

The Observer

The Official Publication of the Lehigh Valley Amateur Astronomical Society

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August, 2018

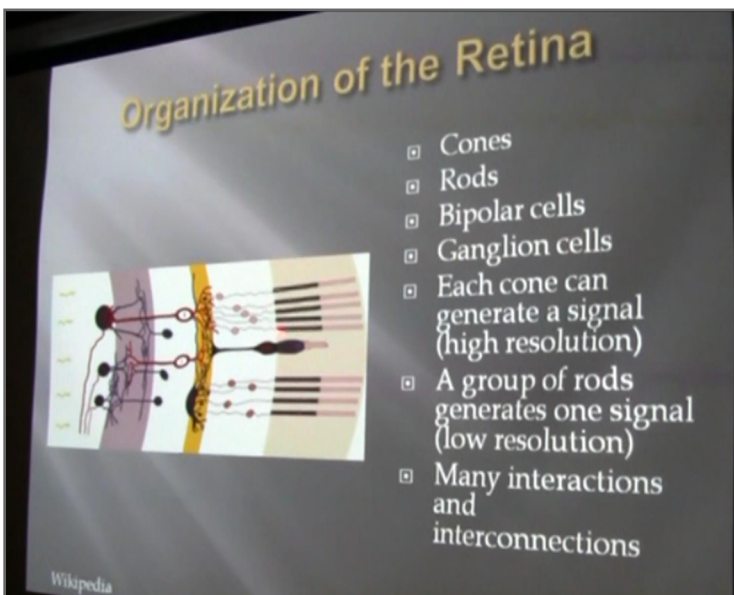
Volume 58 Issue 8



ad astra*****

The LVAAS picnic is always a fun event and this time the weather cooperated. I would like to thank everyone who made the event such a success, especially Rhonda Young who made sure there were plenty of hot dogs, hamburgers and soft drinks; Bill Dahlenburg, Pete Brooks, Mike Clark and Earl Pursell for all their hard work keeping our South Mountain Headquarters in such good shape, and everyone who brought food - it was *delicious!*

When everyone was finished eating, we were treated to a very interesting talk by LVAAS Secretary Earl Pursell entitled "Night Vision and Astronomy." During his presentation, he described the structure of the eye, the organization of the cells in the retina and how they responded to different colors and intensity of light. It was fascinating to learn why astronomers use diverted vision to see faint objects such as nebula and galaxies through an eyepiece. Earl also told us why everyone screams when someone turns their headlights on at a star party. I didn't realize that for people of a certain age, it can take almost half an hour for their eyes to recover and now I know why. If you missed the talk, it is now available on a DVD (thanks to Dave Raker) which can be taken out on loan from the library. After a short informational meeting, we came outside again and could hardly believe our eyes- yes, the sky was clear. Some people stayed to do observing and a few even set up their own scopes. It was a great evening! But would the weather gods be as cooperative at Pulpit Rock the following week?



When Tom Duff decided to go ahead with Megameet on the following weekend, I must admit I was a little skeptical - it was Friday 13th! Chris and I arrived at 7 p.m. and it was a bit hazy but, as time went on, it became clearer. Once we had our scope set up, we decided, as we always do, to have a walk and take in the view from the Rock. “Where have you been?” asked Ron Kunkel. “You should have been here for the unveiling of the new sign.” I apologized and then went over to have a look. As most of you know, Pulpit Rock is also a favorite resting place for people hiking the Appalachian Trail as the view is spectacular. Many of them find their way onto our site, so, Rich Hogg, Ron Kunkel, Dave Moll and Eric Loch decided it was time to refurbish the old sign and add a QR code to let them know what they have stumbled across and enable visitors to find out more about our society. Ron took this photo - I think the sign looks really good!



As darkness set in, the planets began to appear. Venus was the first to show in the western sky and then Jupiter and Saturn. And yes, we had some hikers who couldn't help asking what we were up to. Many of our them had never seen

Saturn through a telescope so we just had to oblige. When they looked through my scope, which is not on a tracking mount, they also got a sense of how fast the Earth is rotating. “Crazy cool” was the response.



Chris Kiely and Earl Pursell trying to spot Jupiter before sunset.



Lynn Krizan setting up for a night of astroimaging.

I then moved the scope to look at Jupiter and couldn't resist telling them the mnemonic "I eat green caterpillars" which I learned from Vicky Wrigley to help remember the four Galilean moons of Jupiter - 'I' stands for Io, 'eat' for Europa, 'green' for Ganymede, and 'caterpillars' for Callisto. They are called the Galilean moons because they were first seen by Galileo in 1610. It wasn't until 1892, with the help of two much larger telescopes, that E.E. Barnard discovered a fifth satellite, Amalthea, very close to the planet - its orbit being inside that of Io. E.E. Barnard was the gifted American astronomer who is best known for his discovery of the high proper motion of Barnard's star in 1916. Since then many more moons have been discovered, most of which are less than 5 kilometers in size.

