

The Observer

The Official Publication of the Lehigh Valley Amateur Astronomical Society

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September, 2018

Volume 58 Issue 9



ad astra*****

Every month in The Schlegel Observatory Report, our Assistant Director, Rich Hogg, keeps us up-to-date with what is happening with the 40” telescope project. But only when I listened to his talk at the last general meeting did I fully realize how much work he, Frank Lyter, Ron Kunkel, Earl Pursell, Matt Bailey, Kyle Kramm and Pete Brooks had done over the past year - *it is truly amazing!*

Rich started out by saying how impressed he was by the mechanical design and fabrication work that had gone into the telescope in the years before he got involved, most of which was carried out by Pete Brooks and Ralph Schlegel himself. “The precision machining in the gear train delights the eyes, and to see it in action, moving so quietly and smoothly is a multi- sensory pleasure.” He then went on to explain how they had overcome several problems with the mount and pier to enable them to obtain polar alignment using a program called SharpCap. The team still has to overcome a problem with flexure in the tube which will govern how much the secondary mirror will move out of alignment as the telescope is tilted.



They have discovered that one of the main culprits are the joints that hold the steel rods in place and they are now looking into the possibility of welding them together.

This is only a brief summary of Rich’s talk. Unfortunately, Dave Raker could not be at the meeting to video Rich’s talk, however, if you would like to find out more why don’t you re-read The Schlegel Report in past issues of The Observer. Here is Rich describing the components of the 40” telescope.

(Photo courtesy of Frances Kopy)

The August General Meeting was supposed to be held at Pulpit Rock so that after Rich's talk we could all take a tour of the Schlegel Observatory to see the telescope for ourselves. Unfortunately, and yes I sound like a broken record, the weather gods had other plans so Rich had to give his talk the next day at South Mountain.

The heavy rain has not only been a problem at South Mountain, it has also caused some issues at Pulpit Rock and the road leading up to it. Ron Kunkel, who is in charge and carries out most of the maintenance at our Pulpit Rock site, recently used a York rake to cut down the high shoulder that was forming on the edge of the road, preventing water from getting into the gutters. Once the material was loosened, it was moved into the middle of the road to give it a crown so that the water drains off more easily to the sides. The road is now in excellent shape. Ron also says that the grass is growing like crazy and he has had to do a lot of mowing.

Then, would you believe it, last weekend (August 24th-26th), it stayed dry. Every full moon weekend, Ron invites a group of scouts or cub scouts to camp at Pulpit Rock. This month it was turn of a group of cub scouts, Pack 180 from Kirksville, PA. About 46 scouts and leaders attended. They had a beautiful weekend of camping, hiking and observing. Ron also had them build a 100-foot scale model of the solar system to give them an idea of the relative distances between the planets and the Sun.



On the left is Ron inflating the planet models that scouts use to construct a 100-foot scale model of the solar system (above.) (Photographs courtesy of Cindy Kunkel)



(Photo courtesy of Cindy Kunkel)

Here is a beautiful photograph of Ron and several members of the Kirksville cub scout pack taking in the view from Pulpit Rock at sunrise.

We weren't so lucky with the weather on the night of our August Star Party. Nevertheless, there was a good turnout for Ron's talk about Pluto - *yes, he does an amazing amount for our society!!!* Mind you, he was a little taken aback when Bonnie Buratti, one of the Principal Scientists on the NASA New Horizons project, walked through the door. He couldn't help but smile when she told him she really enjoyed his talk.



A Call for Star Party Volunteers

Our next star party is on September 15th. **Gary Becker** will be presenting both planetarium shows and **Blaine Easterwood** will be giving a talk entitled,

"Ten 'Cool' Things About The Solar System"

So if you would like to help out, please do not hesitate to contact me.

Also I just wanted to let you know that Blaine has agreed to be our **Director of Education**, a post which has been empty for some time. Over the past couple of years, Blaine has helped out with several of LVAAS's outreach activities and for the last 8 years, he has been teaching IT at local colleges (LCCC, Strayer and DeSales), so I'm sure he will do a great job.

On a more national scale, I can't believe that NASA's 60th Birthday is being kept so quiet. Maybe it is me not paying attention to the news. However, I think there has been a mix up with the dates: the publicity team at NASA reported that NASA turned 60 on July 29th, however, while President Eisenhower signed the National Aeronautics and Space Act on July 29th, 1958, NASA didn't actually begin operations until October 1st that year.

Within 3 years, on May 5th, 1961, Alan Shepard became the first American in space aboard Freedom 7 and then on February 20th, 1962, John Glenn became the first American to be launched into orbit aboard Friendship 7. By the end of the decade, NASA astronauts had walked on the moon. The rest is history, **a truly amazing history!**

Such achievements could not be fully appreciated if it weren't for the myriad of iconic images that NASA projects have produced over the years, whether it be Buzz Aldrin's footprint on the surface of the moon; the view of Earth from Apollo 17; the amazing panoramic views of the surface of Mars collected by the Curiosity Rover, or a photograph taken by the Hubble Space Telescope of a star forming region in The Eagle Nebula. These images have inspired generations.

So all I want to say is:

HAPPY BIRTHDAY NASA!



(Images courtesy of NASA)

There are two videos clips that you may like to take a look at:

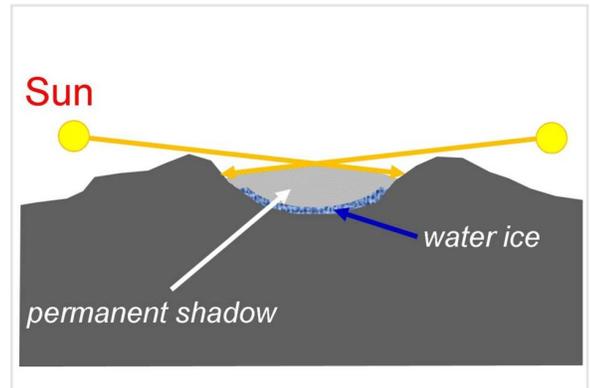
NASA 60th: How It All Began <http://nasawatch.com/archives/2018/07/nasa-turns-60-t.html>

