The Observer

The Official Publication of the Lehigh Valley Amateur Astronomical Society

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610-797-3476

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August 2017

Volume 57 Issue 08

ad astra

We got another great lesson in "time-domain astronomy" at our July meeting. This may seem like something of a buzzword, but in fact it is the very descriptive term for a lot of the current work in the field. When astronomy was young, the list of celestial objects whose appearance varied with time was short. The sun, the moon, and the planets all moved around in the sky, and the moon had its phases and the sun had its spots. Occasionally a comet would show up, take a stroll through the constellations for a bit, and then disappear. A few stars were observed to have varying brightness, and once in a while there was a nova or supernova. And that was about it.

As our abilities to observe and measure improved over the centuries, and we found more and more movement and change in the sky, and this is a process that is still going on. We keep finding new ways to measure these changes, and learn from them; if a picture is worth 10^3 words, a good movie must be worth many orders of magnitude more. Lehigh University's Jon Bartz gave us a great example in his presentation of his work on Be stars. These hot, massive B-type stars lose mass through their decretion disks, which show *emission* lines in their spectra - that's where the "e" comes from in "Be." Jon combines ground-based photometric data from the KELT project with spectra from space-based observations, and interprets the story of how they change over time to build more and more detailed models of how these stars are made up and how they evolve.

This was after our July picnic, of course, and I jokingly took credit for precision-engineering the event for success. Of course, the reality is that we were just as lucky as we needed to be, and not a whole lot more. The weather predictions indicated that the rainstorms would let us have the event, and to that extent they were right – the first shower hit us dead-on, but ended a few minutes before we started, and the second one barely grazed us, but not until we were finished and inside for Jon's presentation.

Based on the forecasts. I was expecting a larger comfort zone, and I think the nearness of the bad weather may have convinced some folks to stay home. But turnout was still pretty good, the food was great and the camaraderie even greater. If you are one who was discouraged from coming by the green blobs on the weather radar, I am sorry for it because you missed a very nice event.

Banquet Update

Our plan for our 60th Anniversary Banquet is shaping up nicely. I am pleased to report the Dr. Bonnie Buratti has accepted our invitation to be our guest of honor! Bonnie, a native of Bethlehem and a long-time supporter of LVAAS, is Group Supervisor of the Asteroids, Comets, and Satellites Group at NASA's Jet Propulsion

Laboratory. I think we are very fortunate that she has agreed to come to our event, and I'm looking forward to a really good presentation.

So save the date — Friday, November 3, 2017 — and watch for an official announcement. We will give LVAAS members (and a short list of special friends) "first crack" at the limited number of seats, once we settle on the menu and price.

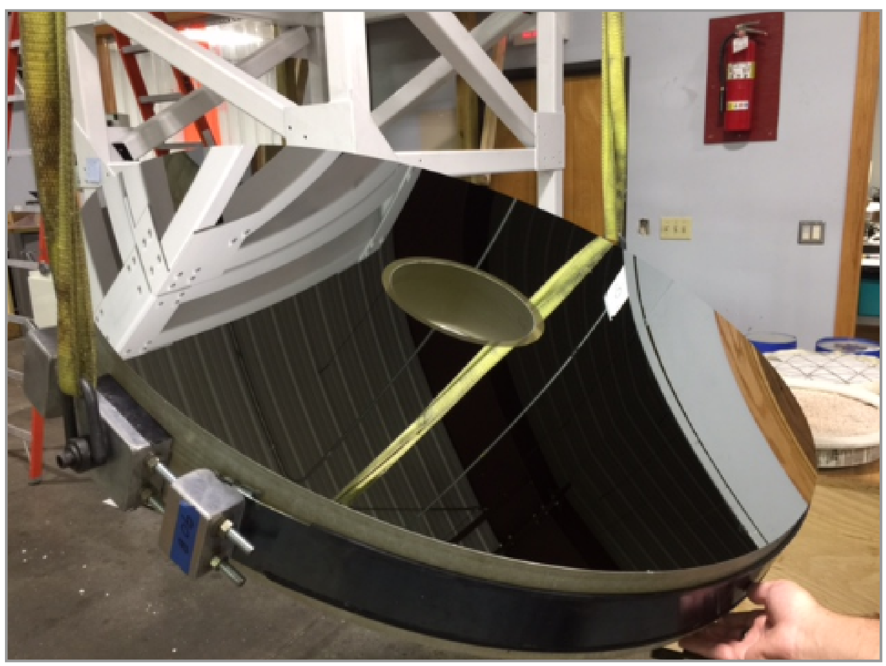
A Major and Challenging Donation

The name Michael Spacek should be familiar to LVAAS members; if you need a refresher, Sandy Mesics provided a nice article for the March Observer. The next chapter of this story unfolded in the past few weeks, as Michael's son Frank contacted LVAAS while preparing for the final sale of the original Spacek property. A few LVAAS'ers assisted Frank in removing items from the observatory/workshop building, and as a result, LVAAS has accepted a donation of a rather substantial collection of instruments and components, including two large refracting telescopes.

This development is so recent, and happened so quickly, that we don't really know what we have yet. We seem to have three new instruments with an aperture of nine inches or more (the third is a Maksutov astrograph), as well as several observatory piers and mounts and a rather overwhelming collection of optical and astronomical components. The instruments are in need of some restoration and it will take some time to figure out how to best make use of them. I'd like to thank Ron Kunkel, Frank Lyter, and Tom Duff for their help in relocating this collection (most of it is now in the Schlegel Observatory building at Pulpit Rock.) Above all, many thanks to Frank Spacek and the Spacek family for this significant donation.

Schlegel Observatory Milestone!

The forty-inch telescope project reached a significant milestone this month: the primary mirror is complete! The mirror has received its Enhanced Aluminum coating at Optical Mechanics, Inc. and is on its way back to Lockwood Custom Optics for use in figuring the secondary. See The Schlegel Report elsewhere in this issue for more information about the project.



At our August meeting, scheduled for August 12 at Pulpit Rock (with an August 13 rain date), I will be giving a complete overview of the project, covering what's been done and what remains.

Ad Astra!

— *Rich Hogg*

General Meeting Minutes of July 8, 2017 held at South Mountain, Allentown, PA

The General Meeting held Saturday, July 8th, was the annual picnic at our South Mountain site in Allentown. The festivities were slightly delayed from a 5:00 p.m. start to about 5:15 p.m. as a quick shower passed through the area. Slightly more than 40 members and guests attended, partaking of hamburgers, hot dogs, and numerous covered dishes. Thanks to Bill Dahlenburg, Earl Pursell and Rhonda Young for cooking, and to Rhonda for obtaining many of the picnic supplies. By 6:40 p.m., just as we were finishing eating, a second thunderstorm threatened more rain. Foods, tables, and pop-up tents were quickly removed and everyone moved indoors as we prepared for the program.