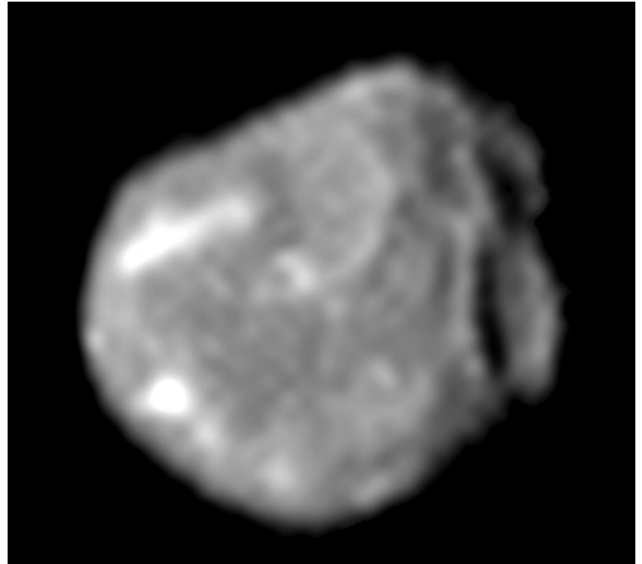
Of all the planets in our solar system, Jupiter has the most moons, the tally being 67 until last month. On July 17th, a team led by Scott Sheppard from the Carnegie Institution for Science announced the discovery of 12 additional moons. Many of these are less than a mile across but as Scott Sheppard says, "*there is no such thing as a dwarf moon.*"

Two of these newly discovered moons are in the prograde group, whose orbits are outside that of Callisto, and nine are in the retrograde group - a group of moons with much larger orbits traveling in the opposite direction to the rotation of the planet. The remaining moon, named Valetudo, after Jupiter's great-granddaughter, is a bit of an oddball because while it is traveling in the same direction as the planet is rotating, its orbit is much more distant and more inclined than those of the prograde group. In fact, its orbit crosses that of the retrograde moons which could lead to a head on collision. For more information, visit:

<https://www.space.com/41180-oddball-moon-orbits-jupiter.html>

The following Friday, July 20th, a group of LVAAS members took their scopes along to the Da Vinci Center for "Science Under The Stars." Fortunately, there were only a few clouds in the sky. The event attracted over 1,300 visitors and there was a continuous line of people waiting to look through the scopes. I would like to send **A BIG THANK YOU** to everyone who went along to represent LVAAS and to Eric Loch for coordinating with the Da Vinci Center.

Unfortunately, the weather gods did not cooperate for our star party the following day. Despite the cloud and drizzle, 30 visitors came along to see the planetarium shows and listen to the talk. I would like to thank Fred Bomberger and Earl Pursell - a lot of work goes into preparing a planetarium show. I would also like to give a special thank you to Ron Kunkel, who stepped in at the last moment to give a talk about the Sun and Solar Observing.



A photograph of Amalthea taken by NASA's Galileo spacecraft (August 1999)

So what do we have to look forward to this month?

Well, if you missed MegaMeet why not come along to the next General Meeting on Saturday **August 11th** at **Pulpit Rock**. Assistant Director Rich Hogg will be giving a talk about the latest developments on the 40” telescope project, and you will also have a chance to be trained up on some of the club scopes. Being the night of a new moon, the sky will be really dark and you may even spot a few shooting stars as the Perseid Meteor Shower is supposed to peak in the early hours of August 12th and 13th. If the forecast looks favorable, I will definitely bring my scope along because the *southern sky will be an astronomical showcase!*



A Call for Star Party Volunteers

Our next star party is on August 18th. I will be presenting both planetarium shows and Ron Kunkel will be giving a talk entitled, “Whatever Happened To Pluto?” There may not be such a thing as a dwarf moon but there is certainly a dwarf planet.

If the sky is clear, you could always show our visitors where they would find Pluto if they had a very big telescope and a very dark sky. Mind you, I think they will be even more impressed when they see Mars, Saturn and Jupiter through the club scopes.

ad astra,

Carol Kiely, Director

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:

Assistant Director:

Rich Hogg

Secretary:

Earl Pursell

Treasurer:

Scott Fowler

Regards,

Bill Dahlenburg -Nominating Committee Chairman

LVAAS General Meeting

Pulpit Rock Astronomical Park

Saturday, August 11, 7:00 p.m.

(Rain date August 12)

featured program

"40-inch Project Update"



presented by

Rich Hogg

LVAAS Assistant Director

Minutes for the LVAAS General Meeting - July 7, 2018

The July 2018 LVAAS General Meeting was held on July 7, 2018 at the LVAAS facility on South Mountain in Lower Saucon Twp. It was preceded by the annual picnic, which started at 5 p.m. The meeting was opened by Carol Kiely, Director, at 7:10 p.m.

The talk for the night was "Dark Adaptation and Astronomy" by Earl Pursell. The talk covered anatomy of the eye, how the eye detects light in both bright and dim light, and how to improve night vision. There are two types of light-sensing cells in the retina. Cones (3 types) are responsible for color vision, but only work in relatively bright light. Rods (one type) are responsible for low-light vision, but only see in shades of gray. Although the eye's iris opens fully within a few seconds after the light is turned off, the light-sensitive chemicals in the rods require at least 30 minutes to reach full sensitivity (some sources say more than a day is required!) The cones are concentrated in the fovea, the center of the eye's vision, but there are no rods there. The concentration of rods peaks at 10-20 degrees off-center, so to see the best detail in low light, averted vision must be used. Since the light-sensitive chemicals in the eye are all derivatives of Vitamin A complexed with proteins (rhodopsin in rods,) a balanced diet including Vitamin A, zinc (improves action of Vitamin A), and anthocyanins (antioxidants that aid in regeneration of opsins) can enhance night vision. Use of red goggles or an eye patch can be used to help start dark adaptation while still in the presence of white light. Once adapted, use of dim red lights, to which rods are not sensitive, can preserve night vision. White light reverses the process, so exposure to bright lights restarts the process and dark adaptation must start over again. After a few questions, the general meeting began at 7:55 p.m. Note: Dave Raker recorded the presentation. It should be available for loan soon.

Scott Fowler, Membership Chair stated that there were no first or second readings.

Gwyn Fowler, Treasurer, reported that the General Fund Year-to-Date Income was \$17,681.41, while Year-to-Date Expenses were \$7,921.65.

