meeting will be June 10th, and Carol will be speaking on "The Microscopic World of Lunar Dust."

An announcement was made reminding everyone, new members in particular, to contact Mike Clark via e-mail (see website) to rent a club telescope.

Frank Lyter, Pulpit Rock Observatories, mentioned that there is plenty of work to be done at Pulpit Rock this year, with many opportunities for volunteer activities - the more the merrier! Work parties will be set up and announced as the weather improves.

The meeting was concluded at 9 p.m.

Minutes recorded and contributed by Secretary Earl Pursell

LVAAS Library Announcement

from David Raker, Librarian



The library is looking for the following back issues of the magazines **Astronomy** and **Sky and Telescope**. If anyone has these and is willing to donate or sell them to the library, please let me know. Thank you.

Astronomy magazine issues needed:

September, October, November and December 1973

January and February 1974

January, June, November, and December 2006

Sky and Telescope magazine issue needed:

August 2017

Ron's Ramblings

Ron's Ramblings is a monthly series of articles describing some recent or otherwise important event in astronomy. The ramblings will attempt to describe both the astronomical event and its significance. Obviously, the description will be that of a rambling amateur astronomer.



Galaxy Evolution Revisited

The current theories of galaxy evolution almost exclusively are based on optical telescope observations of galaxies. Those theories have the fundamental assumption that there are two classes of galaxies- blue galaxies in which stars are actively forming and red (quiescent) galaxies in which star formation has essentially stopped. The absence of an intermediate class of galaxies implies a catastrophic process that suddenly, in cosmic time scales, converts a star-forming galaxy into a quiescent, red and dead galaxy.

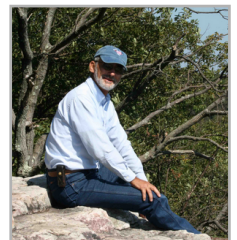
Now a recent and extensive survey of half-a-million galaxies done at the far-infrared wavelengths reveals that these current theories of galaxy evolution are seriously biased and flawed. The five year long survey, completed in 2013, was conducted by the Herschel Space Observatory (HSO) operated by the European Space Agency (ESA.) HSO was initially known as FIRST (Far InfraRed and Sub-millimeter Telescope) and it observed at far-infrared wavelengths, 200 times longer than optical wavelengths. While optical wavelengths originate from star light, far-infrared radiation comes from interstellar dust, the tiny solid grains of material between the stars. When galaxies are observed in the far-infrared light, the galaxy populations look very different. The Herschel survey found a new and mysterious class of galaxies, ones with a larger ratio of dust to star mass than any other type of galaxy. They named these galaxies BADGERs (Blue And Dusty Gas EnRiched.) The BADGER galaxies discovered by the HSO team fall into the region between the blue star forming galaxies and the red quiescent galaxies. This discovery has resulted in a major revision of galaxy evolution. There really is only one single galaxy class. There is no longer any need for a violent and rapid process that converts a blue star-forming galaxy into a red and dead galaxy. HSO has shown that galaxy evolution is actually a quite gentle process.

References:

A century of galaxy discrimination revealed by giant European astronomy survey. (2017, December 21). Retrieved from <https://phys.org/news/2017-12-century-galaxy-discrimination-revealed-giant.html>

The end of my ramblings until next month.

Ron





From the LVAAS Archives:

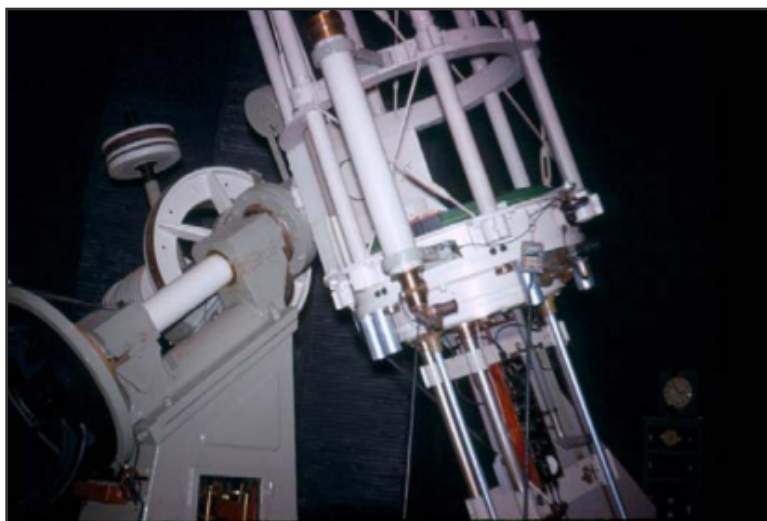
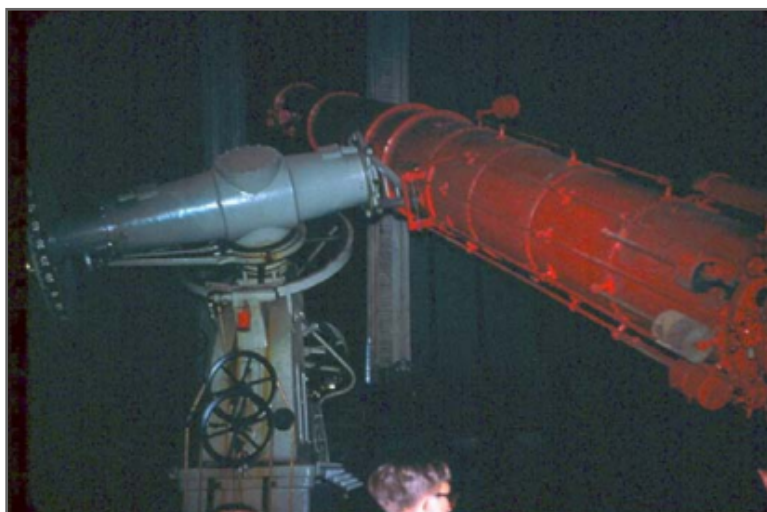
A Trip to Allegheny Observatory

By Sandy Mesics

On June 14-16, 1968, a delegation of LVAAS members attended the Middle East Regional Convention of the Astronomical League (MERAL) in Pittsburgh. On the first evening of the event, members were treated to tours of the historic Allegheny Observatory given by Dr. Nicholas E. Wagman, Director of the observatory. Under poor seeing conditions, the group viewed Jupiter through the 13-inch f-14 Fitz-Clark refractor, once the second largest telescope in the world.



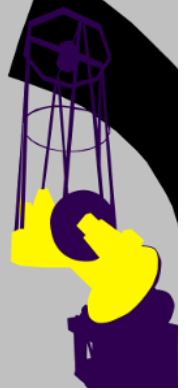
**Fig. 1: Top, the LVAAS contingent
(R) top, the 13-inch Fitz-Clark Refractor
(R) Bottom the 31-inch Keeler telescope**



At the business meeting the next day, LVAAS member George Maurer was elected Vice Chairman of the MERAL group, and LVAAS agreed to host the 1969 meeting. The featured speaker was Dr. Wagman, who presented a slide show on the history of Allegheny Observatory and the discoveries it produced. Beginning in 1930, Wagman was associated with Pittsburgh's Allegheny Observatory, and became director of the Observatory and chairman of the University of Pittsburgh's Astronomy Department from 1941 until 1970. Under his direction, the 0.76-m Thaw refractor was renovated and used to set the standard for parallax determinations, of which over 1200 were made. Many binary stars were also discovered and characterized. The Wagman Observatory of The Amateur Astronomers Association of Pittsburgh is named in his honor.

Schlegel Observatory Report

by Rich Hogg — June 2018



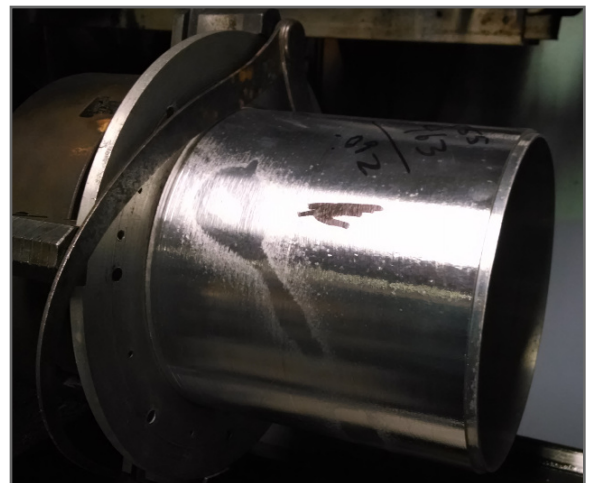
We have progress to report, and some minor milestones, on several different fronts this month. Still, there are a couple of bigger milestones that we hope to reach in the very near future, but not soon enough to report in this issue.