Beginning about 6:50 p.m. Director Rich Hogg made some opening remarks. First, noting the absence of Assistant Director Sandy Mesics, Rich reported that she had been rear-ended in her Mini Cooper. Other than seatbelt burns and some whiplash she was expecting to be released from emergency care. Second, was the discovery of a marker and water color painting of our 40” building at Pulpit Rock, done by artist Lindsay Wilson. Rich then introduced our speaker for the meeting, Jon Labadie-Bartz. Jon is originally from Northampton and is a 5th year graduate student at Lehigh University.

Jon’s topic was titled “The Latest on ‘Be’ Stars." One fourth of all B class stars are Be stars, rapidly rotating, pulsating stars, that occasionally eject mass from their surface, forming circumstellar disks. These non-accretion disks produce unusual emission lines at Hydrogen-alpha wavelengths, thus they are called Be stars, (B emission stars.) Four of the bright stars in the Pleiades star cluster are Be stars. These circumstellar disks are not accretion disks, rather they form from the star, growing from the inside outward, and then dissipate from the outside inward. Disk-forming episodes are usually random and vary greatly from star to star. Jon’s interesting and informative presentation ended at 8:05 p.m.

Before the planned break and the information session, Bill Dahlenburg recognized the attendance of Bob Bukovsky. Bob served LVAAS for four 2 year terms as Director, and also served terms as Assistant Director and Secretary.

After the break, the following topics of interest were discussed:

Bill Dahlenburg announced the opening of nominations for the four elected offices of LVAAS for 2018. Rich Hogg, (Director), Sandy Mesics, (Assistant Director); and Ron Kunkel, (Secretary) have each served two-year limits in their offices, and cannot serve an additional term. Gwyn Fowler has served one year as Treasurer and can serve a second year. Rich agreed to run for Assistant Director. Tom Duff and Earl Pursell agreed to run for Secretary. Gwyn agreed to run for Treasurer. There were no candidates proposed for Director.

Kyle Kramm donated a big roll of solar filter film. After the meeting, members were welcomed to take a piece to be used to make filters for the upcoming solar eclipse.

Gwyn Fowler presented a brief Treasurer's report. She reported income for the month to June 25 of $556.74 and expenses of $1,145.55.

Scott Fowler, Membership Director, conducted second readings for two new members, Warren Landis and Charlie Wirth. There were no first readings.

Lastly, the next General Meeting was noted to be August 12th at Pulpit Rock. The program will be an update on the 40" Project. It was noted that the mirror is currently being coated. Also noted was MegaMeet has been rescheduled to July 21-23, and the next public Star Party will be July 29th.

The meeting adjourned at 8:45 p.m.

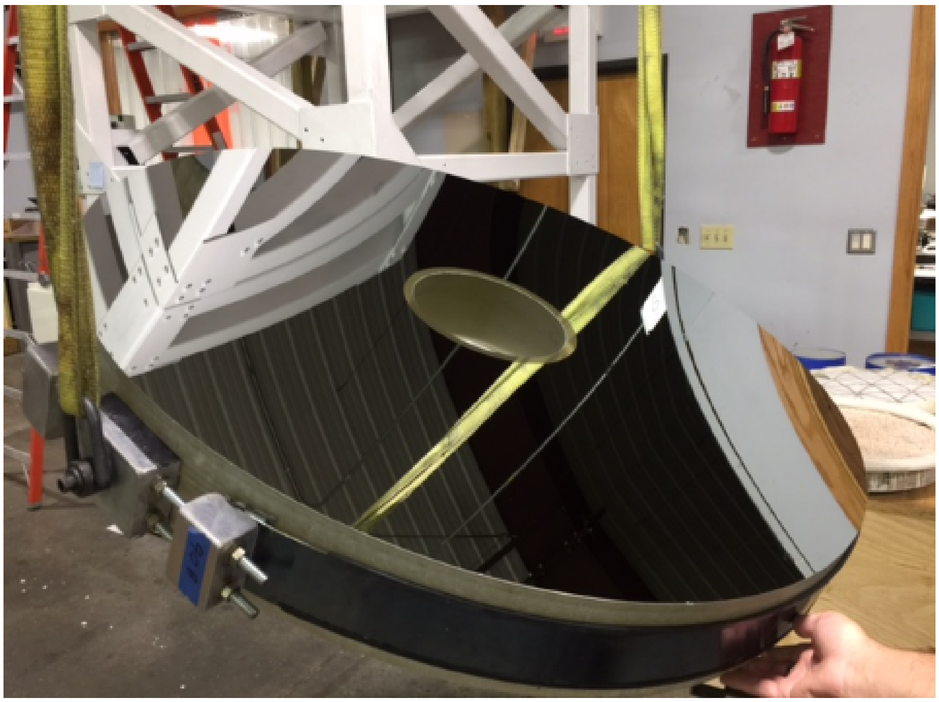
Minutes were prepared and submitted by Secretary, Ron Kunkel.

August General Meeting At Pulpit Rock

Saturday, August 12 (rain date Sunday, August 13), 7:00 p.m

Pulpit Rock Astronomical Park
Kempton, PA

"Schlegel Observatory Update"



presented by **Rich Hogg, LVAAS Director**

Rich will provide an update regarding progress on the 40" telescope and the Schlegel Observatory building. The presentation will detail progress made to date, as well as challenges remaining to complete the project and the plans to "get it done."

**editor's note: Please see The Schlegel Observatory Report in July's and August's Observer.*

Besides his passion for astronomical instruments (and tiny ones as well,) Rich Hogg is an accomplished balsa-wood roboticist and a composer of refuse-bin poetry. He once lost an argument about Special Relativity with Carl Sagan, and is skeptical about the reality of photons. He prefers his interiors, music, liquor, chocolate, comedy, coffee roast, poultry meat, and skies, dark. He enjoys driving a fast car but mostly on slow roads.

***Megameet is currently scheduled for September 15-17. A new rain-date will soon be announced.**

***LVAAS is currently planning activities** to be held at our South Mountain location on Eclipse Day, 8/21/17. Please check the LVAAS homepage for developments, as well as a link to a list of other eclipse events in the area.

Nomination Of Officers Of LVAAS For 2018 Term

NOTICE -- A Business Meeting will be convened for Election of the 2018 Society Officers at the October General Meeting

The LVAAS October General Meeting will be held on its regularly scheduled date – October 8, 2017, 7:00 p.m. at South Mountain - during which a Business Meeting will convene for the purpose of election of our 2018 LVAAS Officers.

LVAAS Full Members in good standing (current dues paid) are entitled to vote and/or be considered for office. Any society member in good standing may nominate qualified individuals until nominations are closed during the September General Meeting on September 10, 2017. At the time of nomination, nominees need to agree to accept the nomination in person, or in writing and signed by the nominee (should the nominee not be able to be present when nominated.) Except as provided for, no nomination shall be accepted by the Nominations Committee, nor shall additional nominations be placed on the ballot after the close of nominations during the September 10, 2017 General Meeting.

In the event no qualified candidate is listed for one or more positions at the time of election (October 8, 2017) the election shall go forward for the remaining offices. After the election results are verified, the nominations committee shall open the floor for the nomination of any qualified candidate to a vacant position. Any LVAAS member (in good standing and not elected to an office in the just-completed election) may be nominated for an open position, if said person has not held that position for the immediate past two consecutive terms of office.