Dave Raker, Librarian, noted that there were some books and DVDs for sale in the library and the Red Shift. Also, books and DVDs are always available on loan to LVAAS members from our library. The video from the last general meeting is currently available. New books are in a separate bookcase in the back right of the library. New videos are on a shelf just inside the library door, on the right. Dave will be doing the annual inventory during August, so he requested that all checked-out materials be returned at this time.

Tom Duff reported that MegaMeet is planned for July 13-15 at Pulpit Rock. The final decision will be made on Thursday (7/12), based on weather reports. The gate will be tended from 4-7 p.m. on Friday and Saturday for those without keys. Directions can be found at <https://lvaas.org/staticpages/index.php?page=PulpitRock>.

Carol Kiely announced some Outreach opportunities:

- Carol will be presenting a planetarium show and tour on Wednesday afternoon (7/11) for about 27 students and 4 adults from the New Goshenhoppen science camp (contact: Matt Easterwood.) She asked for volunteers to help with the tours of the telescopes.
- She also reminded everyone about the DaVinci Science Center's "Science Under The Stars" on Friday, July 20, from 6-10 p.m. and asked for volunteers.

There will be a LVAAS Star Party on July 21 with the 6 p.m. planetarium show to be presented by Fred Bomberger, Ron Kunkel doing the 7 p.m. talk, and Earl Pursell concluding with the 8 p.m. planetarium show.

Bill Dahlenburg has agreed to chair the election committee.

The meeting ended at 8:05 p.m. Some members had set up telescopes outside and observing continued.

Minutes recorded and submitted by Earl Pursell, Secretary.

Da Vinci Center “Science Under the Stars” July 23, 2018

From event coordinator, Eric Loch:

"Everything went very, very well. The skies cleared up enough for most of the time to show folks Venus, Jupiter, the Moon, and Saturn. I was able to show some of the early attendees the Sun through my Coronado and Ron had Jupiter in his scope during daylight hours. Pretty neat. The folks at Da Vinci were extremely helpful for set up and very appreciative of our help. The unofficial tally for the evening was 1300 people. I know most of us had a line of 20 people most of the evening. It is always a pleasure hearing the “Oh WOW” and “That’s Amazing” when looking through an eyepiece.

Thanks to our great group of volunteers, I would consider this a very successful evening.

Our volunteers included Rich Hogg, Ron Kunkel, Warren Landis, Earl Pursell, Lou Spikol, and myself."



Photos courtesy of Eric Loch, Director of Public Relations

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 Toughest Test

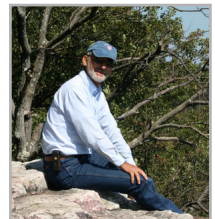
Einstein's theory of general relativity describes gravity as the distortion of a flexible space-time continuum. It posits that any object with mass distorts its local space-time environment. Then, in turn, that distorted space-time environment determines how other objects with mass move through that environment. Thus a tenant of general relativity, the 'equivalence principle,' states that all objects regardless of their mass or their composition should move exactly the same way through a distorted space-time environment. The equivalence principle has been confirmed many times, on Earth, on the Moon, and even on the scale of the solar system. But to date all of these tests have been in the realm of relatively low mass and density. Now the equivalence principle has been confirmed in the realm of what is considered a strong gravitational field, the fields of the incredibly dense and massive neutron star and two white dwarf stars.

A neutron star packs more than the mass of the Sun into a sphere the size of a large city. A white dwarf packs less than the mass of the Sun into a sphere the size of the Earth. These two types of stars are thus quite different in density and composition. Some neutron stars emit a beam of radiation as they spin, and this beam can sweep past the Earth. Such neutron stars are called pulsars. The arrival time of the pulses can be used to very accurately characterize the orbit of the neutron star if it is in orbit around another star. In the case of this test of the equivalence principle, the system PSR J0337+1715, the 1.4 solar mass pulsar spins at 366 times per second as it orbits a 0.2 solar mass white dwarf every 1.6 Earth days. This duo of stars then co-orbits a second distant white dwarf with a period of 327 Earth days. Thus the equivalence principle tested in this case was that of a neutron star and a white dwarf, two very different and massive objects, orbiting a second massive object, also a white dwarf.

For six years astronomers have been monitoring the radio-wave emission pulses from the neutron star. They tracked the orbit of the neutron star and could determine its position to within a few hundred meters, an incredibly precise determination of its orbit. If the neutron star and its white dwarf companion violated the equivalence principle, the distortion of the pulsar orbit would have been detected. The observed distortion was less than 3 parts in a million. This test was 10x more accurate than any prior such tests, and thus general relativity, which has passed every test to which it has been subject, has now passed its toughest test yet.

References:

Wall, Mike. Einstein's Theory of Gravity Passes Toughest Test to Date. (2018, July 4). Retrieved from <https://www.space.com/41077-einstein-general-relativity-survives-test.html>



The end of my ramblings until next time. Ron



From the LVAAS Archives:

The First August Meeting At Pulpit Rock

By Sandy Mesics

In August 1968, LVAAS had its first regular meeting at Pulpit Rock, a tradition that has been carried on to this day. But before the 7 p.m. meeting, there was work to be done by several work details, which focused on the Schlegel-McHugh Observatory and the 20-inch telescope, which was then under construction. The work was carried on from 2 p.m. to 5:30 p.m., and from 5:30 to 7:00 p.m. there was a picnic supper. LVAAS provided the grills and soft drinks. At 7 p.m., a meeting was held, and an observing session was scheduled to follow, weather permitting. Here is an account of that event from the August 1968 Observer:

“The August regular meeting consisted of a combined work party, picnic, and business meeting at our Pulpit Rock site. More than fourteen of our members arrived in the early afternoon and pitched in to the work activity that resulted in significant progress by the days end.