and

An Inspiring History of NASA <https://vimeo.com/49757682>

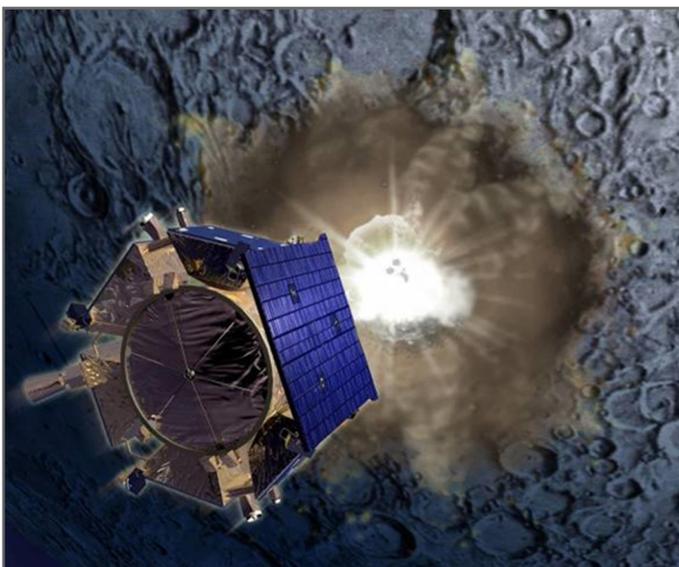
And now for a bit of lunacy...

In 1961, scientists from Caltech pointed out that due to the small tilt of the rotational axis of the Moon with respect to the ecliptic, the floor of some of the craters very close to the lunar poles could be in permanent darkness. As a consequence, surface temperatures at the bottom of these craters could be extremely low and they could act as cold traps that are capable of accumulating volatiles, such as water. NASA's Lunar Reconnaissance Orbiter (LRO) has measured temperatures as low as -248°C in these craters.

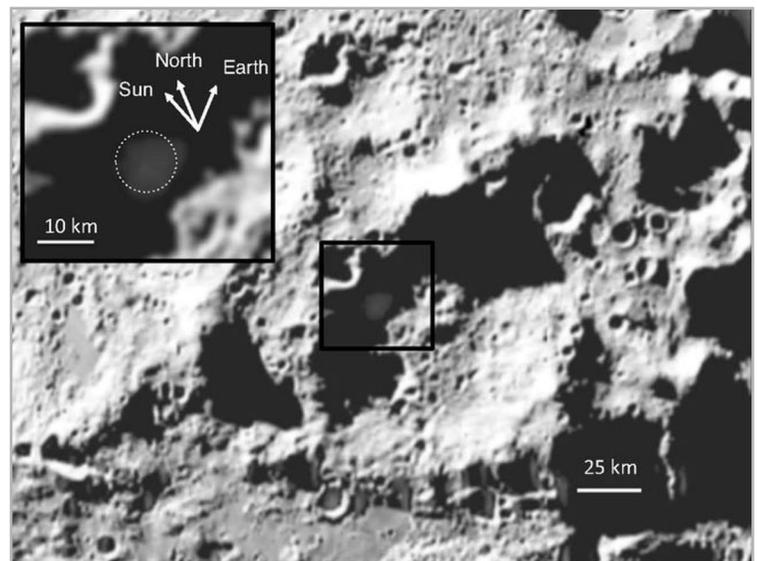


Data from the Visual and Infrared Mapping Spectrometer (VIMS) on Cassini during its flyby of the Moon in 1999 revealed two absorption peaks: one associated with water and another with hydroxyl (-OH) groups. Spectral data collected by NASA's Deep Impact Space Probe also revealed the presence of hydroxyl groups and water molecules on the surface of the moon and while the signals were stronger at the poles, they also appeared to change with time.

On October 22nd 2008, the Indian Space Research Organization (ISRO) launched the Chandrayaan-1 spacecraft. There were several instruments on board, one of which was NASA's Mineralogy Mapper (M3) which also detected signals typically attributed to hydroxyl- and/or water-bearing minerals. Then on October 9th, 2009, NASA sent the Centaur upper stage of the LCROSS carrier rocket on a collision course directly into Cabeus Crater, followed very shortly afterwards by the LCROSS spacecraft itself. There was, however, just enough time for spectrometers on board the LCROSS spacecraft to collect data from the plume of the first impact and relay it back to earth and, yes, the infra-red absorbances confirmed the presence of water in the plume.



An artistic rendition of the LCROSS spacecraft following the Centaur upper stage into Cabeus Crater

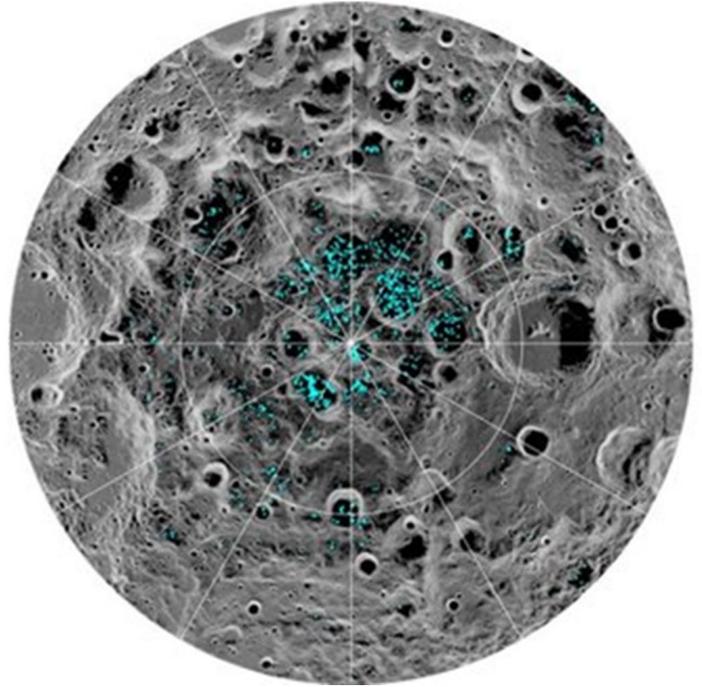


Plume after the impact into Cabeus Crater

(Images courtesy of NASA)

Well, recently a team of scientists took a more detailed look at the near infra-red data collected by NASA's Moon Mineralogy Mapper that was onboard the Chandrayaan-1 spacecraft. By comparing it with pure frost ice data collected by the US Geological Survey, they were able to identify three absorbances that corresponded to water-ice. Their analysis confirms that water-ice accumulates in permanently shadowed regions of the Moon. Surprisingly only 3.5% of the cold traps contained ice and much of it was mixed with dry regolith (lunar rocks and dust.) The distribution of water ice at the moon's south pole is shown in green in the image on the right. Their results were published in this month's Proceedings of the National Academy of Sciences.