The newly elected officers' terms begin at midnight November 30, 2017—and continue until midnight on November 30, 2018.

Nominees to date include:

Director: Carol Kiely

Assistant Director: Rich Hogg

Secretary: Earl Pursell
Tom Duff

Treasurer: Gwyn Fowler

Regards,

Bill Dahlenburg -Nominating Committee Chairman

Schlegel Observatory Report

by Rich Hogg

August, 2017

Primary Mirror Completed!!!

This month, our 40" primary mirror received its Enhanced Aluminum Coating at Optical Mechanics, Inc. in Iowa City. This photo, and the one in Ad Astra, were taken at OMI before the mirror was placed back into its shipping crate. By the time you are reading this, it should be back at Lockwood Custom Optics in Philo, IL, for use in figuring the secondary.

As you can see, OMI fitted a fixture to the central aperture in order to support the mirror in the coating chamber. This prevented an annulus around the center from receiving the coating. This is fine, and was precisely the right way to do it, since this section of the mirror will be shadowed by the secondary and its mounting cell.

In addition to the secondary, we still have a lot of work to do on the building and the rest of the instrument. I'll be going over the "to-do list" as a whole, and diving deeper into a few topics, at the August meeting.

Evaluating Tube Stiffness - Right now, I am going to go into considerable depth about topic that I mentioned briefly in a previous article. We would like to measure how much the Optical Tube Assembly will bend, or deflect, as the telescope is pointed in various directions. I have an idea how I want to approach this, but I am open to suggestions for better ideas, so please consider my proposal and email me if you think you have a way to improve upon it.

First, a brief history. The issue of whether tube flexure will be a problem for us has been a bone of contention for quite some time. The folks who came up with our OTA design (basically, a mirror cell of welded steel mated to a steel-tube truss support for the secondary) certainly believed that the design is sufficiently stiff. But the design has its critics, who are convinced (sometimes with an alarming degree of certainty) that the structure will bend too much under the weight of the secondary, making it impossible to keep the instrument properly collimated.

One of the most vocal critics (who presently is not a member of the society) has tried to draw attention to his viewpoint in ways that have made it a polarizing issue. My initial reaction, aligning with other LVAAS members who were working on the project, was to proceed on the assumption that it would not be a problem, but to be prepared to fix it if that turned out to be wrong. My basic point of view is that we will inevitably find problems with this design as we bring it on line, and we will fix them as we find them, but we should not waste too much time trying to anticipate (and address) every problem that we might or might not have.

However, earlier this year I was convinced that it would be worthwhile to spend a little time checking this one out ahead of time, so that if it does look like a real problem, we'll have more time to design a correction, and an opportunity to implement it before we install the sensitive optical components.

Shortly, we will have the slew motors working again, and we'll be able to point the unfinished instrument in various directions. Obviously, the structure will bend a little as we do that, but will it be 1mm, or more like 10mm? And how do we measure that?

Degrees of Freedom

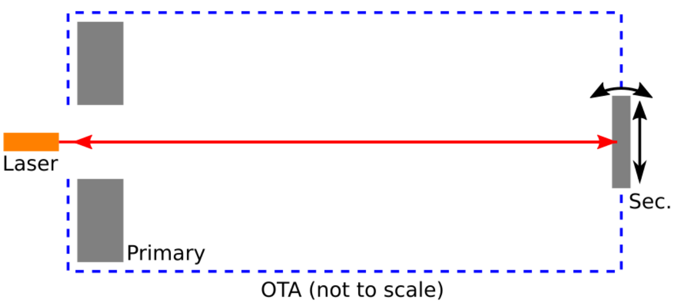
What we care about is movement of the secondary mirror, relative to the primary. The eyepiece, camera, or other instrumentation at the focal plane will be attached very solidly to the primary, so we don't need to worry about movement between those components. We can think of the system in relative terms, using a coordinate system based on the primary, with the goal being that the coordinates of the secondary remain sufficiently stable as the Earth's gravity pulls on the structure in various directions.

A solid object in three dimensional space can move with six degrees of freedom: "translation" (or "sliding" motion) along each of the 3 coordinate axes, and rotation about each of them. For the purpose of this discussion, we can neglect two of these. The mirrors are presumed to be rotationally symmetrical, so a slight rotation of the secondary about its center axis should have no effect. And, if the spacing between the primary and the secondary changes slightly (translation along the optical axis), this can be compensated for by a focus adjustment, with negligible effect on the image.

However, any significant side-to-side motion of the secondary will heavily affect the image quality. The same is true of any tilting of the secondary with respect to the primary. These are the same degrees of freedom that must be adjusted to properly collimate the telescope, and that will likely be affected if there is flexure of the tube, caused by the influence of gravity when pointing it at different parts of the sky.

Laser Collimation

I've used a laser collimator on our 18" Cassegrain before, so it gave me the first idea of how to measure tube flexure on the 40". The basic idea is to install the laser device in place of an eyepiece, and it will send the beam precisely up the centerline of the optical system. (A few steps are required to precisely align the beam with the focuser drawtube, but we can ignore that detail for now.) If the system is correctly aligned, the laser will hit the secondary mirror at its exact center, which is marked, verifying both of the side-to-side translational degrees of freedom. Then the beam will be reflected, hitting a target built in to the collimator, and if the mirror's side-to-side tilt in both directions is correct (the other two degrees of freedom), the spot will be centered on the tiny hole that the beam emerges from. (The beam spreads out enough that it can be seen striking the target, surrounding this aperture.)



Basic concept of laser alignment setup

We don't have a secondary mirror in our 40" yet, but we don't need to precisely align anything at this time. We just want to measure how much the alignment changes. So, we can install a mirror blank or other stand-in for the secondary mirror, and attach a mirror to it to reflect the beam back towards the primary. Then, as we tilt the telescope, if we see movement in the beam — either the point at which it hits the secondary, or the point at which the reflected beam returns to the primary — we will know we have flexure of the tube.

Anticipated problems with the laser

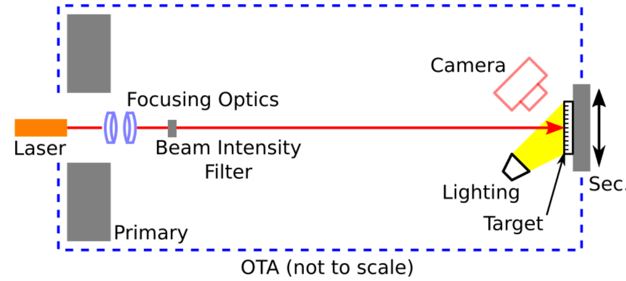
We want to know not whether this movement occurs — it certainly will, to some extent — but how much. Based on my experience using a laser to align the 18", I think we would likely have to solve some problems in order to accomplish this.

First, we need to be able to observe the spot where the laser hits the secondary, which will be moving around, 10 feet or more above the floor, and about two feet from the outer edge of the truss assembly. We would need to have some kind of remote camera focused on the target to observe it.