Preparation of the primary baffle

Thanks to Pete Brooks' work on the big lathe at South Mountain, we have reduced the outer diameter of the bottom section of the primary baffle to 8.463". Now, when it is fitted into the 8.55" hole in the primary mirror, there will be just shy of 1/20" clearance on each side.

This isn't much, and we had some discussion on-line over whether to try to go further, but for now we've decided to stop where we are. There is a danger of the aluminum tube becoming too weak if we try to remove too much -- not too weak to perform its job, which is mostly to just get in the way of some stray photons, but too weak to stand up to the stress of being cut in the lathe. We might end up with a broken and twisted hunk of useless metal, and worse, someone could get hurt.

So, we'll need to carefully center the mirror, which we pretty much need to do anyway, so that we can fit the baffle into place without interference and if it doesn't work, we can try to cut it down further when we get to that point. For now, we are done with cutting it and its biggest problem is that it's way too shiny, as you can see in the photo. It needs to be sanded a bit so that it can accept a coat of black paint.

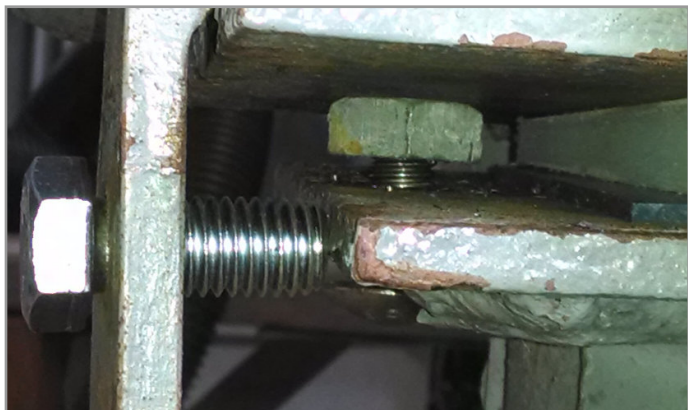


Polar Alignment, Part 1

Frank Lyter, Director of Pulpit Rock Observatories, has been quite busy with his job lately, but he still found enough time to finish some important tasks related to attaching the mount to the pier. His metal-working skills and his collection of good-quality tools were invaluable for this process.

Frank and I met at Pulpit Rock for one work session on May 5, where Frank did some heavy-duty drilling and tapping, and I was the helper. He had an idea to make it easier to lift up the north end of the mount a bit (which we have had to do a couple of times) which was to drill and tap holes in the pier

plates so that 1/2" "jack screws" could be threaded into them to lift up on the mount. This was the first task for the day.



The photo at left shows one of the 5/8" horizontal jack screws, used for adjusting the azimuth, and one of the new 1/2" vertical jack screws, used to lift the mount. It has a nut on the top end to protect the threads from being damaged by the weight of the telescope. To the right you can see the edges of the two plastic pads that allow the mount to slide on the pier for purposes of adjusting the azimuth.

The next job was to drill a new hole for the hold-down bolt on the north-west pier. To do this we needed to lift up that corner a bit to re-position the plastic sliding pads that we had installed; the new jack screw came in handy for that.

Then we had to center-punch the hole so he could drill it. This ended up being the most dramatic moment of the day, since Frank discovered that he could not get into position to hold the punch and strike it with the hammer by himself. So he decided that he would do the holding and ask me to do the hitting.