South Pole of The Moon



(Image courtesy of NASA)

Continuing on with this lunar theme, the talk at our next general meeting on **September 9th** at **South Mountain** will be:

“Looking Lunar: Cool Things You May Have Missed on the Moon”

by **Pete Detterline**

Hope to you see you there.

ad astra,

Carol Kiely, Director

LVAAS General Meeting: Open To The Public

Sunday, September 9, 7:00 p.m.

LVAAS South Mountain Headquarters
620B East Rock Road Allentown PA 18103

featured program

"Looking Lunar: Cool Things You May Have Missed on the Moon"

presented by

PETER DETTERLINE



You've shown our closest neighbor to the public a gazillion times, and you know all the main attractions: the Sea of Tranquility, The Sea of Crisis, Copernicus, Tycho, the Straight Wall and others, however, our Moon is full of hidden surprises that only appear at a certain phase when the lighting is just right. Peter Detterline will guide you on a tour of some of the Moon's best kept secrets. Lunar domes, volcanoes, rilles, crater chains, and mountain passes are some of the objects that portray the vast beauty of the lunar surface. Accompanied by images and sketches, this is a practical talk that will have you locating these sites with ease. So start looking lunar, and the Moon will never look the same again.

Nomination Of Officers Of LVAAS For 2019 Term

NOTICE -- A Business Meeting will be convened for Election of the 2019 Society Officers at the October General Meeting

The LVAAS October General Meeting will be held on its regularly scheduled date, 7:00 p.m, October 14, 2018 at South Mountain, during which a Business Meeting will convene for the purpose of election of our 2019 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 scheduled on September 9, 2018.

Nominees need to agree to accept a nomination at the time of 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 9, 2018 General Meeting.

In the event no qualified candidate is listed for one or more of the officer positions on the Election Ballot for any reason at the time of the election during the October 14, 2018 General Meeting, the election shall take place for the remaining offices. After the election results are verified, the Nominations Committee shall open the floor for the nomination of any qualified candidates to all vacant officer positions. Any candidates not elected to office in the just completed election may be nominated for any position except a position that the candidate held for the immediate past two consecutive terms of office.

The newly elected officers' terms begin at midnight November 30, 2018, and continue until midnight on November 30, 2019.

Nominees to date include:

Director:	Rich Hogg
Assistant Director:	Tom Duff
Secretary:	Earl Pursell
Treasurer:	Scott Fowler

Regards,
Bill Dahlenburg -Nominating Committee Chairman

What's the (LVAAS) Buzz?



by Rich Hogg
LVAAS Technology Director

Our website <https://lvaas.org> has a feature called 'Forums' that was intended to allow us to keep each other in the loop about various topics related to astronomy and LVAAS. The problem is that not many of us bother with Forums these days. As far as I know, few LVAAS members check the forums or receive notifications when forum messages are posted, and even fewer ever post a message, perhaps figuring that almost no one will see it.

For a few years now the Board has been using an email-based service to keep in touch, and earlier this year, after Frank Lyter asked for a better way to communicate with members about Pulpit Rock activities such as observing sessions and work parties, we decided to try an email-based solution. And so, the Buzz was born!

You should sign up for the **Pulpit Rock Buzz** if you are interested in observing sessions, helping at work parties, or other activities at Pulpit Rock.

You should sign up for the **South Mountain Buzz** if you are interested in observing sessions, helping at work parties, or other activities at South Mountain.

If you are planning or considering anything at either site, you should send a message to the appropriate Buzz to let others know. Please keep in mind that since the Buzz is new and is not mandatory, it is always possible that you will find someone using the facilities without posting on the Buzz. That's OK! We're all friends in LVAAS, and while we are usually happy to let each other know what we're planning, we also welcome unplanned, spontaneous visits to our facilities.

Subscribing to the Buzz is easy! You can get the process started either by sending an email to pulpitrock-join@buzz.lvaas.org and/or southmountain-join@buzz.lvaas.org, **or** visit the sign-up page at <http://buzz.lvaas.org/listinfo.cgi/pulpitrock-lvaas.org/> and/or <http://buzz.lvaas.org/listinfo.cgi/southmountain-lvaas.org/>

Please use the same email address that you use for other LVAAS purposes.

After you do this, the system will send you an email to confirm that you really want to subscribe. You must either reply to this email, or click the link you will find in it. Then, an administrator will need to confirm your subscription. **The Buzz is limited to LVAAS members.**

Sending a message to the Buzz is easy! After you subscribe, just send an email to pulpitrock@buzz.lvaas.org or southmountain@buzz.lvaas.org. **For complete instructions:** see <https://lvaas.org/staticpages/index.php?page=thebuzz> (you must first be signed in to the website.)

CATCH THE BUZZ!

Minutes for the LVAAS General Meeting - August 12, 2018

The August 2018 LVAAS General Meeting was held on August 12, 2018 at the LVAAS facility on South Mountain in Lower Saucon Township. It was opened by Carol Kiely, Director, at 7:03 p.m.

The talk for the night was the 40" Telescope Project Update by Rich Hogg. He started with a historical review, in pictures, of the construction of the mount and telescope, and how it has appeared through the years. He gave some of the vital statistics of the finished telescope: Main mirror: 39.8" in diameter; FL: 549"; f/13.8; Spacing between main and secondary mirrors: 112"; Back Focus: 17.5" behind reflecting surface of main mirror; Field of View (FOV): 0.2°. With a 21 mm Ethos eyepiece, it will have a 0.145° FOV, 660x, so may require a custom eyepiece for low-power operations. The back focus was one of the specifications that had to be calculated to accommodate usability, involving computer simulations and building a mock-up of the focuser so that people could test using an eyepiece at several different orientations of the telescope. He also discussed the recently developed method for polar alignment, which involved a small telescope attached to the fork, to which a digital camera was attached, which was, in turn, connected to a computer running SharpCap software. The software made polar alignment a matter of a few minutes: pointing the telescope close to Polaris, allowing the software to plate-solve the positions of the stars, then rotating the telescope about the RA axis to plate-solve the new star locations, then finally using this info to calculate the center of rotation of the telescope and how far off from the celestial pole it was.