Second, I recall the laser spot from the collimator being spread out a few millimeters. It might be too broad to give us the precision that we want, without some additional focusing optics to create a smaller spot at the correct distance.

Third, the laser spot is naturally very bright, and when I used it on the 18" I found it hard to see the markings on the collimator when I used it, due to the high contrast. We would need to have consistent, bright illumination on the target, and possibly some control over the brightness of the beam, in order to create an image in the monitoring camera that we could interpret.

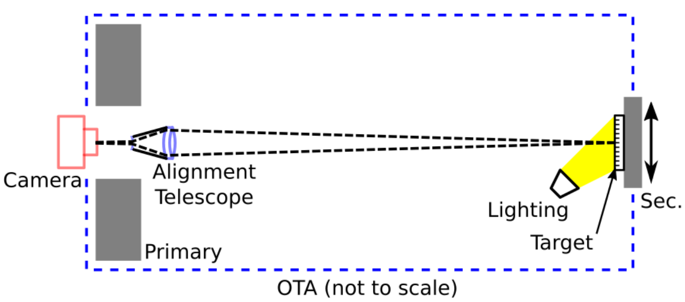
All of this seems doable, but while thinking about it I had an idea. If we have a monitoring camera, focusing optics, and a source of illumination, do we really need a laser?



Additional elements that would potentially be needed for a successful measurement using a laser. This setup measures translational movement of the secondary; to measure tilt, the camera and target move to the primary, and a mirror is added at the secondary.

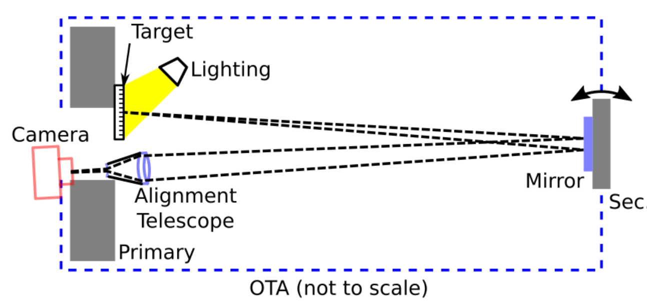
Laser-free alignment

Here is the idea I ended up with. The camera replaces the laser down at the eyepiece location, along with some kind of small telescope that can focus an image on the camera's sensor from a target that is at the end of the tube (for the translational measurement), or twice as far after reflection by a flat mirror (for the tilt measurement.) For the translational measurement, there is an illuminated target (printed on paper) at the secondary; for the tilt measurement, the flat mirror is at the secondary, and the target is down at the primary. The image of the target is captured by the camera and recorded on a laptop, as the telescope is moved through its range of motion. Any movement will be detected as a shift in the image captured by the camera. To me, this seems easier than using the laser, and likely to give a more-precise result.



Camera-based arrangement for measuring side-to-side translational movement of the secondary, which should provide a more accurate measurement than one using a laser, and easier.

I have a couple of ideas on how to create the necessary optics. Easiest would probably be a small finder telescope, that can be mounted where the eyepiece would go, which can accept a 1.25" eyepiece. I have a camera that will go in place of that eyepiece, and an extension tube that should move the focus to where we need it. We could probably stick in a Barlow to get more magnification if we want it.



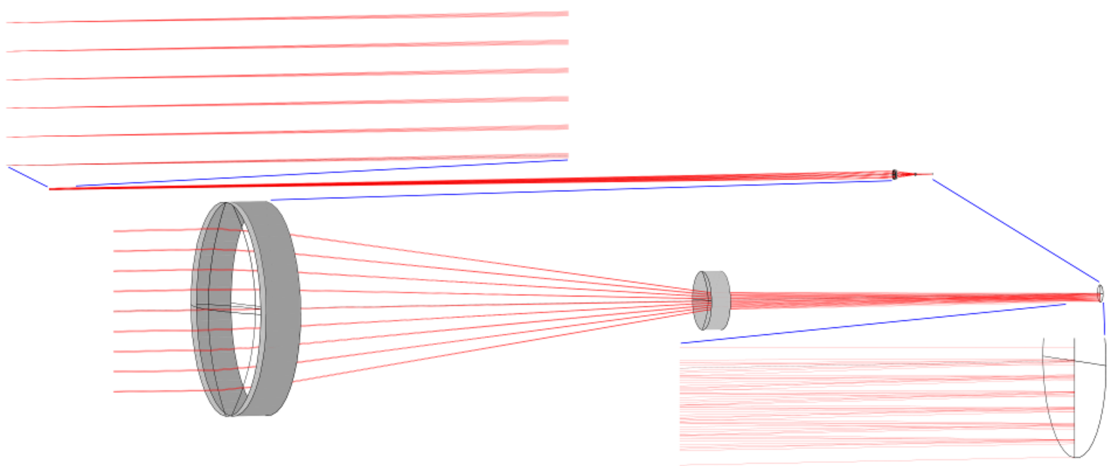
Camera-based arrangement for measuring tilting of the secondary.

Custom-designed optics

Another idea would be to build something specifically for this purpose, using lenses obtained from Surplus Shed and a temporary tube structure, probably made of cardboard and glue. I got the idea for this from a Surplus Shed ad for a simple solar telescope (for use on August 21, duh) designed by Terry Richardson at the College of Charleston (the "Super SSV" described in the second half of this item.)

A few weeks ago, I ran across another interesting development: the optical design package known as BEAM FOUR is now open source! For years I have been using OSLO EDU when I wanted to evaluate an optical design, but this new alternative seemed interesting and I wanted to try it out. (OSLO Lite is more user-friendly while BEAM FOUR is more technical. While OSLO can easily do some things that BEAM can't, such as vignetting analysis, BEAM can evaluate the effects of tilted and shifted lenses, which OSLO EDU cannot do. So, both packages are likely to be useful for our projects.)

I came up with a fairly simple design, using two lenses from the Shed: an 80mm achromatic objective and a minus-7mm double-concave Barlow. With the right spacings, an analysis in BEAM showed imaging of a 1mm target, 3 meters away (the length of the OTA), at a reproduction ratio of about 1:5 (in other words, the 1mm-spaced lines are imaged on the sensor at 0.2mm spacing). I think this arrangement would be able to give us measurements with sub-millimeter precision.



A ray-traced analysis, using BEAM FOUR, of a simple design for imaging an alignment target from one end of the OTA to the other.

But, it would be easier to use a telescope that is already built, if LVAAS has one or if somebody has one to loan. **If you have a small refractor, such as a finder, with a 1.25" (or 2") eyepiece capability, and you are willing to let me borrow it, please let me know.** I promise it won't be harmed. (I suspect that LVAAS may have something stashed away; I haven't really looked yet.)

Or, if you think you have a better idea about how to do this evaluation, please tell me about it. I am open to suggestions! Email director@lvaas.org.

Current Status and Activities:

The primary mirror is complete! It is figured and polished to a focal length of 146.6", cored with an 8.55" central aperture and coated with Optical Mechanics' I-BAD 96 Enhanced aluminum, 96% reflectivity coating. It is on its way back to Lockwood Custom Optics.

