

The Observer

The Official Publication of the Lehigh Valley Amateur Astronomical Society

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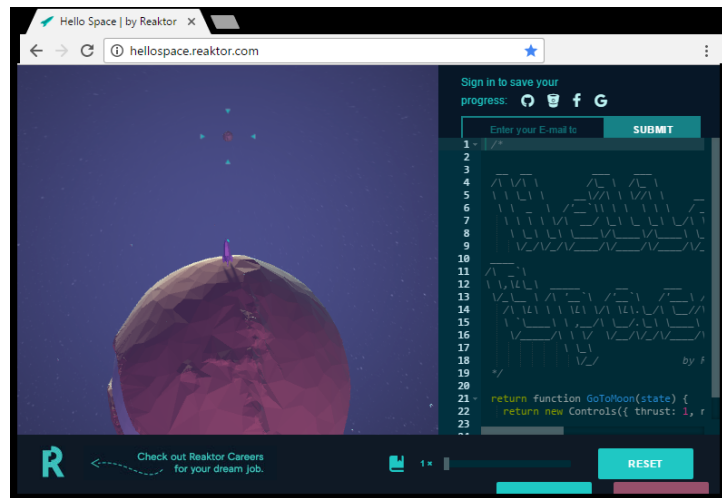


ad astra*****

I had really been looking forward to our February presentation on String Theory and Black Holes and the meaning of the word "Holography" when it is used in theoretical physics, and I wasn't disappointed. Lehigh's Dr. Sera Cremonini did a fantastic job of adapting the material to our audience, and entertained some great questions from us. I may be biased in expressing this opinion since I had some prior exposure to this material at the Thursday afternoon Physics colloquia at Lehigh, but I think at least most of us agree that it was a really good presentation. At least, I didn't hear any complaints!

Since we had a larger venue and an interesting topic, I tried to do a little extra publicity for this meeting, by sending fliers to be posted in the Physics departments at all of the local colleges and universities. Lehigh also carried an announcement of our meeting in a sidebar to an article about Sera on their news site (<http://www1.lehigh.edu/news/vibrating-essence-universe>). Unfortunately the weather reports were a little "iffy" and although the roads were fine, some folks may have decided to sit it out rather than take a chance. But still, we did pull in a few new faces, including several from Lehigh and at least two from Moravian.

I am planning to try this again for our March meeting, which will feature Dr. Asif ud-Doula from Penn State's Worthington campus in Scranton. I met Prof. ud-Doula at one of those Lehigh colloquia, where he showed some fantastic visuals from his simulations of what happens around massive magnetic stars, so I think it will be another great talk. I'm hoping he will manage to show us the videos which he could not get working at Lehigh.



Resisting Temptation

In June last year, I briefly mentioned a coding game I had found (and played) that required writing a program to bring a simulation of the SpaceX rocket in for a soft landing. Well, a company called Reaktor has upped the ante, challenging me to fly their simulated 3D rocket from their simulated Earth to their simulated Moon. It would require learning how quaternions are used to represent rotation, among other things, and it looks like an awful lot of fun. This is like catnip to me and I am itching to sacrifice

the next two weeks or so of my life to working out a solution. Fortunately, I have other interesting and more useful projects to work on, so I am resisting the pull. Or I have until now, at least.

I'm not sure what happens if you play this "Hello Space" game and win. Maybe the screen displays the words "You Won" in a really cool 3-dimensional shape with a really awesome color scheme. Maybe the folks at Reaktor email you with a job offer. If you decide to take it on, please send me a note and relate your experience.

Spring To-dos

Don't forget to put away the snow shovels, drain the gas out of the snowblower, and put the left-over rock salt someplace where it will stay dry until next winter. It's also time to get those records in order for your annual accounting with Uncle Sam and Uncle Miltie (which, as someone who was in High School in the Seventies, is how I still think of the Pennsylvania government.) And please, if you haven't done so already, get your renewal in to our Membership Director! You can download a form with his address [here](#).

Also, keep in mind that MegaMeet will be early this year, or at least our first attempt at a spring season MegaMeet will be early. After both of our Pulpit Rock events were rained out last year, we decided to schedule MegaMeet for the weekend of May 26. Hopefully we will get some nice skies and we'll have a good weekend on the mountain.

Kudos

I'd like to acknowledge a donation from Dave and Angelia Schwartz, facilitated by John LaShell, of 25 sheets of particle board. This came to us at a perfect time, since we want to add a layer of sub-flooring to the observatory floor for the 40-inch, and we were planning to buy material for this. Thanks also to John and Ron Kunkel for picking it up, conveying it to Pulpit Rock, and unloading it into the building.