“Supper time saw the arrival of several more members and families and mealtime was most pleasantly spent around the barbeque equipment supplied and operated by Henry Kawecki. Henry also supplied a generous



Figure 2: Ralph Schlegel at the Schlegel-McHugh Observatory in September 1968.

Reference:

The Observer, 1968



Figure 1: Kawecki Observatory in 1968

amount of his own home-grown sweet corn which he roasted on the spot for everyone’s enjoyment. The home baked goodies supplied by Marion Robson and Margaret Otto put the finishing touches to a most enjoyable mealtime at the ‘Rock.’ “Almost thirty were present when the meeting was called to order, including the last minute arrival of Paul Shenkle and Jeff Shaffer who had just returned from Stellafane. Director Ernie Robson reported that the Metropolitan Edison Co. was preparing another proposal to supply the Pulpit Rock facility with power, and also alerted all to the important work detail at the new site on Saturday and Sunday, Aug. 10th and 11th.”

The August meeting at Pulpit Rock has continued to be an LVAAS tradition to this day.

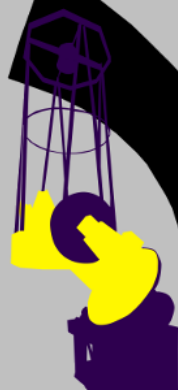
M51, the Whirlpool Galaxy in Canes Venatici



Imaged July 7/8/9 2018 from my backyard in Northern Lehigh County with my Celestron C9.25 Schmidt-Cassegrain, ZWO ASI071MC color CMOS camera, iOptron iEQ45-Pro mount, and SX Lodestar guider on a 60mm secondary scope. Exposures is 30X3-minute subs, for total exposures of 90 minutes. Collected & pre-processed in Nebulosity4, final process in PhotoShop CC. David M. Moll

Schlegel Observatory Report

by Rich Hogg — August 2018



Previously in Schlegel Observatory Report

Last month, I teased you that we had some information on tube flexure that I was holding off on reporting because we were working to understand it better.

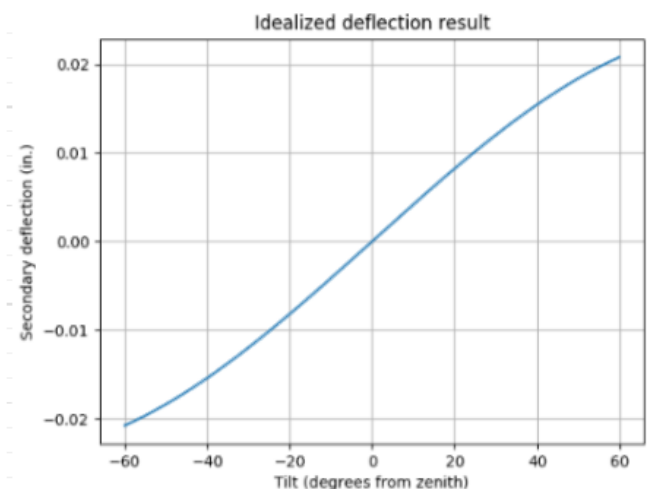
Prior to that, I showed you the nearly-complete fixture to hold a telescope (the "PMHGT") which we would use to measure tube flexure. In previous months I had already described the basic methodology: the PMHGT with a measurement camera would be mounted at the eyepiece, and a calibrated target mounted in the secondary cell. By observing how much the image of the target shifts, as seen by the measurement camera, we could determine how much the secondary mirror will move out of perfect alignment, as the telescope is pointed at various angles.

The bottom line is that it moves too much, although not exactly in the way that we expected. This month I will provide the details of this result, as well as our plans to address them.

What we expected

Certainly we expected to see some movement. As the telescope's aim is changed from the zenith to a lower altitude, the Earth's gravity begins to exert a sideways force on the tube, which should result in some bending. Nothing is infinitely stiff; everything responds to stress (applied force) by deforming at least a little (strain.) The questions for us were: how much bending would we see in response to the gravitational force on the telescope at low azimuth angles, and how much bending could we accept?

An idealized example is shown to the right. For the "stress" axis of this stress-strain diagram, instead of elevation, we will use the angle of tilt from the zenith for the X axis, where +60 corresponds to pointing the instrument to the North at an elevation of 30 degrees, and -60 corresponds to the same angle to the South. We will show the "strain" as the deflection of the secondary from perfect alignment, in inches. A maximum deflection of 0.02" would be very nice, but





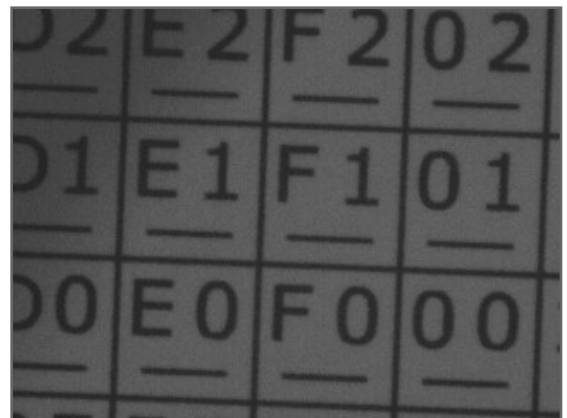
more on that later. Truthfully, we did not know how much to expect, but we did expect a smooth "strain as a function of stress" curve like this.