Polar alignment requires adjusting the telescope in its mount, and there was some anecdotal information that the current adjustments were already near their limits, so all three attachment points had to be reworked: a new, larger bolt with a flexible attachment for the altitude adjustment point, and enlarging the slots, fixing bent tabs, and replacing roller bearings with "slippery pads" for the azimuth adjustment points. Altogether, this allowed the telescope to be aligned much more easily and precisely than had previously been possible. Flexure of the truss was also examined, both directly and with simulations. The structure's flexibility turned out to be much greater than predicted, and examination turned up several causes: couplings in each two-piece truss member were slip-fit at one end, and they did indeed slip when the telescope was moved. The fittings at the secondary mirror were also slip-fit and at least one could be moved easily with hand pressure. Several corrective measures are now being considered, from simply welding together all the joints, to completely reconfiguring and rebuilding the truss with new materials. The following items also need to be worked on: main mirror support (several options); secondary mirror support; finding and reattaching the wires for the main mirror cover blade motor; how to cover the scope when it is not in use; paint color scheme (the telescope and mount are in need of repainting and have been partially stripped.) There are also still some items on the building that need tending to: additional subfloor; choice and installation of flooring; drywall and ceiling treatment for 1st floor; some electrical and computer connections. One note: the bathroom is in excellent condition!

After several questions, the talk concluded and a break was called at 8:22 p.m. The business meeting began at 7:40 p.m.

Scott Fowler, Membership Chair, reported that there was a second reading (Carol Stager) and one first reading (Andrew Heilman.) Scott also reminded everyone to renew their memberships before the end of the year, suggesting that the October General Meeting would be the perfect time as it would benefit the 2019 fiscal year.

Gwyn Fowler, Treasurer, gave a brief report: for the General Fund, the income since the last meeting was -\$973.15 due to some accounting changes from the previous month, while expenses since the last meeting were \$6075.62, mostly due to our insurance premiums being due this month. At the last Board of Governors' (BOG) meeting, the proposed 2019 budget was passed and it will be voted on by the membership at the September meeting. Carol added that we are budgeting for a new roof for the South Mountain main building next year, but that despite much rain lately, we had no detectable leaks in the building! We will need to monitor both the budget and the roof. If the leaks recur, some fund raising may be required to pay for part of the new roof.

Dave Raker, Library and History, was not present, but Carol reminded everyone that Dave will be doing his annual inventory during August, and that everyone should return all borrowed materials until after the audit is complete.

Carol noted that MegaMeet, coordinated by Tom Duff, took place July 13-15 at Pulpit Rock. Friday night, July 13, was well attended, with several Appalachian Trail through-hikers in attendance. The new sign was also unveiled to great fanfare. We also had an LVAAS contingent, personnel and telescopes, coordinated by Eric Loch, at The DaVinci Science Center's "Science Under The Stars" night on July 20th. They had over 1300 attendees!

Nominating Committee Chairman Bill Dahlenburg reported the following nominees so far: Director: (open;) Asst. Director: Rich Hogg; Treasurer: Scott Fowler; Secretary: Earl Pursell.

Carol also noted that we need volunteers for the following appointed positions: Membership Services (Red Shift snack bar); Star Party Coordinator, and Education Director.

The next Star Party is August 18th with Carol doing both planetarium shows. Ron Kunkel will give a presentation entitled "Whatever Happened To Pluto?" As always, volunteers are needed to attend the door, help park cars, and operate the telescopes.

Rich Hogg noted that. in an effort to communicate information about activities such as work parties, people going out to Pulpit Rock, etc., we have previously relied on the Forums on our website, but that system was not especially effective. He has been trying out a new email list, to which people can voluntarily subscribe. There is an option to either receive all emails as they are posted, or to receive a once daily summary of the emails. He will also try to get any postings to the Forum forwarded to the mailing list. The opportunity to subscribe to the mailing list was tested by a few people, then the BOG. Rich intends to make it available to the membership as a whole next week.

The meeting was adjourned at 8: 58 p.m.

Minutes recorded and submitted by LVAAS Secretary, Earl Pursell

Meade Relocation Project

Contributed by Frank Lyter

Progress is good on relocating the 12" Meade telescope to the 12 inch Spacek observatory. Ron Kunkel and I were at Pulpit today (August 18) and completed the following:

- Modified support pier was installed.
- We plugged in the telescope with an extension cord and verified basic operation of the telescope with the handheld controller.
- The scope has about 1 1/2" clearance when closing the roll-off roof.
- We are planning a polar alignment to double check orientation of the mount before final finishing & painting of the mount.
- When we have verified that the mount orientation is good and painting is complete, we will use the SharpCap program Rich has been using to adjust for a precise polar alignment.

SharpCap program: <https://www.sharpcap.co.uk/>

- Similar to other scopes, we are covering the telescope with a tarp inside the building when closing up the observatory

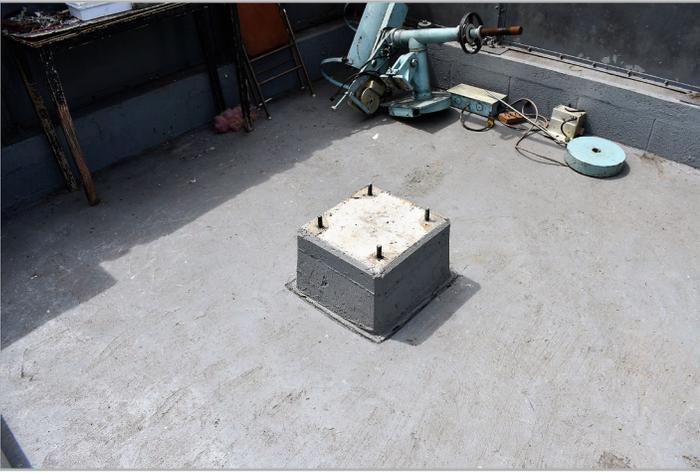
Work remaining includes:

- Replacing the 120 vac outlet on the pier and wiring in the drive key switch to enable power to the outlet.
 - This may require pulling in new conductors through the conduit. Additional testing will determine if that is required.
- Complete polar alignment checks discussed above.
- Paint the mount.
- Thoroughly check out settings on the Meade controller
- Write up instructions for use of the scope, including where to park
- Replace corrugated steel roof with new material. Glicks scrap metal yard in Fleetwood is a source for the material.
 - This item will be completed, but will not impact near-term use of the telescope.