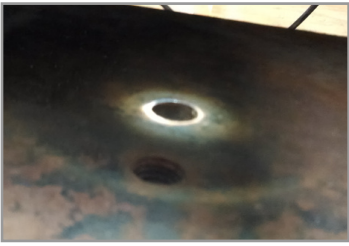
Now, hitting something with a hammer is usually not a big deal, but face it, we've all hit our thumbs once or twice. It's just different when it's somebody else's thumb that you're trying not to hit. It brought back to mind a story about my Dad, who had to hold a digging bar while his co-worker hit it with a sledge hammer, while he was working construction for Bell of PA when I was a kid. My Dad ended up with a broken arm that day, and I could only imagine how his buddy must have felt, as I carefully took aim to hit anything but Frank's hand with the hammer. I am happy to report that I didn't choke; my swing was true, and Frank was able to go home with all of his bones unbroken and unbruised.

But not before he finished drilling and tapping the 5/8" mounting hole! And installing the new bolt. The photos at right show the hole, drilled and tapped through the holes in the plastic sliding pads, and the new bolt installed.

Then, with the north side of the telescope secured to the pier, we prepared to lift the south edge of the mount to remove the pier plate. This required attaching some additional safety chains to make sure we didn't tip it over, but it went smoothly.

Before we removed the plate, we needed to decide where to position the new mounting nut. We did this by shining a flashlight down

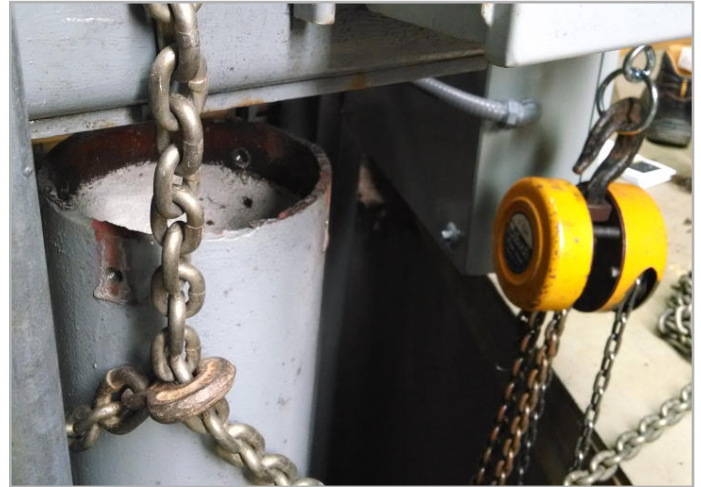




through the matching hole in the top plate, basically "eyeballing" the correct angle. The result of this procedure, as shown at left, was that we decided to put the new (larger) hole exactly where the old hole was.

When we removed the plate, we were able to

confirm that the pier post had been filled with sand, apparently to reduce vibrations. I considered taping a note to it that said "this is not an ashtray." To the right, you can see the uncapped post, along with a chain and a chain hoist that we had in place to control the mount.



Polar Alignment, Part 2

More quickly than I expected, Frank found the time to modify the plate we had removed in his home shop, drilling it and welding a nut to the bottom so that it would receive the new 1" bolt that would be the south attachment, acting as a pivot for azimuth adjustment and as an adjustment screw for altitude. He even gave it a nice coat of paint, as you can see below. (The bottom view shows the 1" flanged nut which is welded to the bottom of the plate as an anchor point for the pivot bolt. The top view shows the 1" pivot bolt, which is drilled and tapped to received a 1/2" mounting bolt, along with spherical washers which will sandwich the mount plate and accommodate the angle required to achieve the proper azimuthal tilt.)



I started to get nervous as we contemplated installing it, because of the rough procedure we had used to locate the mounting nut. I was thinking we really ought to have been more careful with that measurement.

May 11 was supposed to be the first day of MegaMeet, but you know what happens to MegaMeet more often than not. But clouds were not a problem for installing the modified plate. Ron Kunkel, Pulpit Rock Maintenance Director, and new member Vince Giranda were on-hand for the process.

It all went really smoothly! We lifted up the south end of the scope again, wiggled the modified plate into place, and nudged it around with the hammer until we could get all of the mounting bolts in place. Then, after adjusting the 1" bolt to the approximate height that we thought we needed, it was time to try to fit the 1/2" bolt that would hold down the south end of the telescope.

