The Observer

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September, 2019
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The Elephant Trunk nebula in constellation Cepheus, imaged in narrowband (H alpha, SII, and OIII); 10 minute exposures (30 frames of H alpha, 16 frames O3, 17 frames S3) for just over 10 hours cumulative exposure time. I processed in DSS and photoshop and used a modified Hubble palette (SHO) where green is changed to a more pleasing gold color.
Imaged by **Jason Zicherman.**

Cover image: **The Dumbbell nebula by Jason Zicherman**
Date of acquisition: 7/11,7/13,7/20, 2019; H alpha 600 second exposures x 10; luminosity 300 seconds exposure x 15, RGB 300 seconds x 15 each; processed in Deep sky stacker and Photoshop; Acquired with Sequence Generator Pro and PHD2; H alpha data was layered on top of LRGB as an additional Luminosity layer. Tec 140 f7 scope on Astrophysics 1100 Goto mount, TEC 0.9x flattener/reducer. Camera: QSI 685 wsg; Astrodon filters, off axis guider: Ultrastar

ad astra**********

Have you visited Pulpit Rock lately (or ever)? If not, you are missing out on one of the greatest benefits of LVAAS membership. We will all probably remember this summer for the excessive rain that we experienced in the beginning of the season, and the record-breaking heat in July, but let's also remember the really fine evenings we had for several LVAAS events on the mountain.

Mega Meet

We only needed to reschedule Mega Meet once this year, but the revised date crept up and surprised me. I had forgotten all about it until only a few days before! I decided I had better check the weather forecasts and then suddenly realized that we might actually have a good weekend for astronomy.

And we did! There was a decent-sized crowd on the mountaintop on Friday, July 26, including a bunch of LVAAS members, a couple of hikers passing through, and a few from Ron Kunkel's family, there to serve cake in honor of Ron's birthday. Of course the field was in excellent shape, thanks to Ron's dedication to caring for the landscape.

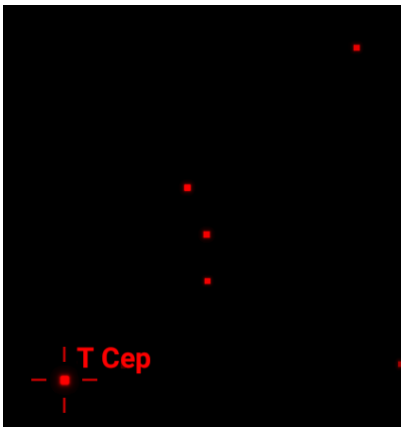
It turned out to be a good, though not quite perfect evening for observing. There seemed to be a fair amount of water vapor in the air and so the transparency was below average, but I thought the seeing was reasonably good — not much turbulence — which made it a good night for planets, if not for deep-sky objects. Tom Duff was showing off his new Stellarvue SVX130T Apochromatic Triplet Refractor, with a Tele Vue Nagler 16mm eyepiece and Tele Vue 2X Barlow, and I think it is the best view of Jupiter and Saturn that I have seen.

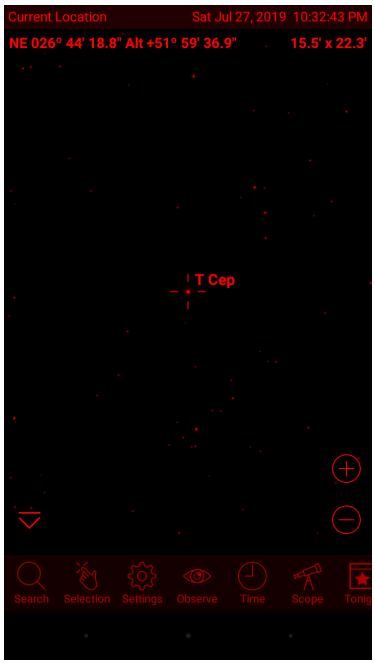
Saturday was almost as good, although different. The air was a little more transparent, but there were some clouds wandering in, which eventually shut down the observing session a few hours before dawn. I spent most of the evening hanging out in the refurbished Spacek Observatory. The combination of the roll-off building and the 12" Meade SCT make for a very comfortable observatory, especially on a night like this, when the air was pleasant and the insects were mostly leaving us alone.

We were joined for a little while by Alex Arnold, the physics grad student from Lehigh University who was the speaker at out February meeting. You may recall that he studies Mira variables, and he mentioned that he had never actually seen one through a telescope. This seemed like a reasonable challenge, worth a few minutes' time. Using my Android phone, I went through the list on the page linked above, swapping back and forth with the Sky Safari planetarium app, checking each Mira for height above the horizon. In a few short minutes I had selected T Cephei, and John Kmetz helped me to target the Meade instrument on it, using its alternative designation SAO 19229.

Then it was a challenge to confirm we were looking at the right star. I'm pretty good at comparing star charts, once I have the scale roughly correct. Again John was a big help as we tossed a couple of

numbers back and forth to calculate an estimate of our field of view. Matching this in Sky Safari yielded a display roughly as shown in the illustration, and the view in the eyepiece matched the configuration in the enhanced detail shown to the left. The layout is just asymmetrical enough to allow distinguishing the target star from its near-twin, in the upper right, on the opposite side of the distinctive triplet in the center.





Which was fading out, before my eye, as I tried to carefully make up my mind which was which! A cloud was in the process of getting in the way. I quickly centered the correct star in the eyepiece, and called for Alex to take a look before it was gone completely. Mission accomplished.

Special Guests

On August 4, a few of us met again at Pulpit Rock to entertain Carl Hein and his wife Alyse, as well as his friends John and Liz Hartman. Carl volunteers at the WK&S Railroad, as does our Pulpit Rock Observatories Director, Frank Lyter; and it was there that Frank met Carl, and learned that he had helped build the Kawecki Observatory! We heard some great stories about how Carl's 150 pounds figured in to the calculation of how many concrete blocks the helicopter could carry at one time, along with Carl and Henry Kawecki.