New power supplies are ready to install in the telescope, and the slew motors should be operational again before the August meeting.

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.

The Age of The Fermi Bubbles in the Milky Way

The Fermi bubbles are two huge hour-glass like structures 'burped out' by the Milky Way's super massive black hole. They are visible in X-ray and gamma-ray light and were discovered by the Fermi Gamma-Ray Telescope in November 2010. But since the super massive black hole in the Milky Way is relatively quiet, unlike the active super massive black holes in many galaxies, astronomers have been trying to determine when this structure formed.

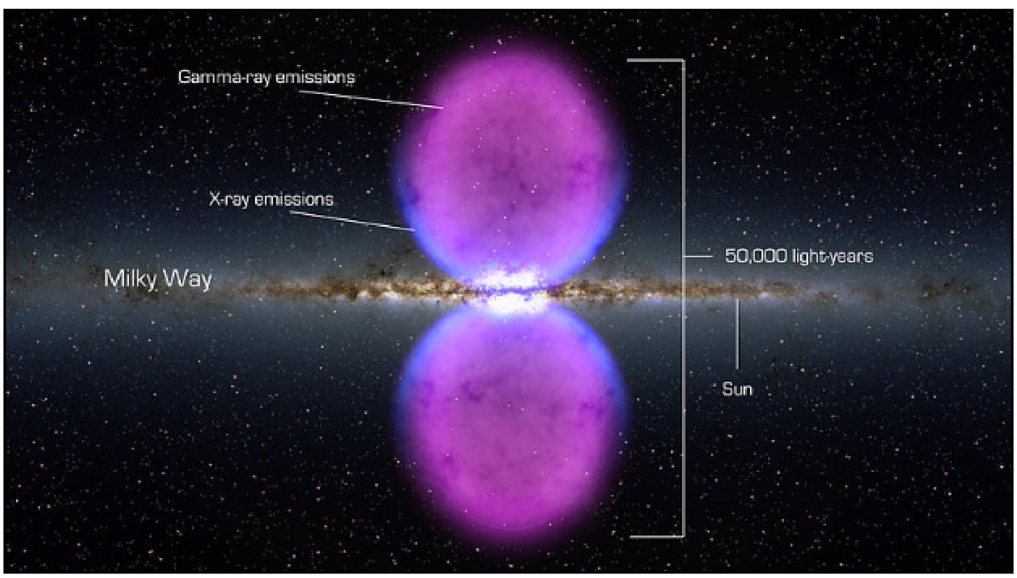


Image – NASA's Goddard Space Flight Center

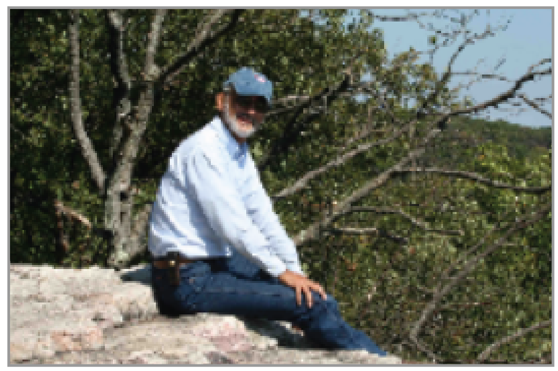
Now a team of astronomers led by Rongmon Gordoloi of the Massachusetts Institute of Technology has determined that the bubbles are 6 to 9 million years old. The age estimate is based on the mapping of the motions of cool gas within the northern Fermi Bubble. Using the Cosmic Origins Spectrograph on the Hubble Telescope, they measured the motions of this gas by observing the ultraviolet light from 46 quasars whose light passed through the bubbles.

The gas in the bubbles contains elements such as silicon and carbon, traveling at 2 million miles per hour and at a temperature of 18 million degrees. The high temperature of the gas is what causes the X-ray and gamma-ray emission. The origin of this gas is the last known "big meal" enjoyed by Sgr A*, the super massive black hole in the center of the Milky Way.

References:

Hubble Dates Black Hole's Last Big Meal. (2017, March 9). Retrieved from http://hubblesite.org/news_release/news/2017-10

The end of my ramblings until next month. Ron Kunkel



StarWatch

by Gary A. Becker

Telescopic Solar Eclipse Viewing

At this point you may be saying, "Not another article about the August 21 solar eclipse, Gary!" As astronomical events go, this sun-moon courtship ranks as one of the biggest occurrences of the early 21st century, except for the April 8, 2024 solar eclipse which will be total in Erie, PA or the serendipitous discovery of a Hale-Bopp type comet which can be viewed from urban locales. What if you would like to observe the partial phases of this eclipse with binoculars or a telescope?

There are two basic and relatively inexpensive methods to attain this goal, but first a warning. **Never, never observe the sun directly without proper filtration.** If you choose to view the partial phases of the August eclipse with an optical aid, my first suggestion would be to purchase a solar filter(s) to attach onto the front end of your telescope or binoculars. **You never filter at the eyepiece end of your scope** because telescopes and binoculars are used to gather light, and already the unmagnified sun has tens of thousands of times too much light for the unaided eye to view safely. Remember the old magnifying glass trick where you set a bunch of leaves on fire by concentrating the sun's energy into a focused area? Binoculars and telescopes do the same thing, but with higher precision. To purchase a front end solar filter(s) for your binoculars or telescope, my suggestion would be to go to the Thousand Oaks website: http://thousandoaksoptical.com/shop/solar-filters/full-aperture-solarlite/ (928-692-8903), but you must act now because the demand is high, and they're a relatively small company located in Kingman, AZ.

Locally, Skies Unlimited, 52 Glocker Way, Pottstown, PA 19465 (888-947-2673) has a knowledgeable staff and is well stocked. Using a telescope, you can also project the sun onto a screen. The key here is finding Sol without looking through the telescope. When pointed at the sun, your scope's tube will make the smallest possible shadow on the ground. Your projection area and or telescope should also be baffled so that direct sunlight does not fall onto the screen. Finder scopes, smaller wide-field instruments attached to the main tube, should either be removed or covered so that no one makes the fatal, eye-suicide mistake of looking through them. Also, use a cheap eyepiece because all the heat and the light of the sun will be transmitted through the telescope, sometimes damaging the eyepiece lenses. Most importantly, never let your telescope or binoculars unattended, because kids do the craziest things, and practice before the event so that on eclipse day everything goes according to plan. Safe solar viewing to all.

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Moravian College Astronomy - astronomy.org

From the LVAAS Archives:
August 1967- A Missing Telescope for a Missing Building, and a Successful Pot Luck Observing Session

by Sandy Mesics

In August 1967, LVAAS received a gift, as reported in the September, 1967 Observer. "The LVAAS has another 6-inch refractor, a gift from the very generous Mr. George S. Philson, of Phoenixville, PA. This telescope has an excellent f:17 objective, a 2.6-inch finder and an optional eyepiece diagonal. The mounting, made by Mike Spacek, is based upon a massive angle-iron pier with a 3-foot square slab of one-half inch steel at the bottom and a smaller slab on top. Within the pier is the drive mechanism and a 6 volt power supply. The polar axis, whose bearings are bolted to a 110 pound chunk of cast iron on top of the pier, carries a 6-inch bronze worm gear on a magnetic clutch. The whole 1000 pound works is held off the ground by three hefty casters, which makes it portable to a limited extent. Present plans are to make a few changes in the mounting and to mount the telescope in the dome of the headquarters building at Pulpit Rock. This should be a fine telescope for planetary and double star work."