I figured we would need to move the scope around a bit to get it in there, and worst case, we would find that one or both of the hold-down bolts on the north side would still be in the wrong place. But I guess we got lucky! It went right in, with no repositioning required. After many months, we finally had the telescope again properly secured to the pier, and we could remove all of the clamps and chains and other improvisations that we had used to keep the instrument in place.

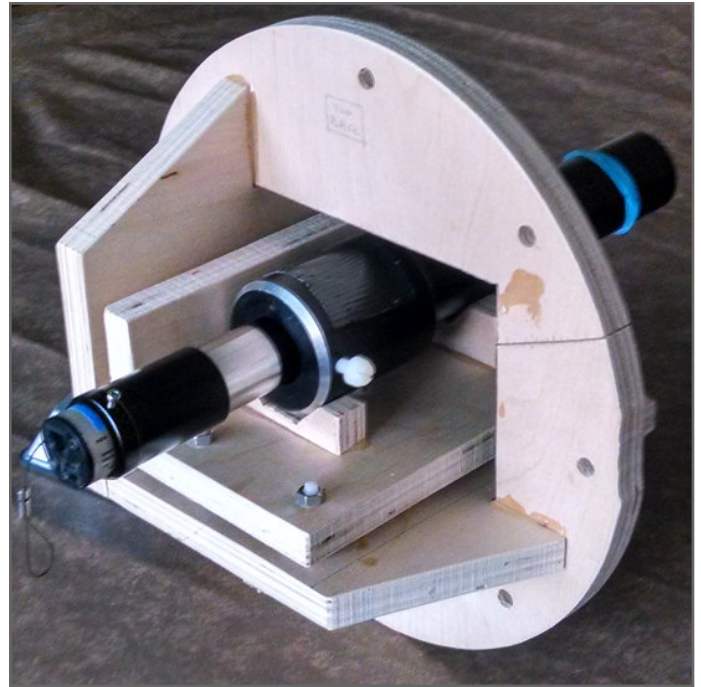
The image below shows the completed pivot bolt on the south pier post. From the bottom up, you see the post, the newly-repainted pier plate, the 1" nut used to lock the adjustment bolt, the 1" adjustment bolt (with hexagonal head), one of the two spherical washer sets, the top plate, and the mount frame to which it is welded. The 1/2" bolt that holds the plate to the 1" bolt is hidden by the washers and the plate.

What remains is to find a clear night and then attempt, once again, to achieve polar alignment of the mount. As I write this, tomorrow evening is predicted to be perfectly cloudless, and we are planning to take advantage of it. Stay tuned.



Tube Flexure Measurement

Another milestone that we are about to reach is to determine, finally, after all these years of debate, whether the tube structure of the 40" is rigid enough to maintain collimation as the telescope is pointed in different directions. Last month I showed a CAD rendering of a fixture to hold the "PMHGT" so that it can be used to view relative movement of the secondary mirror cell. Here is a photo of that fixture, almost completed. The next chapter in its story will be a test fitting to make sure that it fits where it is designed to: in the mirror cell at the same place where the main baffle normally mounts.



One thing that I will add to it is some arrangement to hold my spare Android phone. Like most smartphones, it has a 3-axis tilt sensor, and I have already written a small Python program that runs on the phone and sends the tilt readings to my laptop. This will make it easy to record the measurements on tube flexure along with the telescope's orientation, so that the dependency can be analyzed.

Current Status and Activities: The main baffle has been machined to reduce its diameter for better clearance in the primary mirror core. The issues with securing the mount to the pier have been resolved, and we are ready to complete the polar alignment. Also, we are nearly ready to perform the tube flexure measurement.

Photos in this article by Frank Lyter and Rich Hogg.

by Gary A. Becker



June Skies, Hopefully Clearer

Let us hope—pray—beg that June is not as cloudy as May. Even some of the good nights last month turned out to be dew-laden, not a fun experience if you’ve got your scope out, and it gets fogged or starts dripping from the condensation of water.