I would estimate that the telescope work will all be completed in the next two weeks at which point it could be available for training on the use of the scope.

Frank & Ron

Next page: left to right, top to bottom: Base Pier, Installation of Support Pier, Installation of Wedge, Ron and Frank Check Viewing Positions, Clearance with Roll-Off Roof. All photos courtesy Frank Lyter.





Great news! We achieved first light through the relocated 12" Meade telescope at the Pulpit Spacek observatory last night! It was also a nice night on the mountain under clear moonlit skies. Time was spent viewing Polaris, the Moon, Mars and Saturn. Rich and Earl stayed to take some videos of Mars. We completed a rough polar alignment with the modified mount and have concluded no further modifications are required and we can proceed with painting. Once the painting is complete in a week or so, we will perform a precision polar alignment of the telescope. Ron is hosting cub scouts on the mountain this weekend so the telescope should see a lot of use. Work remaining includes:

- Replacing the 120 vac outlet on the pier and wiring in the drive key switch to enable power to the outlet.

The existing conduit and cable cannot be salvaged. This will require embedding new conduit and conductors in the concrete floor. In the meantime, we will use an extension cord to power the telescope.

- Complete polar alignment checks discussed above.
- Remove the mount, paint and reinstall.
- Thoroughly check out settings on the Meade controller.
- Write up instructions for use of the scope including where to park.
- Replace corrugated steel roof with new material. Glicks scrap metal yard in Fleetwood is a source for the material. This item will be completed, but will not impact near-term use of the telescope.

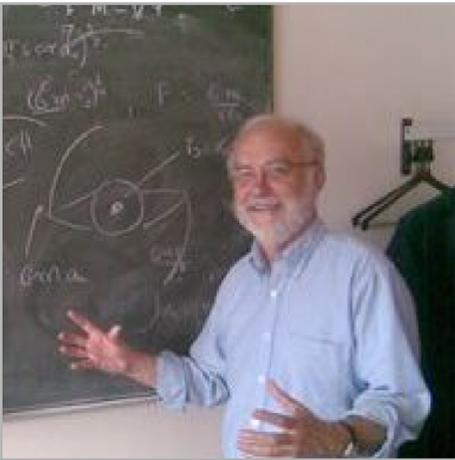
Participating last night were Ron Kunkel, Cindy Kunkel, Rich Hogg and Earl Pursell



From the LVAAS Archives: **The Alchemy of the Universe**

By Sandy Mesics

The speakers at the September 1968 LVAAS general meeting were Dr. Robert H. Sanders and Dr. Allen V. Sweigert, from Princeton University. They spoke on the Alchemy of the Universe.



Dr. Robert H. Sanders

Dr. Sanders would receive his PhD from Princeton in 1970, two years after this talk. His dissertation was on "The Coalescence of Colliding Stars in Dense Stellar Systems." His advisor was the noted astrophysicist Lyman Spitzer, Jr. After working at Columbia University and the National Radio Astronomy Observatory, he moved to Europe, and spent his career studying active galactic nuclei (in particular the Galactic Center,) the hydrodynamics of gas in galaxies and, for several decades, the problem of the 'missing mass' in astronomical systems. His previous books are *The Dark Matter Problem: A Historical Perspective* (2010) and *Revealing the Heart of the Galaxy: The Milky Way and Its Black Hole* (2013.)

Allen V. Sweigert worked at NASA's Goddard Space Flight Center in Greenbelt, MD, in the Laboratory for Astronomy and Solar Physics. He published extensively, including "Globular Clusters as Laboratories for Stellar Evolution" (2010) and as recently as 2016` coauthored "The Hubble Space Telescope UV Legacy Survey of Galactic Globular Clusters: Implications from the Nearly Universal Nature of Horizontal Branch Discontinuities."

According to the October, 1968 *Observer*, their talk "provided a fascinating insight of the atomic process within a star that enables it to produce the heavier elements utilizing the basic hydrogen atom found abundantly in the universe. The great breakthrough in this study came about with the discovery that the carbon cycle of burning, long thought to be stable, is indeed unstable over long periods of time. This results in flare-ups of the interior burning layer, during which there is sufficient agitation to exchange atomic particles needed in the outer hydrogen burning layer to produce iron. Until recently, this process went unexplained. It is thought that after a sufficient amount of flare-ups, a sufficient amount of iron particles are produced so that some of these particles eventually find their way into interstellar space (through radiation, flare-ups, novas, or cataclysmic events) to enrich the universe with atomic iron. This would then lead to the formation of new stars that would have a higher iron content than those that had existed previously."

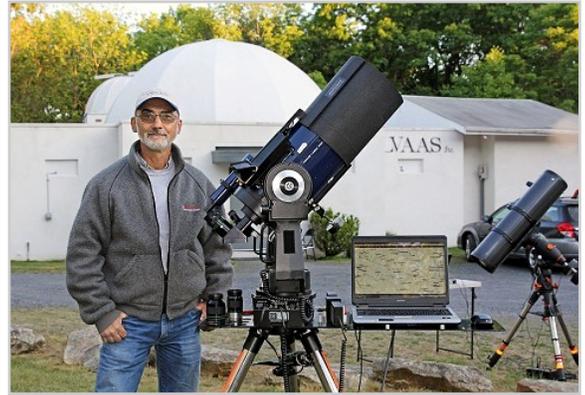
We now understand that fusion in massive stars can create heavier elements from the ubiquitous hydrogen found there. Once fusion causes silicon to create iron, the star becomes a ticking time bomb. The iron core collapses quickly, either resulting in a neutron star or a black hole, depending on the mass. Neutrino stars create supernovae, and the resulting explosive nucleosynthesis creates even heavier elements. As Carl Sagan said, we are all made of this "star stuff."