Unfortunately, the whereabouts of this telescope remain a mystery, and the Pulpit Rock Headquarters building was never realized, even though the plans for the building were approved that month.

A Successful "Pot Luck" Observing Session

The U.S. Naval Observatory, under the leadership of David Dunham, organized an expedition to observe and record a lunar grazing occultation on Wednesday, August 2, [1967] in cooperation with LVAAS. This type of event occurs when a lunar edge appears to just touch or graze a star or planet as the moon goes by. An observer who is along the path of the graze will see the star disappear and reappear, sometimes a few times, as lunar mountains and valleys pass in front of it. Observers deployed just a few hundred yards apart on a line perpendicular to the graze path may make different observations. By measuring the positions of the observers and timing the disappearance and reappearance events, it is possible to construct an extremely accurate profile of the lunar terrain. Because graze paths rarely pass over established observatories, amateur astronomers are the primary recorders of graze data. The predicted occultation time was approximately 0500 local time. The headquarters selected was the Robson residence in Parker Ford, a center for any one of three alternative sites in the path of the occultation. At that time, Naval Observatory personnel transported their transmission cables and

Figure 1. Riverside California amateurs timing an occultation in 1967. David Dunham is in the white jacket. A Tale of Two Space Rocks (PDF Download Available). Available from: https://www.researchgate.net/publication/252423066_A_Tale_of_Two_Space_Rocks [accessed Dec 27, 2016]

arrived to direct local operations only when the weather forecast twelve hours before the event was 80% favorable. The transmission cable had connections every 400 feet where an observer with a unique tone generator could signal each time a star vanished or reappeared. The recording station also recorded a continuous time signal, so that every tone from an observer was recorded automatically against the time signal.

Although a weak high pressure system was predicted for the wee hours of that morning, a blanket of morning haze was also predicted. Consequently, the Naval Observatory called off the official event but encouraged an unofficial "pot luck" expedition, and they sent detailed instructions.

Sixteen astronomers reported for the "pot luck" occultation, knowing that the odds were unfavorable. Eleven LVAAS members were present, of whom 4 were senior members and 7 junior members – a typical index of interest during 1967. There were 3 astronomers from Delaware and 2 from East Brunswick, New Jersey. Five teams were organized around 5 short wave radio sets, which timed the observations that were made through a 10-inch Newtonian, 2 Questars (3-1/2 inch) and three 6-inch reflectors. There were stop watches at 4 stations. Four of the teams were stationed along a mile of the PRR single track line that runs east of route 724 and west of the Schuylkill River near Parker Ford.

Lunar Grazing Noted by Area Astronomers

Local astronomers recently observed some lunar "grazing" over the eastern part of the state.

"Grazing" is the apparent motion of a star along the edge of the moon, marked by "flashes," the sudden shining of a star through a lunar mountain range, and "blinks," the momentary darkness cutting the bright path of a star as it passes behind a lunar mountain peak.

The data collected by members of the Lehigh Valley Amateur Astronomical Association Inc. was sent to the U. S. Observatory, Washington, D.C., where it will be pooled with other topographical information to help chart the lunar surface.

At 2300, August 1, the night sky showed a few stars; at midnight there was a slight improvement. At 0100 and 0200, August 2, only Vega was visible with averted vision. At 0300, the sky was totally black. One team started home and most of the boys went to sleep to forget a night of failure and frustration. Then, without warning, at 0330, a member of the Delaware team ran into the house and announced, "The moon is up and clear. Let's get to our stations."

The sky then cleared entirely and everyone had one hour to man his station, test equipment and get set for the occultation. The occultation was observed and recorded by all 5 stations. The Naval Observatory received a report rich in information. Interestingly, the 10-inch reflector team (most likely Ernie and Marion Robson} located off the predicted path, reported some grazing, despite being off the predicted path.

One participant summed it all up: "... what began as one of the most frustrating of evenings ended as an exciting and rewarding event." A few months later, LVAAS director Ernie Robson received feedback from the Naval Observatory, as reported in the October 1967 Observer: "Word has been received from the Naval Observatory to the effect that the data collected from the observations of the "pot luck" grazing occultation expedition of August 1-2 are quite interesting and, although not completely correlated, give promise of being significant."

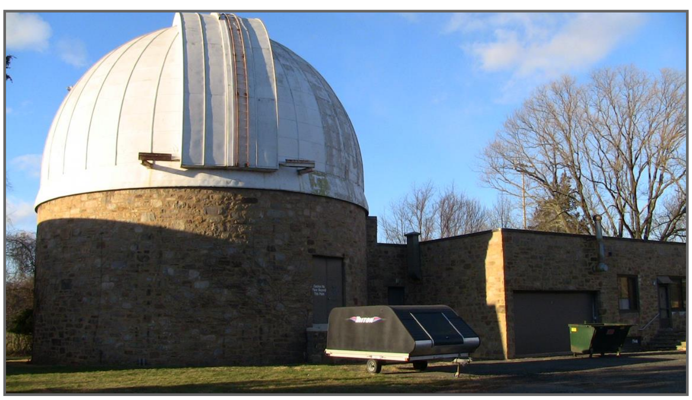
Sources:

The Observer, September 1967, October 1967

Astronomer's Field Notes

Princeton University: March 4, 2017
By Dave Raker

Here are several photos of when I visited Princeton University on March 4, 2017. I included one of the occultation of Aldebaran by the moon.



Clockwise from upper left: FitzRandolph Observatory; the observatory from a higher vantage point; Dave standing in front of Peyton Hall.

Photos courtesy of Dave Raker.

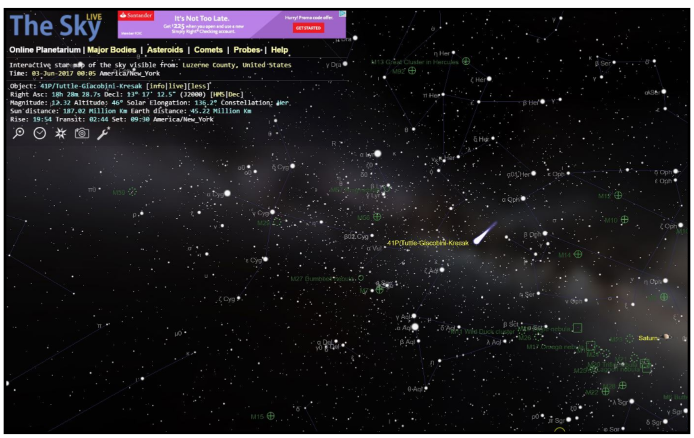
Pulpit Rock Night Skies: June 2, 2017

by Frank Lyter and Ron Kunkel

A nice evening at Pulpit Rock. Skies really cleared out from earlier in the day and the winds were calm. A group of six of us observed till 12:30 under the moonlit sky. We had great views of the moon, Jupiter and Saturn.