As June begins, Venus is still the dominant object of the dusk sky, wonderfully bright and relatively high in the west. It shares the twilight heavens with a thin waxing crescent moon on the 15th and 16th, and with a rapidly changing Mercury by the end of the month into the first week of July. The other planet to keep tabs on is Jupiter, continuing to be better and better placed in the evening sky. At dark in early June, Jove is playing its reflectance just to the east of south, but that changes to the west of south by month’s end. It will be the prominent object in the evening southern sky throughout June.

As July approaches, however, there is another newcomer in the southeast - Saturn. Nearby trees may still hide it as the skies darken, but by midnight it should be plainly visible in the south. If you’re wondering what that unusually bright object is next to the moon around midnight on June 30, try reddened Mars which will reign supreme during the late summer.

Currently, high in the north by 10 p.m., the Big Dipper is just starting to make its downward turn, with the bowl lower than its handle, a sure sign of the warmer days of summer to follow. The star, Polaris, around which the northern heavens pivot, can be easily found. Follow the Pointer Stars (lowest) of the Dipper’s cup, Dubhe and Merak, to the right and down in a straight line to find it. The Pole Star’s reputation results not from its brightness, but rather from its stationary position, marking the direction north, and the location in the sky to which the Earth’s rotating axis points. You can demonstrate this concept by simply looking straight up into the sky and finding the nearest star overhead. Rotate (spin) slowly and watch as all of the heavens seem to circle around the axis of your body and create your own personal “North Star.” Rotation is just one of many different motions that affect the positions of objects in the sky with respect to the horizons and zenith, or in regards to each other. Revolution, precession, nutation, the aberration of starlight, parallax, astronomical refraction, and proper motion come to mind. Thank goodness for computers.

Above Polaris and about as high in the sky as they can climb are the second and third brightest stars of the Little Dipper (Little Bear—Ursa Minor), Kochab (left) just a smidgen dimmer than the North Star, and Pherkad, about two and one-half times fainter. These stars mark the top of the bowl of the Little Dipper, which can only be seen in its completeness from rural locations. However, binoculars will allow you to see the entire star pattern even from an urban locale. Bisecting a line between Kochab and Pherkad to Mizar, the middle star of the Big Dipper's handle will bring you to a pair of stars in the tail of Draco the Dragon. The brighter member is Thuban, the north star of Ancient Egypt's Old Kingdom. The Earth's axis wobbles (precesses) approximately once every 25,772 years like a giant top in a 47-degree circle. Currently, the axis points towards Polaris, but by 14,000 AD, Vega in Lyra the Harp, that bright star nearly mid-sky in the early evening east, will be our pole star. Allow your eyes to sweep in an arc from Vega to Polaris to Thuban and you will trace the circle around which the axis pivots in nearly 26,000 years.

© Gary A. Becker – beckerg@moravian.edu or garyabecker@gmail.com
Moravian College Astronomy - astronomy.org

We wish we were there:

a postcard from Jim Rittenburg

"Nightfall taken from the front deck of the house.

Illumination is moonlight and you can see all the moon shadows." The house is on the edge of Glacier National Park, a designated International Dark Sky Park.



"Full moon rising around New Year taken from the front deck of the house."

"Between auroras, fireballs, satellites, alpenglow, etc. there are always interesting and unusual things going on in the sky."

"Typical late afternoon view of the mountains as the sun sets and the alpenglow lights up the peaks. This was taken from one of the XC ski trails we put in around the southwest side of the property."

"We have plenty of room out here if anyone wants to check out Glacier National Park and some really dark skies."