So anyway, here are some photos of the test setup. We see the back of the mirror cell, where we have the PMHGT mounted in its fixture, with a 1.25" Barlow lens and my QHY5II-M camera. It is focused on the target mounted in the secondary cell, as shown in the second photo. Also in the first photo, you can see the

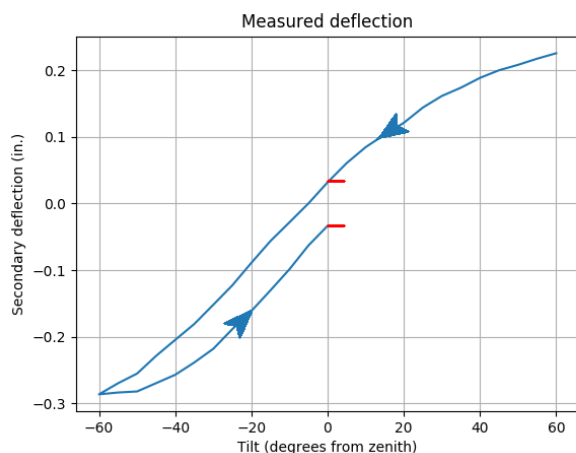


Big Red Magnet with my geared tripod head attached to it, which we had used to mount the PMHGT when doing polar alignment. It is now holding an Android smart phone, displaying a black console screen with white text. It is running a Python program that is reading the phone's tilt sensor and sending the information (through a WiFi router donated by Eric Loch) to my laptop.

The test was performed as follows: I used the slew controls on the telescope to reposition it, watching the readings from the tilt sensor to get close to where I wanted to take a reading, every multiple of 5 degrees. (I say "close to" because the tilt sensor in a smart phone is not that accurate.) Then I would use a program on my laptop, running inside of SharpCap, to take an image from the camera. It would also grab the tilt readings and use them to construct the filename under which the reading was saved, preserving the correct association between the independent and dependent variables. Later I decoded the pixel positions of the images, along with the alphanumeric position codes from the target, to produce a deflection reading.



And here — Ta da!!! — are the results:



In case it's not obvious, that "ta da" was highly ironic. These results are not anything to be excited about. We are looking at deflections roughly 10 times greater than we would like to see. But there is another feature of this measurement which is very interesting, and is the reason I held back reporting it until we investigated further.

As you can see, the deflection does not depend solely on how much the telescope is tilted. The strain is not a simple function of the stress, as we expected, but it also

depends on which direction we are moving it, as shown by the arrowheads drawn on the plotted curves. For example, if you move it from the zenith, to 30 degrees altitude in the South, and then back to the zenith, it fails to recover fully from the southward bending stress, leaving a gap or "hysteresis" in the strain curve of over one twentieth of an inch, indicated by the red tics.

We expected this truss tube to at least behave like an elastic structure, but it doesn't. It is exhibiting plastic deformation, changing its shape in a semi-permanent fashion in response to the most recent stress.

Further investigation

We tried a whole bunch of experiments to understand what is happening. Almost everything we did made the problem worse, but we think it also narrowed down what it could be. Here are some of the things we did:

1) We rigged up some nylon webbing with a come-along to pull the two ends of the optical tube assembly (OTA) together, with the idea that it would immobilize any loose joints in the structure. This didn't help, and we think it is because the tension we applied was only resisted by a few of the truss members, while others remained unloaded (and we may have set up a slight see-sawing effect.)

2) We removed the braces, made of 1/2-inch pipe and bent into circular form, that had been installed between the truss members, simply because they had mechanical joints that could be moving, and could easily be eliminated as an experiment.

Still, we remained convinced that something in the structure was loose, and was moving with the changes in stress on the frame, adding to the deflection that is caused by elastic deformation of the metal.

Engineering models

Simultaneously with beginning these experiments, we also started an engineering project to use the principles of structural design and the related mathematical techniques to understand what we should expect to see with this frame. This capability would also be very helpful for deciding what action to take to improve the performance of the structure.

Engineering methods for analyzing structures like this have been around for at least a century or two, and could theoretically be done by hand, by solving a system of a few hundred simultaneous equations in the same number of unknown variables. Obviously, a computer makes this much easier.

[Frame3DD](#) is a free program for frame and truss analysis that is maintained by the Department of Civil and Environmental Engineering at Duke University. I was very happy to find it almost immediately when I started looking for a tool for this purpose, because it is just about perfect. It has all of the features we need to build an accurate model, and to do the required calculations to predict how it should perform.

The program needs X, Y, and Z coordinates for every "node", or joint, in the structure, as well as dimensions of all the structural members, so making some measurements was the starting point. I made a

simple measurement gauge to get the wall thickness of the tubing, basically by inserting a hook-shaped probe made out of a paper clip into a hole. Frame3DD includes guidance on setting up the required "strain moduli" for each element — these are parameters that describe how a structural member responds to stretching, bending, and twisting forces; six numbers for each type of tubing, or beam section, or whatever.

The vertical elements in the truss tube are two pieces, joined by a coupler. We found that the bottom section has an OD of 1.9" and a wall thickness of 0.145", and appears to be standard Schedule 40 pipe commonly used for water, steam, etc. The upper appears to be steel tubing with a 1.75" OD and a wall thickness of 0.065". We think this lighter tubing was used to save weight at the front end of the telescope. Schedule 40 pipe is made in ductile iron as well as steel, so we also performed a grinder spark test to determine that it is steel. Steel is appreciably more rigid than ductile iron.

Basically we went to great lengths to build a simulation of the truss which is as accurate as possible. And I think it should be accurate enough to give useful results. It includes everything that we can think of and does the right calculations. Frame3DD appears to be properly engineered and well tested.