The August Meeting

Since that night turned cloudy, Carl and Alyse came back for our membership meeting on the following Saturday. He told me he was curious about how we planned to handle a 446-pound glass mirror, so I was glad I had some material in my presentation to cover that. (446 pounds is the estimate provided by the CAD software, based on an accurate description of the mirror's shape.)

We had another nice night! The main limitation to observing was the moon, but we had a few members bring telescopes, and others using the fixed observatories. Tom Ledoux set up a video astronomy demonstration in the Spacek Observatory (the roll-off), and it proved to be very popular with the group. (I apologize to Tom for giving him a hard time as he was setting up; I misunderstood his intentions and got the idea that he was planning to take over what is now our most popular telescope at PR, to do astro-imaging on a "group night.")

As I write this, it's raining again, but Nature gave us three lovely evenings for our Pulpit Rock events in the past month. (And I'll throw in a mention for the perfect weather we had for the July picnic at South Mountain, too! Let's count our blessings.) I hope to see you soon at The Rock.

Ad Astra!

— Rich Hogg

LVAAS General Meeting: Public Welcome!

Sunday, September 8, 7:00 p.m.

South Mountain Headquarters, 620B East Rock Road, Allentown PA

Program: "The Great Ptolemaic Smackdown and Down-n-Dirty Mud-Wrassle"

Presented by

Author Mike Flynn

The transition from the Classical geostationary model of the World to the Early Modern geomobile model was neither instantaneous nor obvious. Scientists and astronomers had sound empirical reasons to regard heliocentrism as falsified. And their instrumentalism meant they could happily calculate epicycles without feeling obliged to think them real.

Let's follow the trail from the settled, consensus science of the 16th century, when the term for "astronomer" was mathematicus, to the unsettled science of the Scientific Revolution and beyond.

Mike Flynn is a prolific science fiction author, and has written more than 70 stories and articles,as well as 15 novels and story collections. He received the Robert A. Heinlein Award for his body of work, and the Sturgeon prize for the short story House of Dreams. His most recent work is the collection Captive Dreams, six interlinked stories dealing with issues of morality and technology. Mike lives in Easton, PA with his wife, Margie.

Minutes for the LVAAS General Meeting - August 10, 2019

The August 2019 LVAAS General Meeting was held on August 10th at the LVAAS facility Pulpit Rock Astronomical Park between Lenhartsville and Hamburg, PA. Attendance numbers were not recorded. As this is the only meeting held at Pulpit Rock every year, the meeting was less formal than usual, held outside, and included observing sessions before and after the meeting, using Kyle Kramm's telescopes and the club's 12-inch Meade in the roll-off observatory. The meeting was opened by Director, Rich Hogg at 7:20 p.m.

The first order of business was a first reading for new member Mark Puskas, introduced by Rich Hogg. Mark learned about LVAAS while hiking at Pulpit Rock a few weeks before and thought it looked interesting. He saw a meteor shower 30 years ago, and has since noticed the encroachment of light pollution and how it has changed the views in the area and was hoping to see better views here.

Rich reminded everyone that the September meeting will be at East Stroudsburg University's new planetarium. (*Editor's note: Moved to South Mountain*) Also: Watch out for snakes while at Pulpit Rock!

Pulpit Rock Observatories Director Frank Lyter introduced two distinguished guests: Carl Hein and his wife, Alyse. Carl helped Henry Kawecki build the 8" refractor observatory. A plumber, Carl would help Henry with projects. One day Henry asked Carl to help him with the observatory. The plan was to fly up to the site in Henry's helicopter.

After asking Carl how much he weighed, Henry determined that he could fly both of them plus 8 cinder blocks up on each trip, and that's what they did! Fourteen trips were required to bring up all the blocks. Henry owned about 3000 acres of land at the site. When the town of Hamburg was required to put in a reservoir, he donated the land, reserving the site of the observatory that was on top of the mountain, which was eventually donated to LVAAS. It was pointed out that current member and Risk Management committee director, Dave Moll also had experience riding in Henry's helicopter.

(3rd from right) Carl Hein, with his wife Alyse; (r) friend John Hartman and Liz; (l) Ron Kunkel, Frank Lyter and Duncan the Sheltie. Carl helped Henry Kawecki build the Kawecki observatory. Carl related that they initially used Henry's helicopter to carry up 8 cinder blocks at a time before switching to bringing material up via the jeep trail. We were able to show Carl and friends the observatories before being run off of the mountain by rain. There is a chance Carl may attend our meeting on Saturday evening.
Photo courtesy Frank Lyter

A brief recess was called so that visitors could take advantage of the view from the Pulpit Rock lookout while it was still light out. The meeting was resumed at 8:30 p.m.

The speaker was Rich Hogg and his topic was the Schlegel Observatory Update, including the 40" telescope. In addition to being the current Director of LVAAS, Rich is a career engineer and software developer and a "glutton for punishment" when it comes to taking on difficult projects. He has BS and MS degrees in Electrical Engineering from Lehigh University.

The project was started in the mid-1980's. The original plan was to grind the mirror at LVAAS, but that proved to be impractical, so a contractor was sought out. After some problems with 2 or 3 contractors, the mirror was finally ground by Lockwood Custom Optics in Illinois. The main mirror is finished (ground and coated), and the grinding of the secondary is being completed as this is being written. In order to give LVAAS a break on the cost, he has worked on our mirrors between other projects. This takes longer, but we were in no particular hurry, as we have lots of other projects to complete!

The telescope's structure is currently disassembled for modification, paint stripping, and re-painting. Last year, the first obstacle to be overcome was the polar alignment: the adjustments on the base turned out to be inadequate, necessitating the rebuilding of the two horizontal adjustors and the pivot bolt assembly. These changes allowed for an alignment to within 1 arc-minute of the celestial pole.

The next hurdle was the realization that the truss assembly was not sufficiently rigid to support the secondary mirror assembly properly. The truss tube attachment points were shifted to create a more rigid arrangement, and the attachments of the tubes to each other and to the mirror cells were beefed up, greatly improving the stiffness. In anticipation of the delivery of the glass main mirror later this year, the concrete "mirror" (acting as a surrogate and counterweight) had to be removed. The robustness of the concrete (compared to the actual glass mirror) meant we could practice removing and installing the mirror several times before trying it with the fragile and expensive mirror, especially considering that the concrete mirror had not been removed from the telescope for a few decades, and very few current club members had actually done it or even seen it done!