Ad Astra!

— *Rich Hogg*

Minutes for the LVAAS General Meeting of 12 February 2017

Director Rich Hogg brought the meeting into session promptly at 2:01 p.m. He thanked LVAAS member and Muhlenberg staff member, Dr. Judy Parker, for arranging the facilities for today's meeting. He also introduced Rhonda Young, the newly appointed Director of Member Services, aka the Red Shift Store. It was noted that the 2017 LVAAS calendar was still available and that the price was now discounted to \$15.00.

After a quick introduction of LVAAS to the guests present, he introduced Dr. Sera Cremonini, Assistant Professor of Physics at Lehigh University, today's speaker. Dr. Cremonini's topic was Black Holes, Strings, and Holography, which are her research interests. She described how string theory gets past the singularity problem of black holes in General Relativity because strings have fixed lengths and they cannot be compressed to a singular point. She further noted that the Entropy, S , of a black hole, as derived by Bekenstein and Hawking, was proportional to the area of the event horizon's surface of the black hole. Thus the properties of a 3-D entity, the black hole, could be fully described by the 2-D surface of the event horizon. This is the holographic effect that comes out of string theory, a quantum theory of gravitation. The very interesting talk concluded at 3:18 p.m.

After a short break, Rich gathered the audience for the usual information session. He turned the agenda over to Membership Director, Scott Fowler, who reminded members who still have not done so to do their renewals now before their names would be dropped from the active list. He then conducted second readings for David Yannarell, Andrea Sarnowski, and Ted Goffinet, who were then recognized as full members of LVAAS. A first reading was then held for Dr. Kathleen Conn.

Rich then investigated the interest of LVAAS members for holding a 60th Anniversary celebration of sorts. The interest was to do so, but to keep the costs in the \$30 range rather than higher. A possible venue of Wood's Dining Hall at Lehigh University in the November time frame was discussed as serious possibility.

Rich also mentioned that donations to LVAAS can now be done through the United Way. Also mentioned was that MegaMeet 2017 was to be held May 26-28, as a spring event rather than the usual fall event of past years. Also the next public star party was scheduled for March 4th. Jim Rittenburg will do the talk and Fred Bomberger and Earl Pursell will do the planetarium shows.

Rich then called on Treasurer, Gwyn Fowler, for a report. Gwyn reported year-to-date income of \$8,317.35 and expenses of \$3,509.25. She also noted an anonymous donation of \$8,500.00 toward the 40" project, which brings that fund total to \$16,313.05.

Lastly, Rich mentioned that the next General Meeting would be held March 12th, again at 2:00 p.m. at Muhlenberg College. The speaker would be Asif ud-Doula on the topic of winds from hot magnetic stars.

The meeting adjourned at 4:00 p.m.

Minutes were prepared and submitted by Secretary, Ron Kunkel.

General Meeting: Open to the Public
Sunday, March 12, 2017 at 2 p.m.

Muhlenberg College, Trumbower Rm. 130 (Lithgow Science Auditorium)

Powerful Winds of Magnetic Massive Stars

Asif ud-Doula, PhD

Associate Professor of Physics, PSU Worthington Scranton



Massive stars (at least eight times as massive as the Sun) possess strong stellar winds driven by radiation. An increasing number of these massive stars have been confirmed to have global magnetic fields. Such magnetic fields can have significant influence on the dynamics of these stellar winds which are strongly ionized. Such interaction of the wind and magnetic field can generate copious amount of X-rays, they can spin the star down, they can also help form large scale disk-like structures. In this presentation I will discuss the nature of such radiatively-driven winds and how they interact with magnetic fields.

The 2017 LVAAS Calendar will be available for purchase at this event.



- Do you live in the area? Do you want to **become a member of LVAAS** and have access to observatories with awesome dark skies and connect with like-minded astronomers who'll be happy to help you hone your telescope techniques, including astroimaging? Don't wait another minute! Download the membership form: http://lvaas.org/filemgmt_data/files/LVAAS2017MembershipRenewalForm.pdf and come to a general meeting or star party; check our website for details!

- Members! If you haven't already done so please **renew your LVAAS membership**:
First, download the renewal form from this link:
http://lvaas.org/filemgmt_data/files/LVAAS2017MembershipRenewalForm.pdf
Then, please send it, along with your check to the address on the form.

- **The LVAAS 2017 calendar** is available for purchase at general membership meetings including those held at Muhlenberg College over the winter months. Price has been reduced to \$15. Proceeds benefit the LVAAS Greater Lehigh Valley educational outreach program.



Thank you for your generous support of LVAAS!