Spent some time looking for comet 41P/Tuttle-Giacobini-Kresak to no avail. Took some wide field photos to see if they showed up there. Need to study further to see it can be detected. The attached photos are compressed, the original photos are 22 MB, so there might be something in there:)

Frank and Ron



Looking for Comet 41P/Tuttle-Giacobini-Kresak

Scanning for the comet

Jupiter and jet contrail.

Jupiter at Tinsley.

Looking for the comet...

Ursa Major

Pulpit Rock Astronomical Park; moonlit view.

A view into the skies from the Pulpit Rock, looking for the comet.

All photos courtesy of Frank Lyter.

This article is provided by ***NASA Space Place.*** *With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!*

Twenty Years Ago on Mars…

By Linda Hermans-Killiam

On July 4, 1997, NASA's Mars Pathfinder landed on the surface of Mars. It landed in an ancient flood plain that is now dry and covered with rocks. Pathfinder's mission was to study the Martian climate, atmosphere and geology. At the same time, the mission was also testing lots of new technologies.

For example, the Pathfinder mission tried a brand-new way of landing on Mars. After speeding into the Martian atmosphere, Pathfinder used a parachute to slow down and drift toward the surface of the Red Planet. Before landing, Pathfinder inflated huge airbags around itself. The spacecraft released its parachute and dropped to the ground, bouncing on its airbags about 15 times. After Pathfinder came to a stop, the airbags deflated.

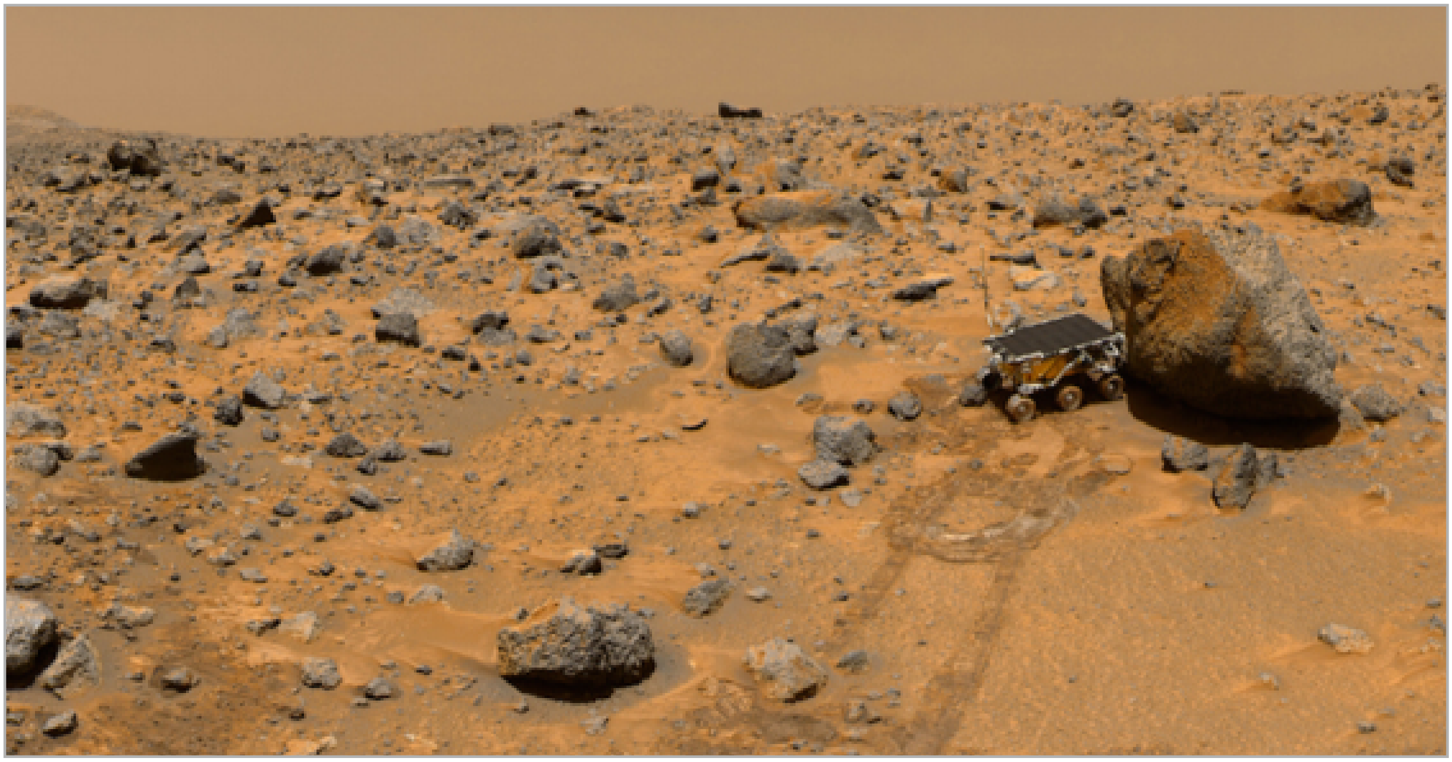
Before Pathfinder, spacecraft had to use lots of fuel to slow down for a safe landing on another planet. Pathfinder's airbags allowed engineers to use and store less fuel for the landing. This made the mission less expensive. After seeing the successful Pathfinder landing, future missions used this airbag technique, too!

Pathfinder had two parts: a lander that stayed in one place, and a wheeled rover that could move around. The Pathfinder lander had special instruments to study Martian weather. These instruments measured air temperature, pressure and winds. The measurements helped us better understand the climate of Mars.

The lander also had a camera for taking images of the Martian landscape. The lander sent back more than 16,000 pictures of Mars. Its last signal was sent to Earth on Sept. 27, 1997. The Pathfinder lander was renamed the Carl Sagan Memorial Station. Carl Sagan was a well-known astronomer and science educator.