Jim



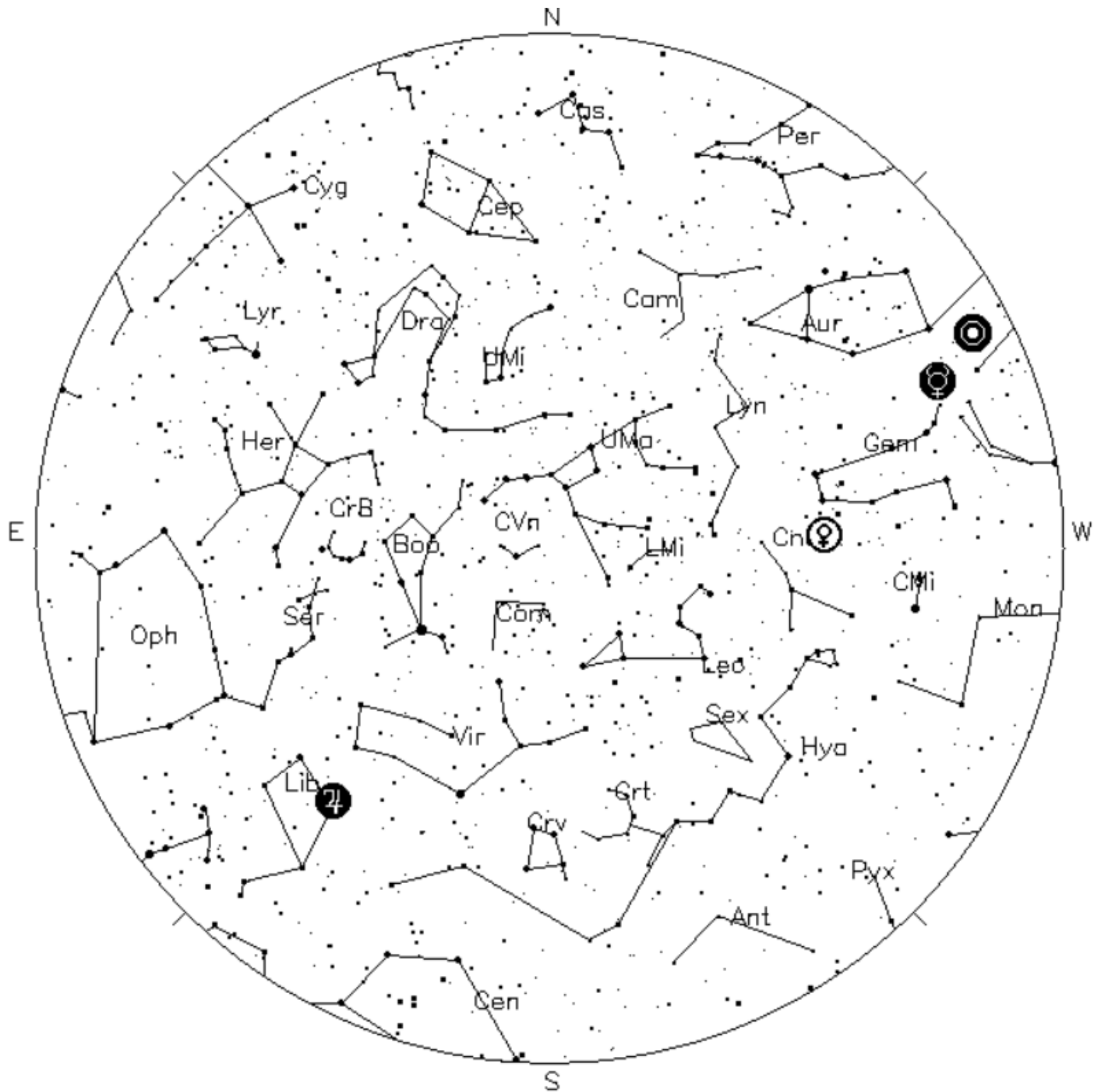


What's Up - June 2018



► <https://www.youtube.com/watch?v=uWQLCQZihWs>

Sky above 40°33'58"N 75°26'5"W at Tues 2018 June 12 0:00 UTC



Your Sky was implemented by John Walker in January and February of 1998. The calculation and display software was adapted from Home Planet for Windows.