Schlegel Observatory Report

by Rich Hogg

March, 2017

We have been trying to avoid "scope creep" in our work to finish the Schlegel Observatory. If you don't know what that is, it's when the "scope" of a project — the defined extent of the work that needs to be done — "creeps" outward to encompass more than was originally intended, requiring more effort and more money. But a certain amount is inevitable and appropriate, especially as one looks under the surface layers of an old project and finds out that things were not as had been assumed.

This is the story with electrical power distribution in the Schlegel observatory building and the 40" telescope system. Here is, roughly, the sequence of discoveries and new circumstances that occurred:

1. We had a major failure of the roof, leading to about 18" of water and ice in the basement in the Spring of 2015. (The roof was replaced that year.)
2. We noted that there was an auxiliary breaker panel in the basement which could conceivably be flooded if something similar happens in the future.
3. We noted that the main breaker panel had too few circuits and was an older style.
4. We noted that there were not enough outlets in certain locations in the building.
5. Most importantly, we also noted severe mold damage and infestation in several locations, which necessitated exposing the walls to replace drywall and insulation.
6. We noted that the power supply units for the telescope were integrated into the building rather than the instrument, which means that if you want to remove power to the telescope, you need to know which breaker to trip. In the future if we have a problem, it could mean exposing the walls again.
7. We found some of these power supply units in the pit, mounted to the wall between the pier and the pit, diligently guarded by numerous spiders and other dangerous vermin and accessible only by an act of contortionism, climbing a ladder (backwards) in the narrow space.

We also observed that these old-style, heavy and bulky power supplies had aging electrolytic capacitors which would need to be replaced, at a minimum.

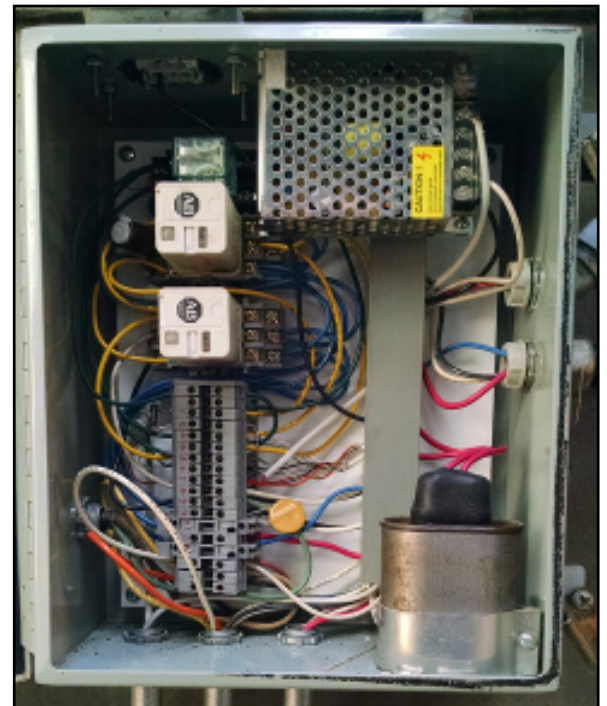
Let me be clear about one thing: I am not criticizing any of the choices that were made in setting things up this way. We have to remember that this project was started over 30 years ago, and like everything else, the technology of power distribution and conversion has advanced considerably. Times change, and technology changes faster than just about anything else. If you approach the same problems with what's available today, you get a different solution, which is more compact, more maintainable, and less expensive. In our case, the situation with needing to open up the walls has led us to decide to redo it while we have the opportunity.

For the building, the story is pretty simple: we'll install a larger panel and remove that basement subpanel, re-routing the circuits to the main panel. We'll add a few more outlets, including one dedicated to the telescope. We'll probably replace some old-style wiring with newer stuff that we found in the basement.

The telescope itself will have a standard 120V power cord that plugs into the wall (specifically, the top of the wall inside the pit, reachable from the observatory floor.) It will also connect to the building via a standard network cable for data, and importantly, it will be easy to completely disconnect it from the building, should the need arise.

The power supplies in the telescope will be replaced with modern, high-efficiency switching power supply units that are lightweight and compact, so that they can all be mounted in an enclosure that I found in the basement and that we have mounted to the pier, under the east side of the mount.

This process has already begun, as shown at right. The new power supply for the dome rotation relays is now nestled into the relay box on the south wall. The old one was a 15-pound boat anchor that required an Indiana Jones-like expedition to get to it, while the new one is about the size of a juice box and is at a very convenient location on the observatory floor. (It cost \$12, by the way.)



The new dome relay power supply, in the small perforated metal box with the yellow warning label, replaces a "boat anchor" that was hidden in the walls.