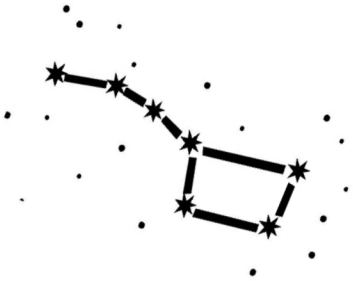
There is a cart with 4 hydraulic jacks on it for lowering the mirror cell out of the telescope, but since the mirror weighs about 500 lbs, the telescope had to be secured in place, and it was decided to also use a secondary support device (an engine hoist) to prevent any unpleasant surprises when the mirror was removed. As a result of the trials, a few modifications are being made to the procedures and hardware. Once the "mirror" was removed, the airbag that supported it (in addition to the 3 hard-point supports) could be examined.

It appears to be in good shape. Without the airbag, distortion from the hard points would exceed one wavelength of blue light (400 nm.) Rich took the opportunity to do some finite element analysis and computer modeling to determine that about 0.5 psi would be needed in the airbag to reduce the distortion to below 1/4 wave (would still like to improve that.) Now he just needs to work on the airbags for the edges of the mirror, although he does not think that that should present any insurmountable problems, since the mirror cell is the same width as standard blood pressure cuffs.

As for the paint removal, Andy Heilman has been using a less toxic citrus paint stripper to remove the old paint down to the primer. The new paint will be an auto-type spray paint. Although most parts near the light path will be flat black, the color scheme for the outside of the telescope has yet to be determined. The large areas of the wheels may be covered with a wrap of a star chart, similar to the wrap that was used for the new sign at Pulpit Rock. Completion of the entire telescope project may take another year. The control system will be composed of several small computers, similar to Raspberry Pie, and similar to what was done for the 18" telescope. This should allow GoTo operations eventually, but will probably initially be the equivalent of digital setting circles. For reference, the telescope will have a 40" main mirror, a 10" secondary, and will be an f/14 with a 560" focal length. The field of view will be approx. 0.2°, and may require custom eyepieces to obtain magnifications below 200x. A question was asked: what will we be able to image with it? The answer: planets - probably; deep sky objects - we'll see. It all depends on how well the telescope guides. The Q&A ended at 9:27 p.m. and the meeting was adjourned to continue observing.

Submitted by Earl Pursell, Secretary

Image (l) courtesy Frank Lyter; other images courtesy Frances Kopy



UACNJ provides free public programs at our Observatory in Jenny Jump State Forest from April through October on Saturday evenings. An astronomy presentation begins at 8 PM in the lecture hall regardless of the weather and is followed by stargazing on the observatory's telescopes until 10:30 PM, weather permitting.

UACNJ Weekly Talks for 2019

April 6	- What's Up in the April Sky?	- Lonny Buinis
April 13	- Size Scales of the Solar System and Beyond	- Jason Kendall
April 20	- Journey to the Stars	- Karl Hricko
April 27	- What Happened to Pluto?	- Ron Kunkel
May 4	- What's Up in the May Sky?	- Lonny Buinis
May 11	- Making Isaac Newton Proud: Modern Newtonian Telescopes	- Rob Teeter
May 18	- Astronomy for Beginners	- Ken Taylor
May 25	- Night Vision and Astronomy	- Earl Pursell
June 1	- What's Up in the June Sky?	- Lonny Buinis
June 8	- How the Stars Got Their Names	- Bill Murray
June 15	- The Life and Death of Stars	- Walt Windish
June 22	- Mars Through the Dust Storm	- Clif Ashcraft
June 29	- Eclipses, Occultations, and Transits	- Gregg Waldron
July 6	- What's Up in the July Sky?	- Lonny Buinis
July 13	- Fly Me to the Moon	- Sean Post
July 20	- New Rides to the Moon	- Dale Skran
July 27	- Let's Go to the Moon	- Karl Hricko
Aug 3	- What's Up in the August Sky?	- Lonny Buinis
Aug 10	- Astronomy for Beginners	- Ken Taylor
Aug 17	- New Horizons Visits Ultima Thule	- Michael Dean Lewis
Aug 24	- You Bought a Telescope, Now What?	- Paul Fischer
Aug 31	- The Milky Way Galaxy - Structure & Evolution	- Ron Kunkel
Sept 7	- What's Up in the September Sky	- Lonny Buinis
Sept 14	- Photographing Night Sky Landscapes	- Stan Honda
Sept 21	- Traveling in Space and Time	- Gary DeLeo
Sept 28	- Northern Lights	- Gregg Waldron
Oct 5	- What's Up in the October Sky?	- Lonny Buinis
Oct 12	- Introduction to Video Astronomy	- Bill Murray
Oct 19	- The Cosmic Distance Ladder	- Jason Kendall
Oct 26	- The Beauty and Power of the Universe	- Walt Windish

Street Address:
333 State Park Road
Great Meadows, NJ

More information and alternate directions can be found through our website

www.uacnj.org

From the LVAAS Archives:

Junior Astronomers Dedicate Observatory

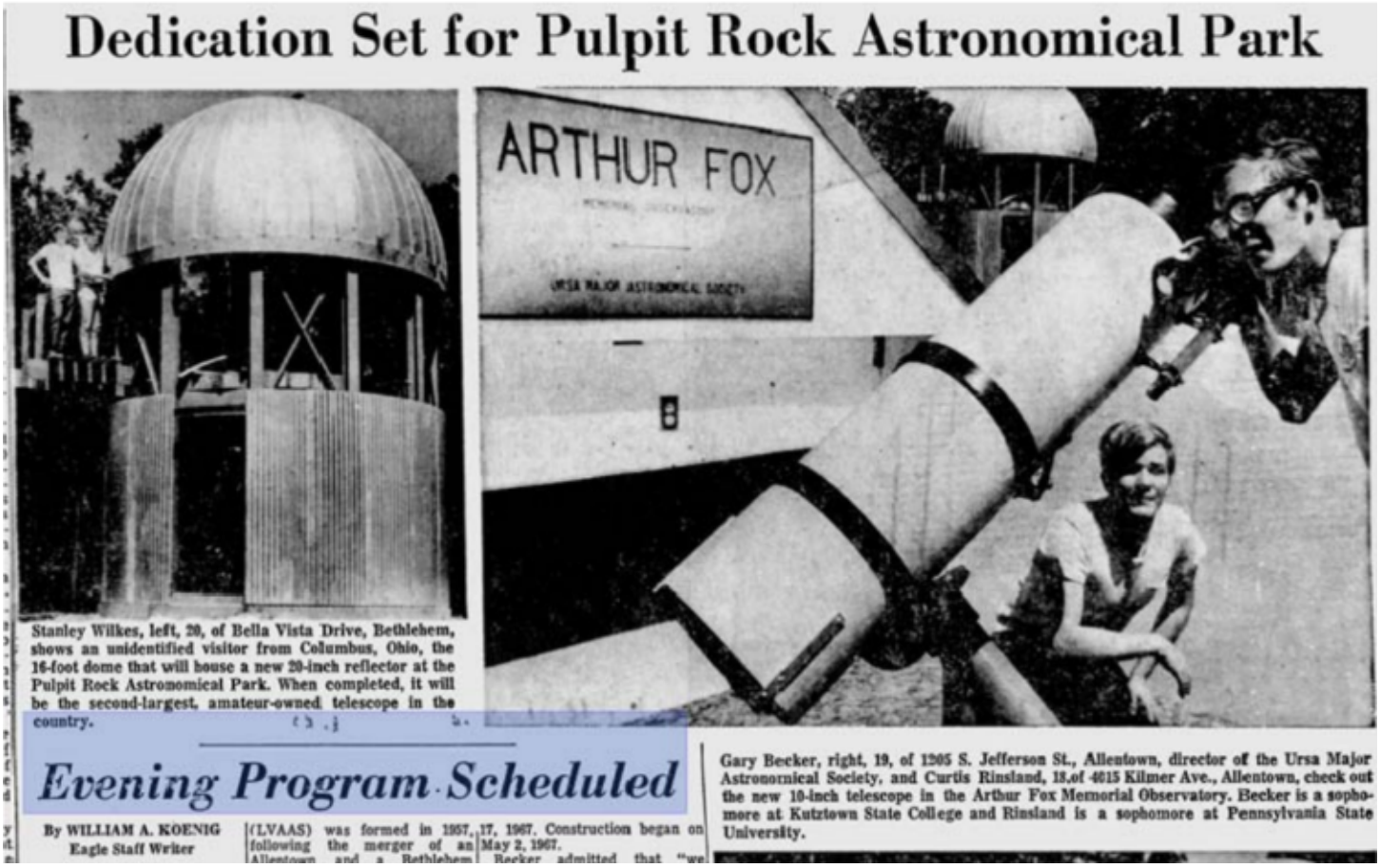
by Sandy Mesics

In August 1969, members of the Ursa Major Astronomical Society (UMAS), the youth group of the LVAAS, dedicated the first LVAAS-built observatory at Pulpit Rock. The project started in 1967 when I was Director of UMAS. Our first objective was to get the observatory from the planning to the building stage. The group undertook a major fundraising campaign, sending over 400 letters to Lehigh Valley business leaders and industrialists seeking donations. The UMAS received large contributions from Ernie Robson and noted philanthropist Philip Berman, who that year purchased Hess' Department Store. The observatory was named in honor of Arthur Fox. Fox was a young LVAAS member and eighth grade student at Moravian Prep who was struck and killed by a car in Hanover Township in 1965. He was 15 years old.

Construction commenced in the basement of member Stan Wilkes in February, 1968. The observatory would be a 10 ft. x 10 ft. roll-off design, housing a 10-inch f/4.7 Newtonian reflector with an 8 x 30 finder scope. The mirror blank and diagonal were donated by UMAS advisor and LVAAS director Paul Shenkle, and optical fabrication was done by UMAS member Jeffrey Shaffer, who reportedly figured the primary mirror to between 1/15 to 1/20th wave. Mike Spacek donated the aluminizing and coating, which were done in his shop. The mount was donated by Earl Bodder, and was identical to a mount used for the 10 inch Newtonian at South Mountain. I refurbished the mount. A feature of the scope was an optically perfect optical flat, to which the secondary mirror was affixed. This was manufactured by Spacek, and donated by the Robsons. Another unique feature of the observatory was wall-to-wall carpeting!

In May, 1968, the site atop Pulpit Rock was cleared and leveled, and the pier and footings were poured. In July 1968, the observatory was dismantled and moved to Pulpit Rock through the courtesy of Jones Trucking. Construction was virtually complete by November 1968, when the building was winterized. Finishing touches were performed in spring, 1969. It was estimated that the Fox observatory cost approximately $600.

The Fox Observatory was formally dedicated on August 24, 1969. More than 140 people attended the event. Dignitaries included the Mayor of Hamburg, Clayton Boltz, the District Attorney of Berks County, Robert van Hoove, and Mr. and Mrs. Sidney Fox, parents of Arthur Fox. For his efforts, Stan Wilkes was given an award by the UMAS.