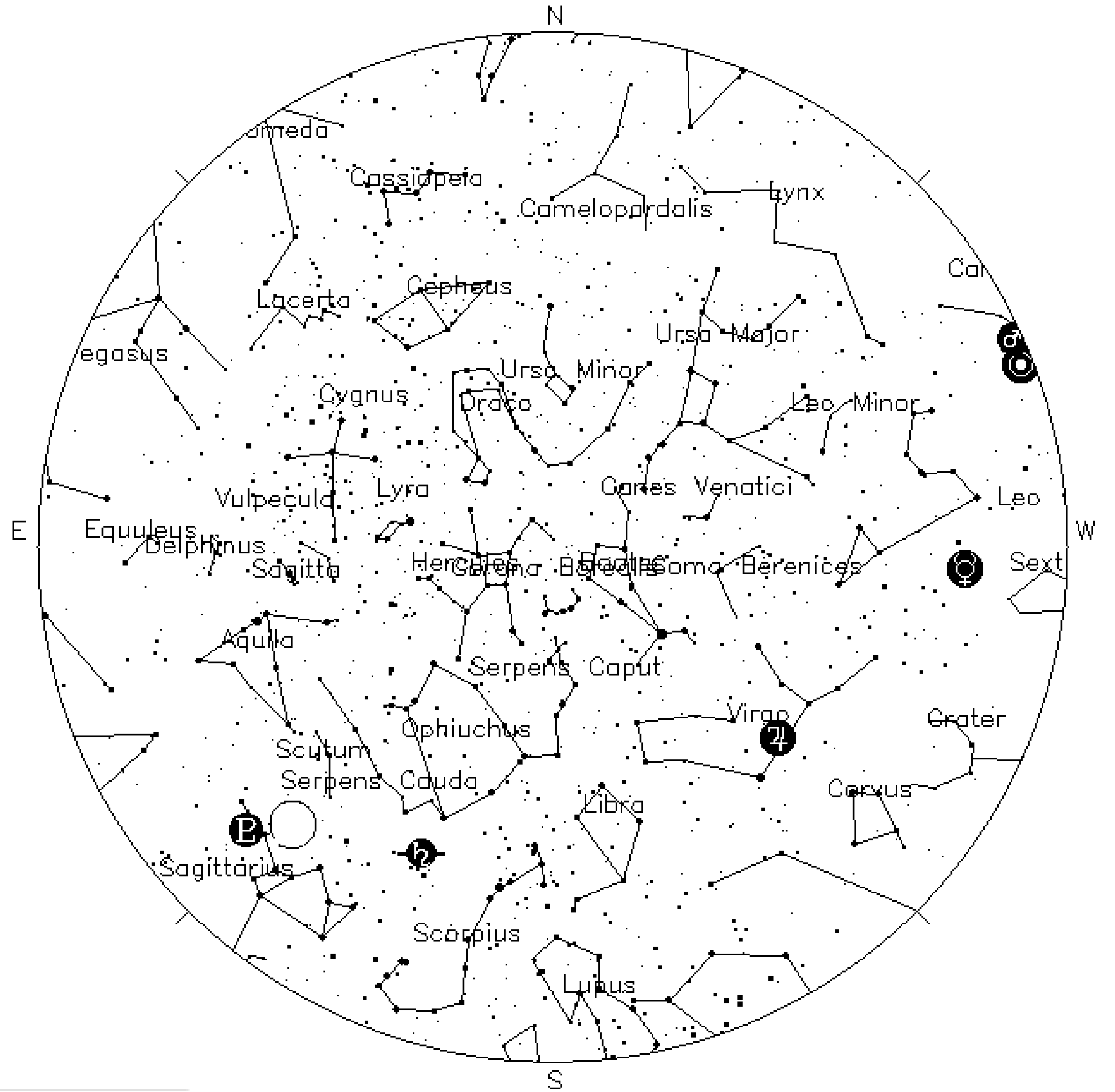
Pathfinder also carried the very first rover to Mars. This remotely-controlled rover was about the size of a microwave oven and was called Sojourner. It was named to honor Sojourner Truth, who fought for African-American and women's rights. Two days after Pathfinder landed, Sojourner rolled onto the surface of Mars. Sojourner gathered data on Martian rocks and soil. The rover also carried cameras. In the three months that Sojourner operated on Mars, the rover took more than 550 photos!

Pathfinder helped us learn how to better design missions to Mars. It gave us valuable new information on the Martian climate and surface. Together, these things helped lay the groundwork for future missions to Mars. Learn more about the Sojourner rover at the NASA Space Place: https://spaceplace.nasa.gov/mars-sojourner



The Mars Pathfinder lander took this photo of its small rover, called Sojourner. Here, Sojourner is investigating a rock on Mars. Image credit: NASA/JPL-Caltech

Sky above 40°33'58"N 75°26'5"W at Sat 2017 August 5 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 [mgardi@watdscu.waterloo.edu].

Lempel-Zim compression based on "compress"

Modified by Marcel Wijkstra [wijkstra@fwi.uva.nl]

*Check out additional features of **Your Sky** at* : http://www.fourmilab.ch/yoursky/

Please visit lvaas.org for up-to-the-minute calendar information

AUGUST 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		01	02	03	04	05
06	07 Full Moon	08	09	10	11	12 General Meeting 7:00 PM Pulpit Rock
13 General Meeting Pulpit Rock (rain date)	14 Last Quarter Moon	15	16	17	18	19
20 Deadline for submissions to the Observer	21 New Moon	22	23	24	25	26 Star Party
27 LVAAS Board of Governors Meeting	28	29 First Quarter Moon	30	31		

SEPTEMBER 2017

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

2017 LVAAS Event Calendar

*** Lunatics and Stargazers has been discontinued until further notice**

2017 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 8	Muhlenberg	29	12	no mtg	no mtg		no camping	27	5	12	19
February	2:00 PM 12	Muhlenberg	26	9	no mtg	no mtg		no camping	26	3	10	18
March	2:00 PM 12	Muhlenberg	26	9	3 & 31	4		no camping	27	5	12	20
April	9	S.M.	30	13	no mtg	1		7 – 9	26	3	11	19
May	7	S.M.	21	11	5	6		19 – 21	25	2	10	18
June	11	S.M.	25	no mtg	2	3		9 – 11	23	1 30	9	17
July	05:00 PM 8	S.M.	30	no mtg	28	29		14 – 16	23	30	9	16
August	12	Pulpit	27	no mtg	25	26		4 – 6	21	29	7	14
September	10	S.M.	24	7	29	30		8 – 10	20	27	6	13
October	8	S.M.	29	5	27	28		6 – 8	19	27	5	12
November	2:00 PM 12	S.M.	26	2	no mtg	25		3 – 5	18	26	4	10
December	2:00 PM 9	Grace Community	17	7	no mtg	no mtg		no camping	18	26	3	10

Megameet is currently scheduled for September 15-17. A new rain date will be announced.
July, Aug & Dec are Saturday meetings with rain date on Sunday
Jan., Feb., and March meetings are at Muhlenberg College
August meeting is at Pulpit Rock
December meeting / Holiday Party is at at Grace Community Church
All meetings 7 P.M. unless otherwise noted

Contributed by Bill Dahlenburg

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 (LVAAS) Inc., 620-B East Rock Road, Allentown, PA, 18103 and as of June 2016, is available for public viewing. Contact the editor at editorlvaas@gmail.com.

Members please use above email address for submissions.

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 BOG (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. Your comments and suggestions are welcome.

Every effort is made to properly credit the sources of the material used in this publication. If additional credit is required, please notify editorlvaas@gmail.com for a timely correction.

To become a member of LVAAS, please follow the directions on the application form, which can be downloaded at: http://lvaas.org/filemgmt_data/files/LVAAS2017MembershipRenewalForm.pdf.

For existing members to update LVAAS information, or to make member contact changes or corrections, please email the membership director membership@lvaas.org.