The 110V power connection ready to be installed on the telescope, as I mentioned in last month's report. It has a drive key switch, an emergency stop button, and a circuit breaker, as well as a power cord and 3 indicator lamps.

The Other Schlegel

I have actually been spending most of my time lately on the 18" telescope in the Schlegel-McHugh Observatory. It developed a problem late last year, with the drive motor not turning at the correct rate. We did some measurements and came to the conclusion that nothing had actually broken. Instead, I believe it is an issue with the driving circuit from the original design, intended to drive the 120V synchronous motor at 60.16Hz for proper sidereal tracking. When the circuit is switched to use 60Hz line current directly, the motor runs at the proper rate for solar tracking, but it isn't working at sidereal rate any more.

I think the reason is that the original circuit was under-designed and never provided a full 120V. It was good enough for many years, but now that the motors and gears have aged, it's no longer making the cut. We had also noticed that the its output contained noisy high-voltage "spikes" that we think are probably not very good for the capacitor required to start the motor. So, I am working on a new driver module to fix the problem, with the goal of getting the 18" back up to snuff for MegaMeet and this year's prime observing season.

I'm looking at two approaches. One is to modify a commercial "true sine wave" inverter module, which I currently have under bid on eBay, to operate at the desired frequency. This will depend on being able to figure out the design of the circuit and add some components for the variable-frequency drive, that can be properly controlled by the existing control system. I am guessing that the inverter probably uses an EG8010 chip to control the waveform, in which case I have an idea what to do.

The other approach I have been working on is to design a custom inverter from scratch. This is a fair undertaking, but there were some additional reasons to give it a try: I'll learn something from it, the result might be useful to other ATMs, and it's fun. So far I've managed to get some software for circuit simulation working, and a circuit design that works pretty well in the simulation.

Current Status and Activities

We received an updated report from Lockwood Custom Optics, which clarified the situation a bit. There is actually no change from last month, and the reason has to do with the weather. The machining of the central opening in our mirror needs to be done in an unheated space, and it requires a water-based lubricant. So, now that they have figured out a way to flip the mirror over safely, they will complete the work when the weather is a little warmer.

We have received prices from two coating vendors and we'll be discussing their offerings at the next Board meeting.

As mentioned above, my efforts have been focused on the RA drive for the 18" lately.

The Iris Nebula, NGC 7023, in Cepheus

By Mike Tapper



The Iris Nebula, NGC 7023, is 1300 light-years away in the constellation Cepheus. It shines at mag. +6.6 and is lit by the mag. +7 star SAO 19158. The image was taken in 2010 during my early days of imaging and post-image processing with a OSC Atik 16c small chip camera.

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.

Milky Way's Missing Dwarf Galaxies – Part II

My November 2016 article discussed the missing dwarf galaxies of the Milky Way. This month I discuss the discovery of possibly the faintest dwarf galaxy yet detected in the Milky Way. The discovery of this faint dwarf galaxy, named Virgo I, indicates that many more of them might exist. If true, this is good news for the 'bottoms up' theory of galaxy formation, which posits that hundreds of these dwarf galaxies should orbit the halo of the Milky Way.

The formation of galaxies like the Milky Way is thought to proceed through the hierarchical assembly of dark matter forming dark halos, with the subsequent infall of gas, and star formation affected by gravity. These models of galaxy formation are based on the so-called cold dark matter (CDM) theory which predicts the presence of hundreds of small dark halos orbiting in a Milky Way-sized dark halo and a comparable number of luminous satellite companions. However, only tens of satellite galaxies have ever been identified. This falls well short of a theoretical predicted number, which is often referred to as the "missing satellite problem". To resolve the problem, astronomers may need to consider theories of dark matter other than CDM theory to explain the shortfall in the number of satellites. Another possibility is that they have seen only a fraction of all the satellites associated with the Milky Way due to various observational biases. This issue remains unsolved as currently only about 50 of these satellite galaxies have been identified. Most of them, about 40, are faint and diffuse and belong to a class called dwarf spheroidal galaxies.

The difficulty of detecting these faint galaxies is daunting. In this discovery, an international team led by researchers from Tohoku University used the large aperture of 8.2-meter Subaru Telescope and the large field-of-view of its Hyper Suprime-Cam instrument. The combination of both these features enabled an efficient search for very faint dwarf satellites over large areas of the sky. The first step in searching out a new dwarf galaxy is to identify an over density of stars. Next, one has to assess that the over density is not due to line-of-sight unrelated dense fields, but is really a stellar system. The standard method for doing this is to look for a characteristic distribution of stars in the color-magnitude diagram, such as the Hertzsprung-Russell diagram. Stars in a general fields, non-stellar systems, show no particular pattern in this diagram, while stars that are part of a stellar system show something similar to

a main sequence-like distribution. This is a very tedious process as it requires the characterization of each star's color (temperature) and absolute magnitude. Prior surveys did not find galaxies this faint because they used too small of an aperture telescope to detect such faint stars.