References

The Observer, October 1968

University of Gronigen <http://rug.academia.edu/RobertSanders>

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.

General Relativity Passes Yet Another Tough Test

Last month I discussed the toughest test that general relativity has ever passed, namely confirmation of the 'equivalence principle' in the realm of the strong gravitational field. That test confirmed that two stars of very different compositions fall in exactly the same way, even in a strong gravitational field. This month I will discuss yet another strong gravitation field test of general relativity. The star known as S2 orbits the super-massive black hole in the center of the Milky Way and it exhibits gravitational redshift effects as predicted by general relativity. This is yet another confirmation of the validity of general relativity in the realm of a strong gravitational field.

There is a small group of fast moving stars that orbit the 4 million solar mass black hole, Sagittarius A* in the center of the Milky Way. One of these stars, S2, has an orbit period of about 16 years and its orbit around Sagittarius A* has now been tracked by astronomers going on 26 years. On 19 May of 2018 star S2 again passed closest to the super-massive black hole at the phenomenal speed of 15.5 million mph. Odele Straub, an astrophysicist at the Paris Observatory, used the European Southern Observatory's (ESO) Very Large Telescope (VLT) located in Chile to analyze the light from S2. The measurements of S2's light confirm that it clearly exhibits an effect know as gravitational redshift in an amount as predicted by general relativity's description of how gravity bends the space-time continuum.

Gravitation redshift effects have often been measured here on Earth, in weak gravitational fields, but this is the first time this effect has been measured in the realm of a strong gravitational field, the field of the 4 million solar mass super-massive black hole in the center of the Milky Way. Additional observations of S2 are continuing in order to also observe the advance of its closest point of approach to the black hole to see if it too advances at a rate as predicted by general relativity. This then also will be another tough test of general relativity in the realm of the strong gravitational field. As soon as results of this measurement are released I will be sure to cover it in Ron's Ramblings.

References:

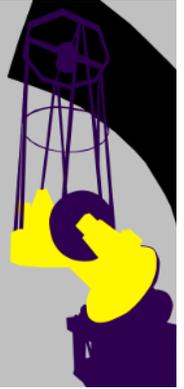
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Schlegel Observatory Report

by Rich Hogg – September 2018



I had a good time talking through our work over the past year as the presenter at our August general meeting. Mostly, I went over material that had previously been covered in this column; there were only one or two new developments, which I'll report below, along with what we've done since the meeting. It isn't much. We've been doing more experimentation and having more discussion on the plans we formulated last month.

Joint Investigation Bureau

We were able to confirm that some of the joints in the truss structure were moving, as we suspected. To get to this point we had to do some disassembly, but it looks like it was not wasted effort - we will need to disassemble and rebuild the entire truss in order to weld the joints properly, and we are still planning to modify the truss design slightly as shown in last month's column.

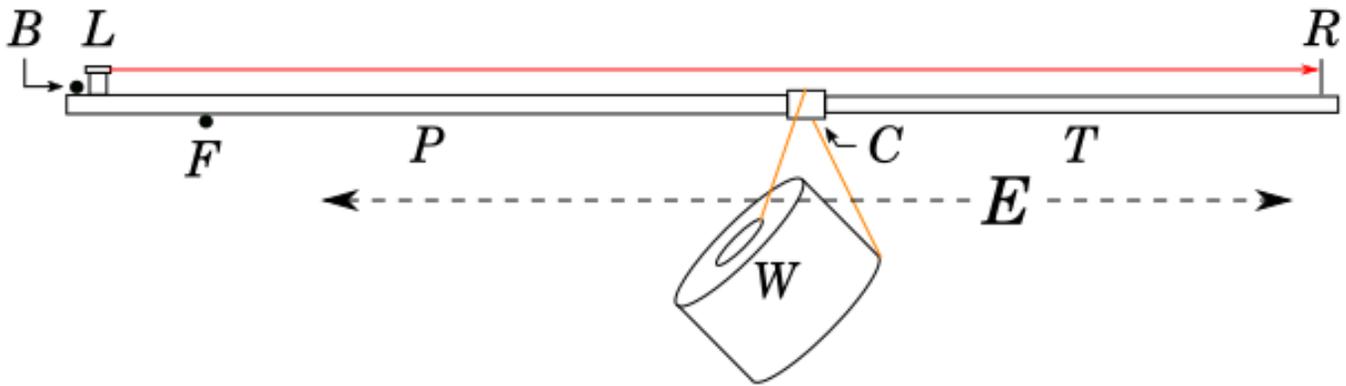
One of the parts that we removed is the guide scope - a 6" refractor that looks to be about f/15. I'm thinking that we might want to replace this with a smaller instrument, and try to find another home for the 6". I'll have to do some more analysis down the road, but the consideration is that any unnecessary weight that must be supported by the truss will cause it to deflect a little more, which is undesirable.

We were also able to remove one of the eight truss members, which is the ultimate goal. Frank Lyter has taken it to his home shop to investigate separating the joint between the lower pipe section and the upper tubing section, so the material can be cleaned up and then welded properly back together.

Flexible Validation Plan

Before he did that, I performed another experiment on it. I was looking for some way to confirm the results of the engineering analysis of the frame, using the Frame3DD software that I described last month. What I did was described by Chris Kiely as "sort of a bend test." I supported the pipe/tubing assembly in a way that I could cause it to bend a little bit, by applying a known force, and then measured just how much bending occurred.