Dedication Set for Pulpit Rock Astronomical Park

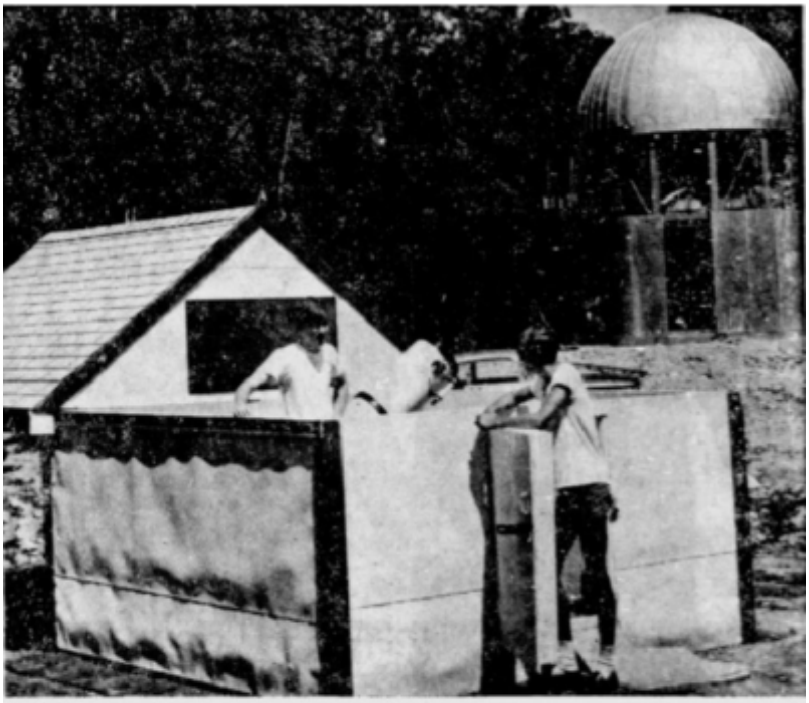
Stanley Wilkes, left, 20, of Bella Vista Drive, Bethlehem, shows an unidentified visitor from Columbus, Ohio, the 16-foot dome that will house a new 20-inch reflector at the Pulpit Rock Astronomical Park. When completed, it will be the second-largest, amateur-owned telescope in the country.

Evening Program Scheduled

By WILLIAM A. KOENIG
Eagle Staff Writer

(LVAAS) was formed in 1957, 17, 1967. Construction began on following the merger of an May 2, 1967.

Gary Becker, right, 19, of 1205 S. Jefferson St., Allentown, director of the Ursa Major Astronomical Society, and Curtis Rinsland, 18,of 4015 Kilmer Ave., Allentown, check out the new 10-inch telescope in the Arthur Fox Memorial Observatory. Becker is a sophomore at Kutztown State College and Rinsland is a sophomore at Pennsylvania State University.



Young Wilkes, inside the observatory, and Becker discuss dedication ceremonies which will be held tonight at 7 p.m. The enclosure which Wilkes is standing in is complete with wall-to-wall carpeting and electrical current. — Eagle Photos by Daniel J Devine.

In summer, 1974, the roof was reconstructed, and some wall panels replaced. In summer 1975, Paul Shenkle re-polished the mirror and readjusted the mounting plate for a better polar alignment. A 2.5 inch Tasco guidescope was purchased for the instrument. Unfortunately, since the Fox Observatory was constructed of wood, it was vulnerable: by summer 1976, an inspection revealed that it needed scraping and painting, and was rapidly deteriorating, and would last no longer than two to three years. The UMAS discussed the possibility of helping to finance the construction of an observatory to replace the Fox building. The LVAAS board passed a resolution that the UMAS purchase sheet metal for no more than $150 for future use in either repairing or rebuilding the observatory.

By the next month, the UMAS had raised $130. In June 1977 vandals destroyed the door by smashing a gaping hole in the structure. Repairs were made during the summer months, and the optics, which were undamaged, were stored in the new 12 inch building.

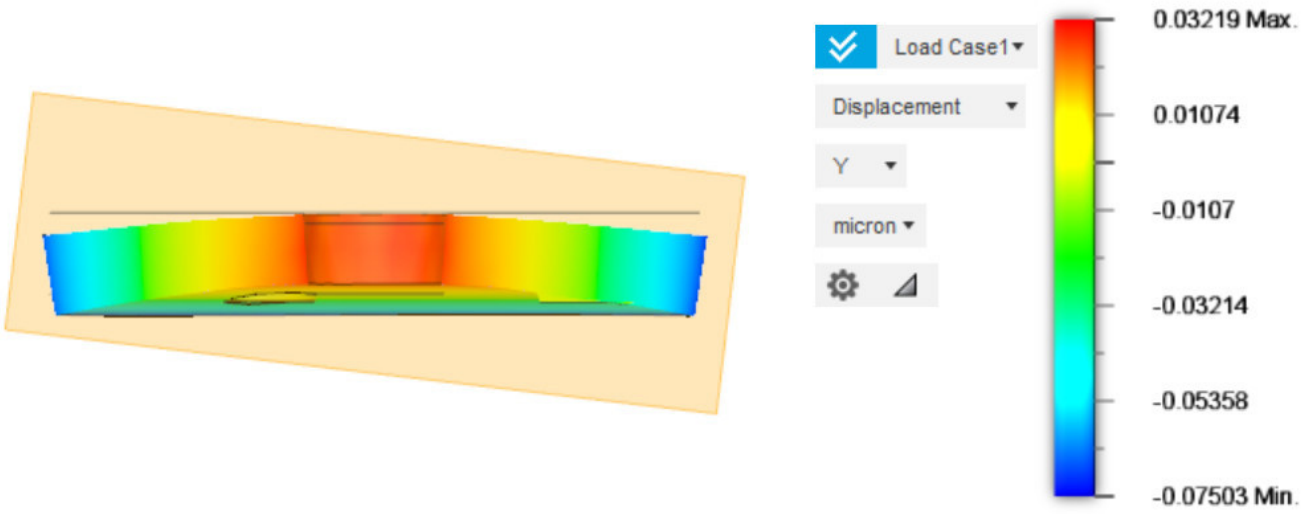
The following year, the optical set was removed, and a crack was noted in the optical window. The Fox Observatory was still listed as an LVAAS building as of February 1985, but in the summer of 1989, after twenty years of service and a lack of upkeep, the Fox Observatory was leveled. Sadly, the first LVAAS- built observatory at Pulpit Rock became the first observatory to be demolished at Pulpit Rock.

Schlegel Observatory Report

by Rich Hogg – September 2019

Some of this month's column will recapitulate material I presented at the August meeting (in case you missed it.)