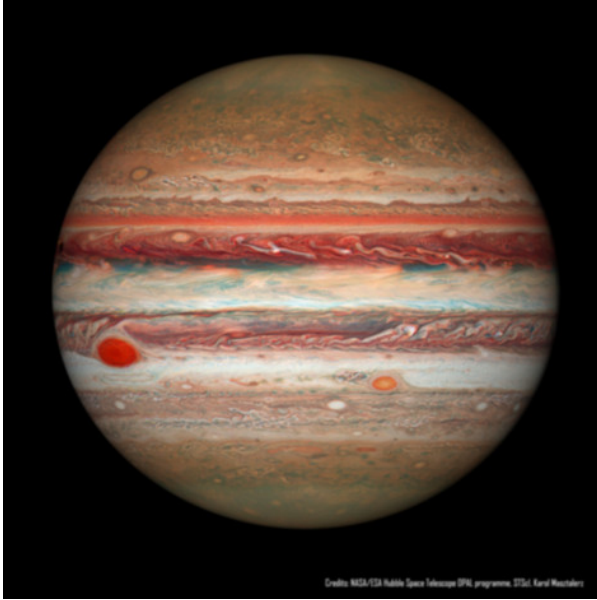
What it tells us is that the frame, as designed, should only allow a deflection of less than 0.05", under its own weight and the weight of the secondary mirror cell assembly. We think the difference, and the hysteresis is due to the movement in the joints at the tops and bottoms of the 1.75" steel tubing sections. (Another Frame3DD simulation indicates that joint movement of only 2 or 3 hundredths of an inch could result in the deflection we are seeing.)

We also did an optical simulation to see how much deflection we can tolerate. For this purpose, I used the optical ray-tracing program [BEAM FOUR](#), which was made open-source and freely available a few years ago. BEAM FOUR is not as user-friendly as OSLO Edu, another package I used to analyze the 40-inch optical system — you have to generate files containing tables of numbers for its input. In this respect it is similar to Frame3DD, and in both cases I wrote Python programs to generate the data.

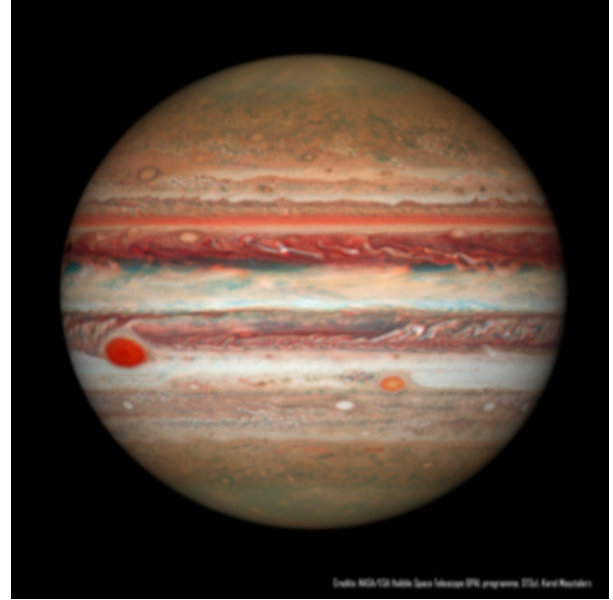
The advantage that BEAM FOUR has is that it can simulate tilt and offset of the optical elements, which OSLO Edu, the free version of OSLO, cannot. It is also exactly what we need to evaluate the effects of our tube flexure, causing the secondary mirror to be offset (and very slightly tilted) from perfect alignment. BEAM FOUR works by tracing the paths of individual rays of light through the system, and generates clusters of points that represent the image that would result from viewing an idealized star.

I stared at these "spot diagrams" for a while and decided that they were not giving me enough information, so I took it a step further. First, I got the source code of BEAM FOUR and hacked it a bit to allow me to run it automatically, over and over. The reason for this is so that I could work around its built-in limit for how many rays it would trace. It seems to have some limitations that would have been appropriate 15 years ago, but not for today's PCs. I decided I needed the extra rays for the next step.

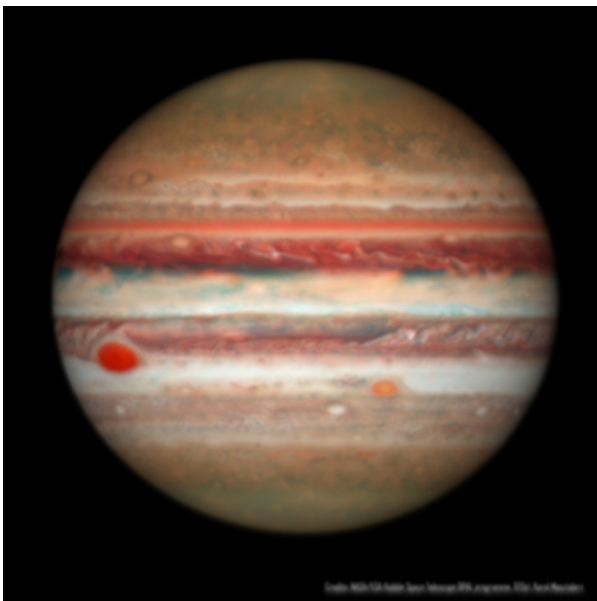
Inspired by a report from Frank Lyter on a recent view of Jupiter through a large Dobsonian at Cherry Springs, I coded up some additional image-processing algorithms to convert the BEAM FOUR spot diagrams into simulated views of the giant planet. These results also include the theoretical diffraction limit of a 40-inch aperture, but do not include any effect from atmospheric seeing, so you might consider them somewhat aspirational — however, for those rare moments on those rare nights when the seeing is exceptional, we want our telescope structure to be able to deliver.