Here is my not-yet-patented invention for performing the "sort of a bend test:"

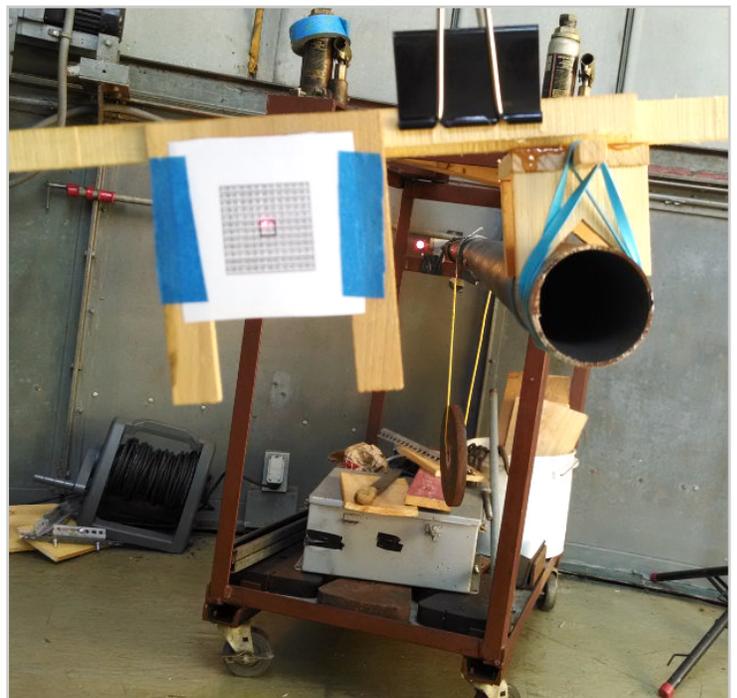


Truss Element (**E**), consisting of Pipe (**P**) and Tubing (**T**) joined by Coupling (**C**), is supported in a Cantilever Configuration by Base (**B**) and Fulcrum (**F**). Weight (**W**) hangs from Element (**E**) by means of Wire (**ALSO W**). The force of Gravity (**G, NOT LABELED**) acting upon Weight (**W**), via Force transmitted through Wire (**ALSO W**), as well as directly upon Element (**E**), causes Element (**E**) to Bend by a certain Amount (**A, ALSO NOT LABELED**). Laser (**L**) is attached to Element (**E**) near the End which is supported by Base (**B**). Reticle (**R**) is attached to Element (**E**) near the Other End. The Amount (**A, ALSO NOT LABELED**) that Element (**E**) is caused to Bend by the Force of aforementioned Gravity (**G, NOT LABELED**) is measured by the position of the beam from Laser (**L**) on Reticle (**R**).

Well, that was fun for me, I hope it was good for you too. And yes, I really did this experiment; here is a photo, which is unfortunately not as neat and organized as the drawing.

In this image we are looking at the setup from the "other end," and the laser and the reticle are on the left side of the tubular truss element which is being tested.

"Base B" is the pipe clamp attached to the wall, and "Fulcrum F" is a cross-member on the wheeled cart, which is intended for handling the primary mirror to install it in the mirror cell. You can see the bright light from the laser aperture, just to the left of the far end of the tube, as well as the spot impinging upon the paper reticle near the center.



The good news is that the measured deflection agreed fairly well – within about 20% – with the deflection predicted by the software.

Chromatic Aberration

You may recall that I also talked about this project at last year's August meeting, which was held at Pulpit Rock. I had prepared a PowerPoint slide presentation which I brought to The Rock on my laptop, but I somehow had the idea that there was a suitable projector there for showing the slides. And there wasn't, so the slides were held in reserve, and some of them got re-purposed for this year's show.

We had started talking about a new paint job back then, before we realized that we had structural remediation to do, so it's a good thing we didn't get too far with it. But I had worked out a way to automatically create drawings with different color schemes, so I rolled them out this year.

I had picked out a favorite of my own back then, and I haven't changed my mind. Guess what, you have been seeing a version of it in the header of this column since the beginning of 2018. What I have in mind is a two-tone scheme of dark indigo and yellow. But the possibilities are infinite, and I'll be happy as long as it looks good and isn't too boring.

Oh yeah, I also see us decorating the big decoder gear and declination chain wheel with star charts. I think the idea comes from the design of the classic Questar 3.5" Maksutov, but I like the way it looks.

Current Status and Activities: We continue to refine the plan to fix the problems with the truss structure.



by Gary A. Becker



Moravian's Robotic Observatory Online

Somehow five people managed to get through a week starting August 1 at the Mars Desert Research Station with under 300 gallons of water. About one third of that amount was used to run the swamp box for about three hours each day to cool down the habitat to a tolerable temperature. Every day, except for one of the eight that we were at MDRS, the out-of-door's temperature reached into the low 100's. There was also no refrigeration and we were without electricity for the first night, forcing us to sleep outside.

Why would anyone want to live in such a hostile environment? It's really quite tame compared to Mars, where heat is substituted for bone-chilling cold, and all exterior work must be conducted within the confines of a pressurized spacesuit. And yes, we went into town- Hanksville, Utah, population 202- each day for a meal or a milkshake. When you think about it in that respect, our habitat and environs were more than habitable. Still, most people avoid living in such an environment. Because of this, the Hanksville area is one of the darkest locations in the continental US to conduct astronomical research, and it is here that Moravian College has staked its claim in time-sharing with the Mars Society to build the MDRS Robotic Observatory.

When the idea was first pitched in 2016, we gave it about a 5-10 percent chance of success, yet here we were, Peter Detterline, Jacob Wetzel, Adam Jones, Adam Biel, and I, putting the finishing touches on a dream come true. Pete, Jacob, and Adam Jones are all former students of mine, but it has been Peter Detterline that has been the driving force behind the project. Although Moravian has a 25 percent share of telescope time, no Moravian funds were allocated by the College for its construction. Our \$20,000 share was raised solely through public donations, with about half coming from the generous contributions of Dr. Carlson R. Chambliss, who was Pete's and my astronomy professor when we attended Kutztown University back in the 1970s. In fact, it was Moravian's contribution that supplemented the original funding provided by an anonymous donor from the Mars Society to make the observatory fully robotic.

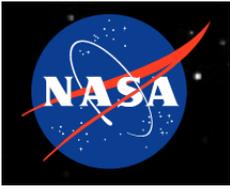
During our week at MDRS we cleaned all components and made some minor mechanical repairs to the dome. Pete put the observatory through its paces, operating it remotely from the habitat in a similar fashion to how individuals from Moravian College and worldwide participants will use it. The only

difference was when glitches occurred we were on site immediately to correct the problem. We also installed two weather stations to act as backup units to the main Boltwood sensor which gives the electronic permission for the clamshell observatory dome to open if weather conditions are suitable for astronomical viewing. The Boltwood closed the dome automatically one evening when the wind picked up during the passage of a nearby thunderstorm. On our return trip back East to Pennsylvania, Pete operated the facility from our hotel room, gathering data for the new online course on astronomy research that he is currently teaching at Moravian.