Mirror Support - the airbag seems to check out as a good solution for supporting the back side of the main mirror (the axial support, i.e. the support along the direction of the optical axis of the telescope.)



The image above shows the result of a simulation of the mirror lying flat (as if the telescope were pointed straight up), supported by the three hard pads and the airbag inflated to 0.5psi. What is shown is not the actual shape, but the amount of deformation from the ideal shape, in the vertical direction. This is shown by the color coding and the shape rendered in the figure, in which the deformation is highly exaggerated to make it visible.

The surface of the mirror is deforming from it's ideal shape by less than 100nm, peak-to-peak, which is not bad. But the result is actually better than that, because the deformation, as evidenced by the exaggerated shape shown as well as by the smooth color gradient, has a roughly spherical profile.

This is good because there exists a deformation profile which is roughly spherical, and about the same overall magnitude, that would do nothing but change the focal length of the system a tiny bit. In other words, it would result in no image deterioration, it would just move the focal plane a small amount.

This software won't let us export the deformation profile for analysis in an optical simulator, otherwise we could quantify this exactly. I was tempted to say that that's "unfortunate" but in reality, it would be splitting hairs to do that. You can tell by inspection that this profile is very close to spherical, and that at least 80% of it can be compensated for by a focus shift, leaving at most a tiny amount of true distortion in the sub-1/8-wave ballpark. It's too small to worry about; there will be other errors in the system (and inaccuracies in this simulation) that will add up to more. In my opinion, to the best of our ability to model it, the axial airbag support will perform very well.

What about radial support? **-** I haven't started modeling the radial airbag idea yet, but I did run some initial checks on an alternative that I thought of. (The axial support takes all of the mirror's weight when the telescope is pointed straight up. The radial support takes most of the mirror's weight when it is pointed at a low altitude angle.)

Quiz question: the mirror is 40 inches in diameter. Suppose you made a huge block of glass the shape of a swimming pool, 40 inches deep, and as long and as wide as you can imagine it. So it is lying there on the ground, not changing shape but just compressing slightly under its own weight. How much does the top surface sink down from the linear compression?

The answer I come up with, two different ways (a Fusion 360 simulation, and a manual calculation) is about 180nm. I did this while thinking about the sling arrangement that our optician is using to support the mirror for testing. I decided that I agree with him, that the sling is a good solution; it is what is used in many large Dobsons, that only tilt in one direction. It won't work in our equatorial fork mount.

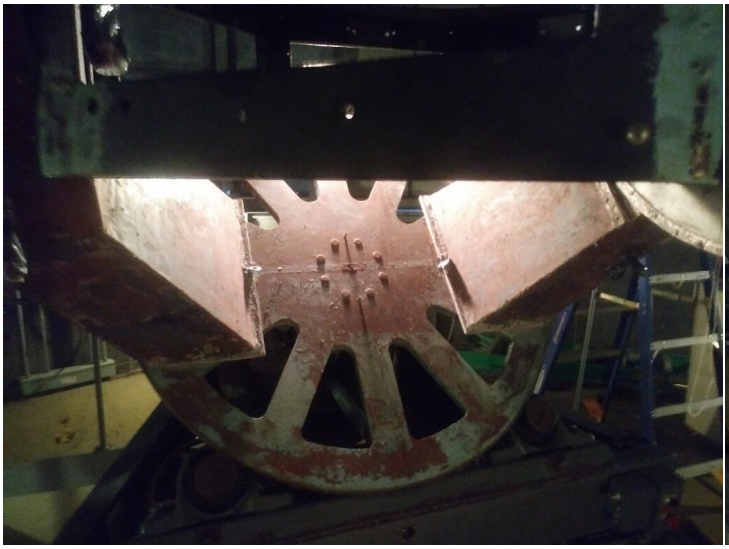
You will see some deformation from radial forces on the mirror, when it is pointed at a low angle, but not nearly as much as when it is pointed high in the sky. It is much stiffer in the 5-inch-by-40-inch orientation than it is in the 40-inch-by-5-inch, like a board standing on edge is stiffer than a board lying flat. We won't see too much deformation, no matter how it is supported, but we will see some, from compression of the glass if nothing else.

For this reason I'm investigating another possibility, which is supporting the mirror axially by the central hole instead of by the outer edge. I'm just getting started, but so far the idea looks promising.

I think this is worth looking at because we've decided we need to make a new main baffle, and we could make the central mirror support as part of it; in fact we would almost have to. If we had not already decided to redo the main baffle, we would be creating a lot more work.

But if we can make this work, it has some key advantages: it will be mechanically simpler and more compact, and create a lot of room in the housing around the edge of the mirror, which otherwise will be cluttered up with support hardware. There are lots of things we might need this space for; one that I am considering is a ventilation system, to blow the hot air off the mirror at the end of a summer day. Another thing to consider is the ability to clean the mirror.

Paint preparation - Andy Heilman has continued his fine work of removing the old paint from the mount, to get it ready for repainting. He has recruited his brother Patrick to help him out. I have been wanting to spend some time up there adding my efforts to this process, but there always seems to be something else more pressing! We need to push to finish this and get a new coat of paint on the instrument before the cold weather.



It was a rainy day when Andy took the above photos, so the only illumination is from the room lights and work lights and the camera flash. You can barely make out Patrick in the far right.

Mirror update - I received an email from Mike Lockwood in which he reports that he has our secondary mirror far enough along that he can see fringes in his test setup. He was able to confirm that he has met our specifications with respect to the radius of curvature and the mirror spacing, and the back focal distance in his setup is about 1/2" greater than what we asked for. This is fine for two reasons; first, our specification for the back focal distance was a rough judgment of what "felt best" when we simulated looking through the eyepiece, and also, because you can adjust it by making a very small change in the mirror spacing, with negligible effect on the optical performance. We asked for 17.5", and 18" is plenty close enough.