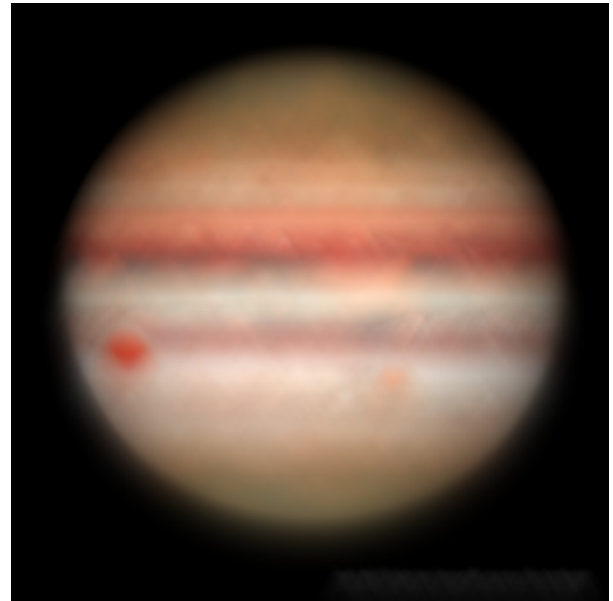
With perfect alignment, and only the diffraction limit affecting the image.



With 0.02" misalignment, the image deterioration is very slight.



With 0.05" misalignment, the image is tolerable, but deterioration is noticeable.



With 0.3" misalignment, the image is severely deteriorated. We can definitely do better.

These images are based on a Hubble image from NASA.

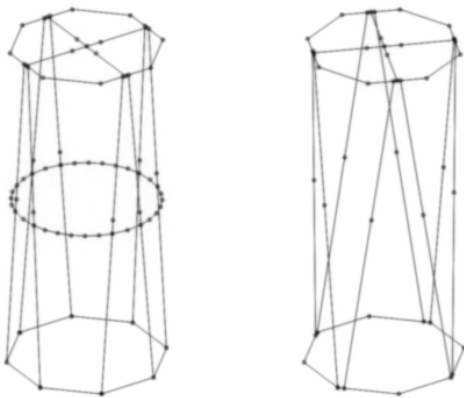
Based on this work, we've decided that we could probably tolerate the 0.05" misalignment. In most cases, its effect will add little to the effects of seeing. If we could get the performance of the existing truss design to the level predicted by Frame3DD, we would probably be satisfied. But, if there is something we can do to get to the next level, we would like to try.

So here is the plan

We definitely think we need to eliminate the movement in those tubing joints, probably by welding them. Before we do so, we need to understand how they are currently joined, which nobody seems to know for sure. When we apply the intense heat of the welder , we're afraid some glue or something might come out of the joint that would ruin the weld and potentially injure the welder.

Also, some of the joints are visibly not straight. When we weld them up we want to straighten them out. As long as we are going to all of this trouble, there is another improvement that we believe is worth doing: by repositioning one end of half the truss members, and rotating the secondary frame slightly, we can improve the stiffness of the structure.

Before-and-after representations of the frame are shown below. Truss tubes, like truss bridges, are built using the same principles; by arranging the structural elements into triangles, one can create a strong, stiff framework, and wider triangles make for stiffer frames. The current structure has four relatively narrow triangles, separated by four trapezoids, as shown on the left. With a fairly simple modification, we can make those triangles wider and stiffer, as shown on the right, and convert the trapezoids into additional, inverted triangles. Frame3DD tells us that this modification should give us a more than 2X improvement, with a maximum deflection of less that 0.02 inches, so that is what we are planning to do.



Current truss tube layout (left) and proposed modification (right)

We're currently refining this plan, figuring out the details of exactly how to carry it out, so it is subject to change.

By the way, I have used the term "we" a lot in this column. The team working on this phase of the project consists of Frank Lyter, Ron Kunkel, Earl Pursell, and me. Kyle Kramm also contributed some useful discussion during Megameet.

Current Status and Activities: We have formulated a plan to correct the flexure issues with the truss tube, and performed simulations that indicate it should work well. We're working out the details and preparing to implement it.

StarWatch

by Gary A. Becker



Perseids: The Big Show Begins

From Saturday evening into Monday morning, August 11-13, are the big nights for the 2018 Perseid meteor shower. Many astronomy enthusiasts call the Perseids the best shooting star event of its kind during the year, and that may be true because it combines relatively high meteor rates with warm summer nights which are relatively short. Compare that to the Geminids in December, where the number of meteors each hour could be double the Perseids, but the temperature may very well be in the teens. By dawn if you do not succumb to the cold, all you can think about is a hot shower. No sleeping bag or bags, hand-warmers, or hot drinks have ever kept me warm for very long during the Geminids.

The best advice for Perseid meteor observing is not to start too early in the evening, although this year may be an exception. The analogy is similar to being in a vehicle moving through a downpour. It is the front window that seems to be getting all of the action as you plow through the deluge. The back window only gets a drop or two because it is shielded by the front of the car. Likewise, in the early evening we are being shielded by the Earth and normally see reduced meteor activity. As local midnight approaches, the Earth slowly makes its rotational turn into the meteoroids, bringing us to the front window, with the resultant increase in activity.

If the peak rates of the shower coincide with the post-midnight hours, observers could be treated to even more enhanced action. That could happen for this year's Perseids, but currently Europe is in the most favored locale. The 2018 peak according to the International Meteor Organization occurs between 4 p.m. August 12 through 2 a.m. August 13, EDT which means that meteor activity could be somewhat enhanced on the evening of the 12th before midnight if maximum activity occurs nearer to the middle of this time interval. As we begin to rotate into the debris dislodged from the many passages around the sun of Comet 109P/Swift-Tuttle, some of the first Perseids witnessed will be just skimming the top of the Earth's atmosphere. They can create long bright trails, sometimes fireballs, as they are ablated more slowly by this thinner region of air. A much earlier peak also means that rates may be enhanced on the previous morning, Saturday into Sunday, August 11-12, but more towards dawn than midnight. This is what the American Meteor Society is predicting.