The GIF output file generation is based upon the ppmtogif module of Jef Poskanzer's pbmplus toolkit, of which many other components were used in creating the images you see here.

ppmtogif.c - read a portable pixmap and produce a GIF file

Based on GIFENCOD by David Rowley

Lempel-Zim compression based on "compress"

Modified by Marcel Wijkstra

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Customize Your Sky : at : <http://www.fourmilab.ch/yoursky/>

JUNE 2018

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					01	02
03	04	05	06 Last Quarter Moon	07	08	09
10 General Meeting - South Mountain 7:00 PM	11	12	13 New Moon	14 Cherry Springs Star Party	15 Cherry Springs Star Party	16 Cherry Springs Star Party
17 Cherry Springs Star Party Deadline for submissions to the Observer Fathers Day	18	19	20 First Quarter Moon	21 Summer Begins	22	23 Star Party
24 LVAAS Board of Governors Meeting	25	26	27	28 Full Moon	29	30

JULY 2018

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
01	02	03	04	05	06 Last Quarter Moon	07 General Meeting/Picnic - 5:00 PM South Mountain
08 General Meeting (rain date)	09	10	11	12 New Moon	13 MegaMeet	14 MegaMeet
15 MegaMeet	16	17	18	19 First Quarter Moon	20	21 Star Party
22 Deadline for submissions to the Observer	23	24	25	26	27 Full Moon	28
29 LVAAS Board of Governors Meeting	30	31				

2018 LVAAS Event Calendar

2018 LVAAS Event Calendar												
	Sundays			Thursday	Friday	Saturday	Mondays	Multi-Day Weekends	Moon Phase			
	General Meeting time	location	Board meeting	Astro-Imaging	Lunatics and Stargazers	Star Parties	Scouts at S. Mountain	Scouts at Pulpit R.	New	First	Full	Last
January	2:00 PM	14 Muhlenberg	28	4		no mtg		no camping	16	24	1 31	8
February	2:00 PM	11 Muhlenberg	25	1		no mtg		no camping	15	23		7
March	2:00 PM	11 Muhlenberg	25	1		24		30-31-1	17	24	1 31	9
April		8 S.M.	29	5		21		27-28-29	15	22	29	8
May		6 S.M.	20	3		19		25-26-27	15	21	29	7
June		10 S.M.	24	no mtg		23		29-30-1	13	20	28	6
July	5:00 PM	7 S.M.	29	no mtg		21		27-28-29	12	19	27	6
August	7:00 PM	11 Pulpit	26	no mtg		18		24-25-26	11	18	26	4
September		9 S.M.	30	27		15		21-22-23	9	16	24	2
October		14 S.M.	28	25		13		26-27-28	8	16	24	2 31
November	2:00 PM	11 S.M.	25	29		17		no camping	7	15	23	29
December	2:00 PM	8 Grace Com	30	20		no mtg		no camping	7	15	22	29

July, Aug & Dec are Saturday meetings with rain date on Sunday
 Jan, Feb & March meetings are at Muhlenberg College
 August meeting is at Pulpit Rock
 December meeting / Holiday Party is at Grace Community Church

NEAF
 Cherry Springs S.P.
 Stellafane
 Black Forest
 MegaMeet

April 21-22
 June 14-17
 August 9-12
 September 7-9
 July 13-15

Publishing images is a balancing act!

When preparing your images for publication in The Observer, please consider the following guidelines:

Put the quality in:

- ▶ Considering the "print" size of the image, make sure you have at least 150 pixels/inch.
- ▶ Use a reasonably good quality for the JPEG compression ratio.

But watch the "waistline"!

- ▶ Don't go too much above 200 pixels/inch max.
- ▶ Use the lowest JPEG quality that still looks good!
- ▶ Shoot for <300KB for a 1/2 page image or <600KB for a full page.

Tip: If you're not Photoshop-savvy, you can re-size and compress undemanding images ("human interest" not astroimages), with an online tool such as

<http://www.ivertech.com/freeOnlineImageResizer/freeOnlineImageResizer.aspx>. It will also tell you the pixel size and file size of your original, even if you don't download the processed copy.

The Observer is the official monthly publication of the Lehigh Valley Amateur Astronomical Society, Inc. (LVAAS), 620-B East Rock Road, Allentown, PA, 18103, and as of June 2016 is available for public viewing. Please use editorlvaas@gmail.com for submissions or communications with The Observer editor, Frances Kopy.

Society members who would like to submit articles or images for publication should kindly do so by the Sunday before the monthly meeting of the board of governors (please see calendar on website) for the article to appear in the upcoming month's issue. PDF format is preferred. Early submissions are greatly appreciated. Articles may be edited for publication. Comments and suggestions are welcome.

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