StarWatch

by Gary A. Becker

Big Horn Medicine Wheel

I have always been fascinated by archaeoastronomy, the interplay of archaeology and astronomy that tries to interpret how ancient cultures used the sky for their practical benefits. In my lessons I focus on the Ancestral Puebloans who were responsible for the Chacoan Phenomenon in northwestern New Mexico, starting about 1200 years ago, and the building and use of Stonehenge, about 90 miles to the west of London, which now is known to predate the construction of the Great Pyramid by over 500 years.

Another American treasure is the great Medicine Wheel in the Big Horn mountains of north central Wyoming between the towns of Lovell and Sheridan. When I first saw it in 1979, the 80-foot limestone rock circle with its central raised hub radiating 28 spokes and six cairns along its circumference was encased by an ugly metal fence capped with barbed wire. That has all changed. When I revisited the site last month with friends the old fencing was gone, replaced with a low, four-foot high circle of vertical posts with three rungs of white nylon rope running between them. Standing behind this aesthetic boundary, the entire wheel was accessible to the eye unobstructed, blending naturally with the open windswept mountaintop and the brilliant blue turquoise sky which dominated the area overhead.

The “why” behind the Big Horn Medicine Wheel’s construction is uncertain—legends abound, but archaeoastronomers feel that its connection with the sky is very compelling. Using two of the five cairns and the central hub, the wheel points accurately to the summer solstice sunrise and sunset positions, the longest day of the year and the point in the solar cycle where the “sun stills” (solstice) its upward motion before beginning its slow retreat into its cold, winter “house.” Observing from the central hub, summer solstice sunset is opposite to winter solstice sunrise, and summer solstice sunrise is 180 degrees away from winter solstice sunset. In theory on a flat surface, all would be perfect, but to my knowledge the winter solstice alignments have never been tested because by December the 9,642-foot altitude of the Medicine Wheel is covered in deep snow. It was probably only used during the warmer months. In fact when I was there on July 3, the site was recovering from a major snowstorm just several weeks earlier that had dropped something like five feet of wind-tossed powder on the higher elevations.

Another cairn alignment also supported the heliacal rising of Aldebaran in Taurus the Bull. A heliacal rising of an object means that it was first seen just before the brightening light of a new day washed it from visibility. This was followed 28 days later by summer solstice and 28 days later by another alignment pair of cairns which pointed to the heliacal rising of Rigel in Orion the Hunter, followed by another pair of cairns about 28 days later which reinforced the heliacal rising of Sirius, the brightest star of the nighttime sky. Aldebaran may have worked as a predictive marker, the ribs of the wheel acting as a counting device to predict the summer solstice, while the rising of Sirius, 56 days after the high sun in mid-August, may have been the time to leave the Medicine Wheel because of the encroaching chill of autumn and winter.

Since the rising and setting positions of the stars change because of the 26,000-year wobble of the Earth's axis known as precession, it is possible to date when these stellar alignments worked, and therefore, when the Medicine Wheel was in use—1400 AD to 1700 AD. This agrees with the archeological record detailing the time of the construction of the site (John A. Eddy.) The great conundrum of archaeoastronomy is that as compelling as these facts may sound, we can't interview the person or individuals who masterminded and constructed sites like the Big Horn Medicine Wheel to glean their specific intentions, but it appears that the sky played a significant role in the lives of these Native Americans. In archaeoastronomy, the stones pose tantalizing mysteries with multiple interpretations. Photos are online at https://astronomy.org/StarWatch/August/index-8-19.html, StarWatch 1199.

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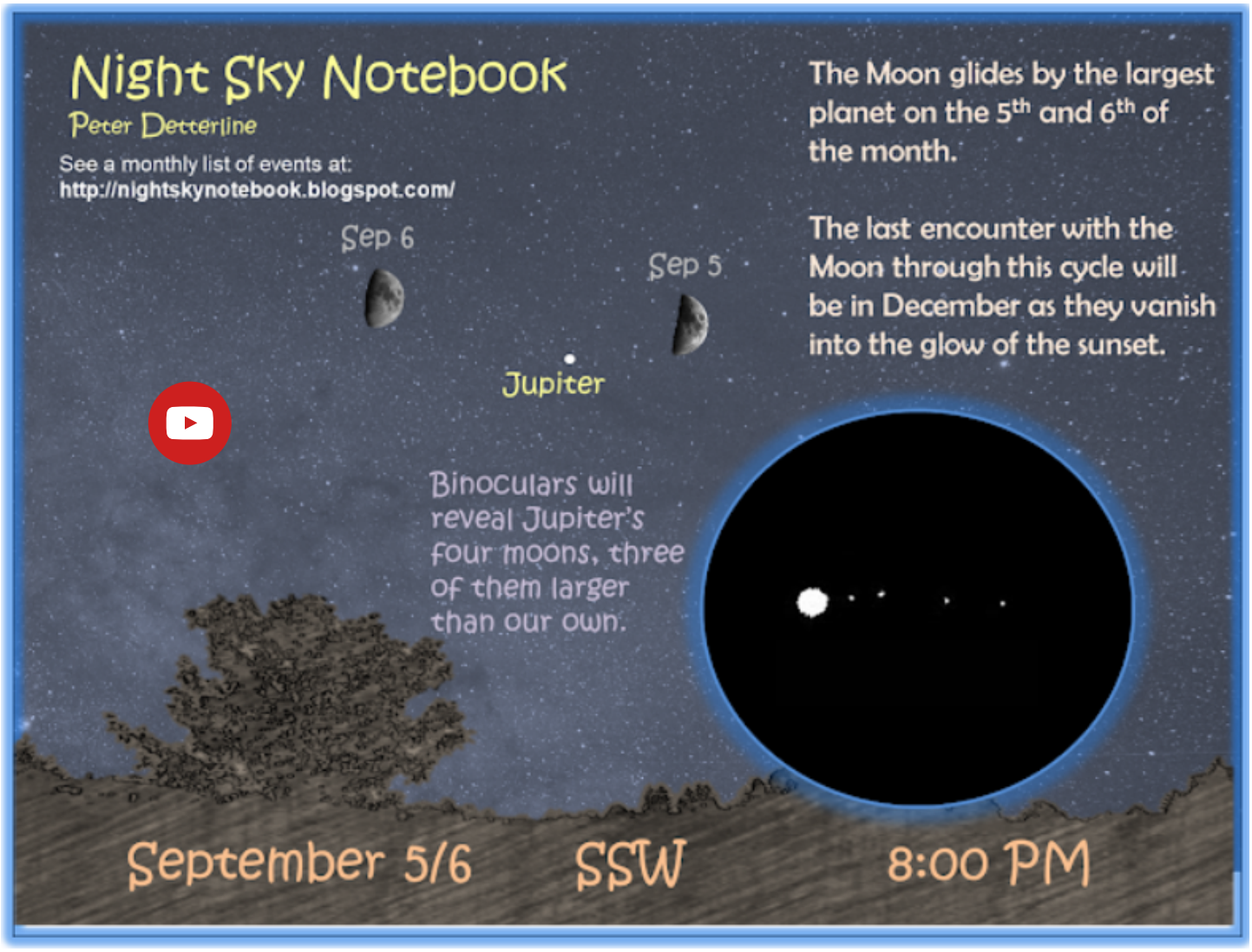
Moravian College Astronomy - astronomy.org
Facebook at facebook.com/StarWatchAstro/