If the highest meteor rates are encountered closer to the predicted end time or even beyond, more enhanced rates can be expected on the morning of August 13.

Predicting a meteor shower peak is still not an exact science, but the Perseids have been known to show a certain amount of consistency over recent years. Do not fret, however, if the weather looks like it is going to bomb out for the best nights. This week, leading up to Perseid maximum, will yield many beautiful shooting stars with more fireballs being spotted on pre-maximum evenings than post-maximum nights. Observing the Perseid meteor shower for two nights on the banks of Flathead Lake in northwestern Montana in 2016, Pete Detterline and I saw brighter meteors on maximum night than on the following evening. Rates also dropped to about half of the activity of the previous night. That again is very consistent with normal Perseid encounters. Perseid meteor rates climb steadily the week before the time of greatest activity and drop off rapidly afterwards, so you'll still have plenty of opportunities to snag meteors in the upcoming days.

Find more information about the Perseids at: <http://www.astronomy.org/StarWatch/August/index-8-18.html>

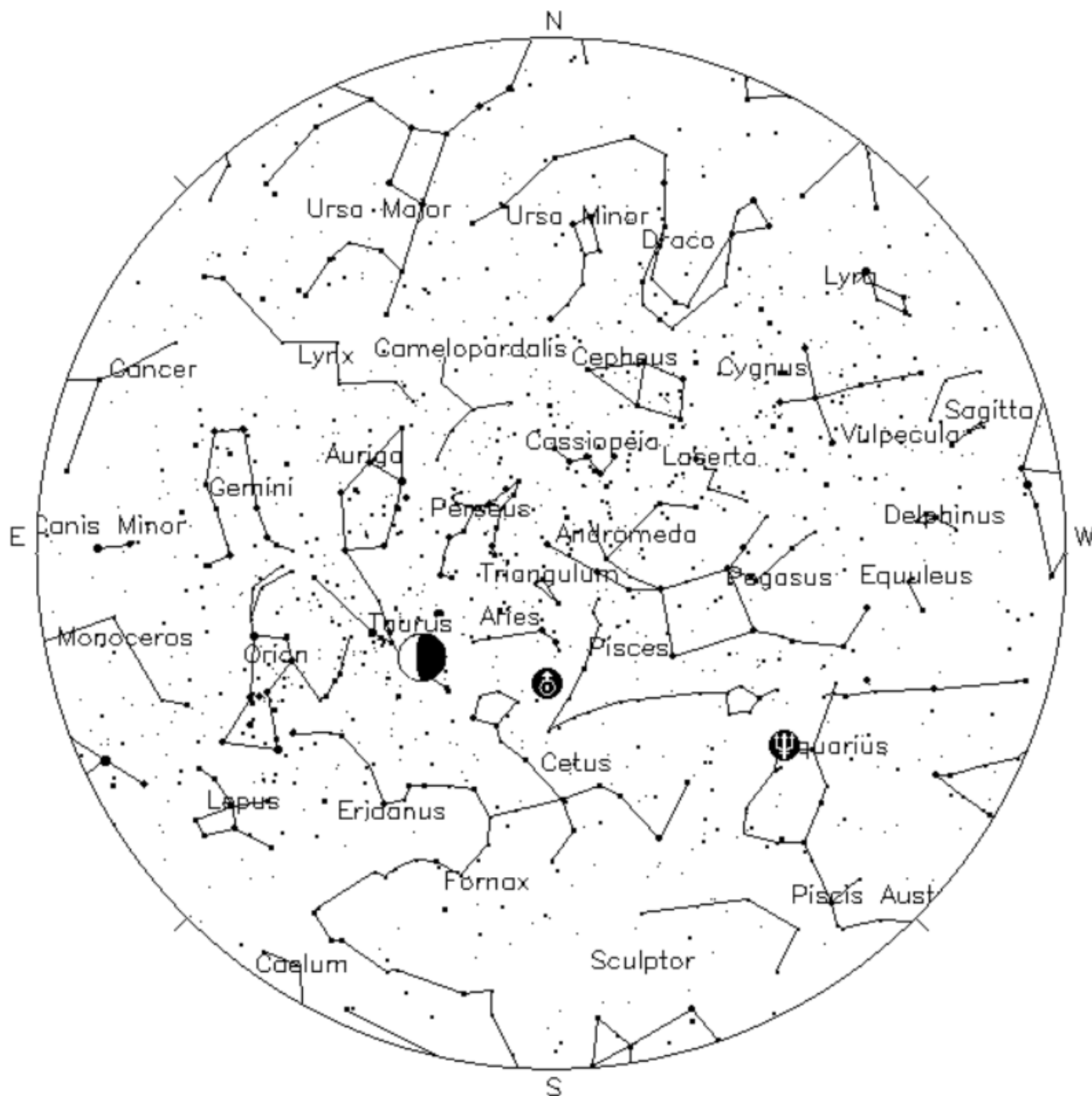
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Moravian College Astronomy - [astronomy.org](http://www.astronomy.org)



What's Up for August 2018



Sky above 40°33'58"N 75°26'5"W Monday 2018 Aug 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

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[Customize Your Sky ->](http://www.fourmilab.ch/yoursky/)

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

AUGUST 2018

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

SEPTEMBER 2018

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

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	2:00 PM	11 S.M.	25	29		17		no camping	7	15	23	29
December	2:00 PM	8 Grace Com	30	20		no mtg		no camping	7	15	22	29

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