You can get a live look at the MDRS Robotic Observatory by downloading the BloomSky Weather application onto your smart phone. David Fisherowski of Boyertown, a major donor of astronomical equipment to Moravian College Astronomy, provided the unit. It has a fish-eye camera lens so that every Hound can keep an eye on the facility. Once the BloomSky program loads, perform a search for MDRS Hanksville, Utah or use the “Explore” tab at the bottom of the screen to scroll across the US to Utah.

The BloomSky positioned most-centrally in the state is the one looking at the MDRS Robotic Observatory. When you see the temperature icon for Moravian’s site, tap on it. When the MDRS site loads, tap on the “Star” icon so that you can “favor” it and automatically go to the site whenever the application is loaded. Daily weather loops can be found on YouTube at **Moravian College Wx1**. Approximately 55 Moravian students including Dr. Kelly Kriebel and Dr. Ruth Malenda will have the opportunity of using the facility during the fall term.

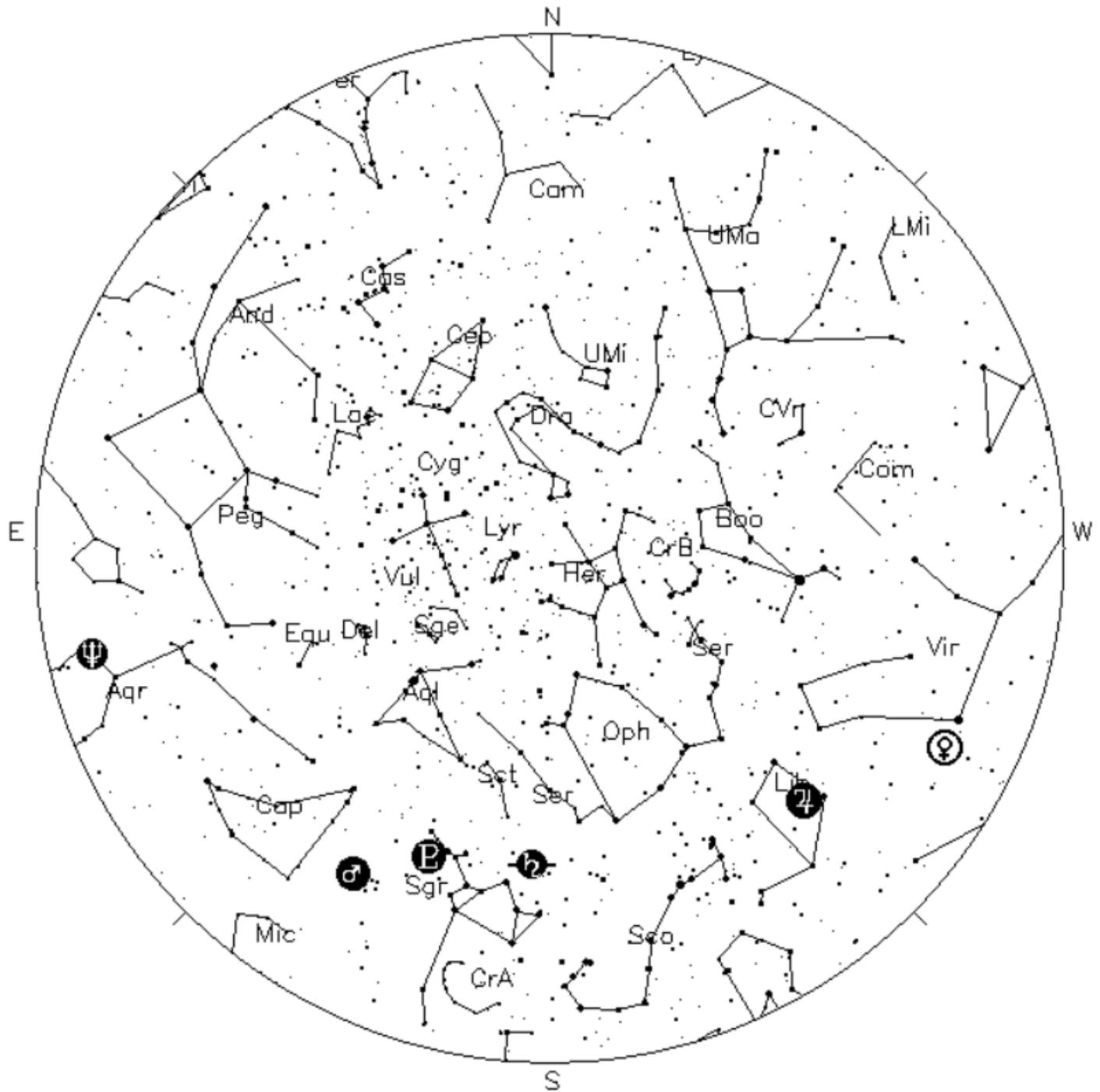
© Gary A. Becker – beckerg@moravian.edu or garyabecker@gmail.com
Moravian College Astronomy - astronomy.org



What's Up for September 2018



Sky above 40°33'58"N 75°26'5"W Thursday 2018 Sept 6 0:00:00 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

Copyright © 1989 by Jef Poskanzer.

[Customize Your Sky ->](#)

at : <http://www.fourmilab.ch/yoursky/>

SEPTEMBER 2018

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

OCTOBER 2018

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

2018 LVAAS Event Calendar

2018 LVAAS Event Calendar												
	Sundays		Board meeting	Thursday	Friday	Saturday	Mondays	Multi-Day Weekends Scouts at Pulpit R.	Moon Phase			
	General Meeting time	location		Astro-Imaging	Lunatics and Stargazers	Star Parties	Scouts at S. Mountain		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	7:00 PM	11 S.M.	25	29		17		no camping	7	15	23	29
December	2:00 PM	8	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 location tbd

NEAF
Cherry Springs
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:

<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. 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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