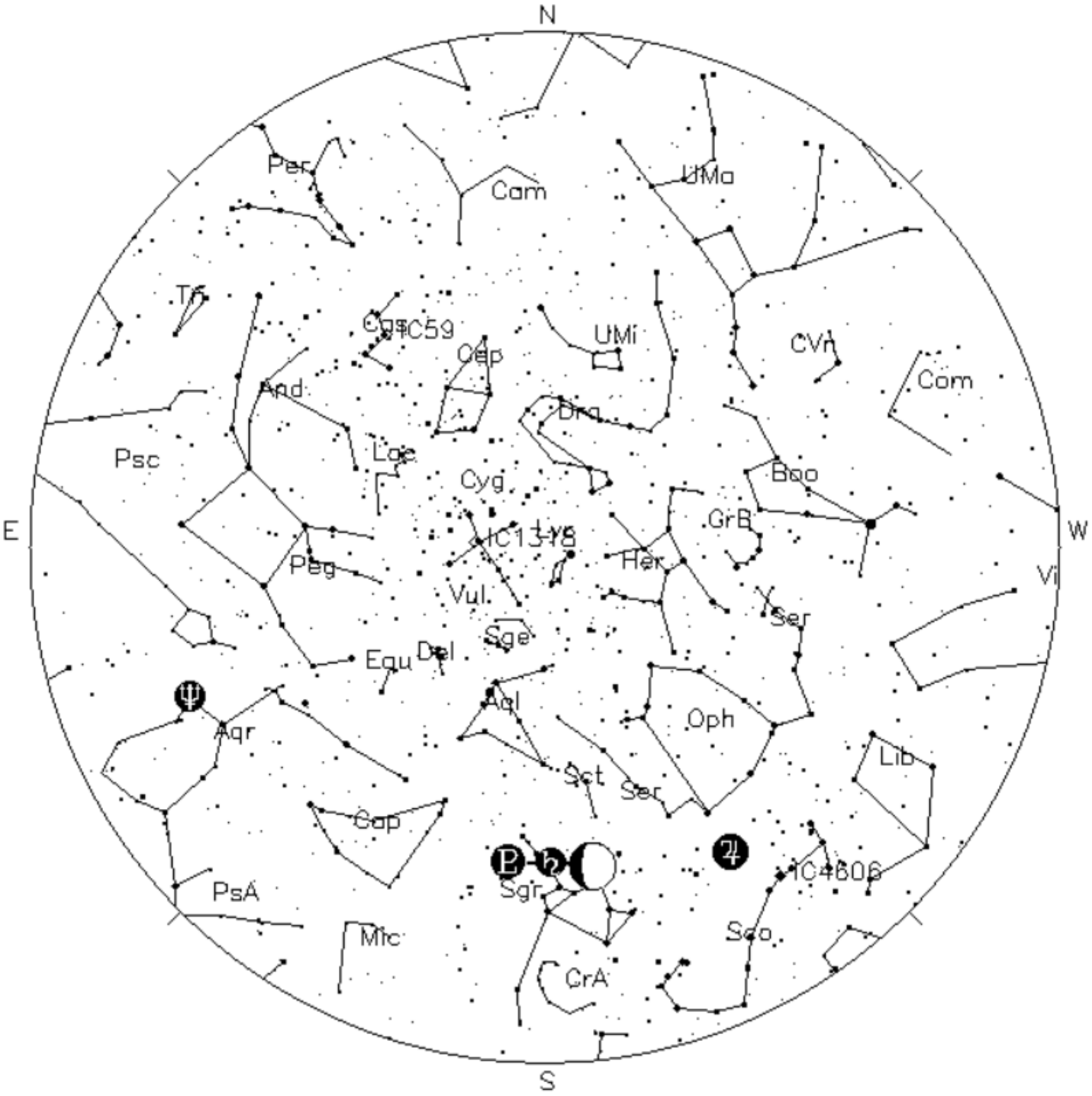
Night Sky Notebook for September

by

Pete Detterline



Sky above 40°33'58"N 75°26'5"W Sunday 2019 Sept 8 1:00:00 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

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

SEPTEMBER 2019

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

OCTOBER 2019

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

2019 LVAAS Event Calendar

2019 LVAAS Event Calendar

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

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

NEAF	April 6 – 7
Cherry Springs S.P.	May 30-June 2
Stellafane	Aug 1 – 4
Black Forest S.P.	Sept 27 – 29
Mega Meet	*see website*

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: https://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. Society members who would like to submit articles, images or videos for publication should kindly do so by emailing The Observer editor, Frances Kopy at editorlvaas@gmail.com. Articles submitted prior to the Sunday before the monthly meeting of the board of governors (please see calendar on website) will usually appear in the upcoming month's issue. **PDF format is preferred**. **JPEG images** emailed directly to the editor following above guidelines are preferred. Early submissions are greatly appreciated. Articles may be edited for publication. 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.

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