This discovery has profound implications because it implies hundreds of faint dwarf satellites are waiting to be discovered in the halo of the Milky Way. How many satellite galaxies are indeed there and what properties they have, will give astronomers an important clue for understanding how the Milky Way formed and how dark matter contributed to it.

Reference:

Record-breaking faint satellite galaxy of the Milky Way discovered. (2016, November 22). Retrieved from <http://phys.org/news/2016-11-record-breaking-faint-satellite-galaxy-milky.html>

The end of my ramblings until next month.
- Ron Kunkel



by Gary A. Becker



The Three Marys: Stellar Role Models

Years ago, early in my teaching career, after concluding a planetarium program about the winter constellations, one of my students talked to me about the three belt stars of Orion: Mintaka, Alnitak, and Alnilam.

She said that in her country, Ecuador, they were called **The Three Marys (Las Tres Marias.)** After my first initiation to this asterism, a group of stars as famous as a constellation, but really just a part of an officially sanctioned star pattern, more students made similar comments until I began to incorporate The Three Marys into my constellation lessons, especially when I was speaking to older, predominantly Hispanic groups; but who these three biblical Marys were still remains a mystery, partly because of the commonality of this Hebrew name.

Were they the three women at the tomb of Jesus on that first Easter: Mary Magdalene (one of my favorite biblical characters), Mary of Clopas, and Mary Salome? Or were they possibly the three Marys present at the crucifixion: Mary the mother of Jesus, and again, Mary Magdalene, and Mary of Clopas? They were risk takers, gutsy individuals. Christ always had an entourage of women following him during his short, but prolific ministry on Earth, and in the early Church, women played a central role. Gradually, however, as Christianity formalized, women became less powerful as they were downplayed into minor characters by the male priesthood, except for Mary, the mother of Christ.

In solidarity with the demonstrations for women's rights being conducted throughout the nation and the world, The Three Marys composing Orion's belt couldn't be more appropriate. They are powerhouses of stars. Mintaka (upper right) shines with the luminosity of 180,000 suns, Alnilam (center) radiates with a brightness of 375,000 Sols, and Alnitak (lower left) 100,000 suns. If these stars were only pink, but The Three Marys are blue giants, and blue in astronomy means young and impressive, similar to whom these women really were!

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Moravian College Astronomy - astronomy.org



From the LVAAS Archives:

Forty and Fifty Years Ago

by Sandy Mesics

LVAAS Phone Home!

At the March, 1967 Board Meeting (which at 2 hours and 1 minute was the shortest board meeting in 1967) there was a discussion about having phone service installed at South Mountain. Keep in mind that in 1967, LVAAS had been at the South Mountain location for almost a decade. Not only were general meetings and board meetings held there, but there were public shows and star parties. In this time before cell phones, no one even thought that having a phone at LVAAS was important! After a heated debate, the motion passed, and LVAAS got a phone.

In 2006, the Board had a similar discussion regarding whether there should be internet service at South Mountain. Again, it was a heated discussion, but eventually the motion passed. Unfortunately, the DSL connection was slow and unreliable, so a few years ago we upgraded to high speed cable internet, and no one thinks twice...

Keep in mind that to this day, there is no telephone land line or internet connection at Pulpit Rock. Hint, hint...

Just who was LVAAS Honorary Member Mike Spacek anyway?

Forty years ago, in March 1977, the LVAAS membership voted unanimously to bestow honorary membership to Mike Spacek of the Spacek Instrumentation Corporation in Pottstown. Spacek had been an LVAAS member since 1967, and had built and donated the 8-inch refractor that is now in the Kawecki Observatory at Pulpit Rock. Spacek also had done the aluminizing of the Society's mirrors free of cost, and he provided advice to society members and allowed the use of his optical and machine shop equipment when needed.

Michael Spacek, born in 1915, was an amateur astronomer as a young man. He studied about the movements of the stars, moon and the planets. When he was 21, he built his first telescope and promptly sold it. He built a second, and this, too found a buyer. In the late 1930's he formed a small optical company. It was in this period when public interest in astronomy was becoming more popular. A few public planetariums had opened and a market for telescopes and lenses for amateurs was beginning to grow from the few sources at that



time. While trying to support himself, he also worked at Bethlehem Steel, according to the 1940 census.

Mike's business was interrupted when he was called into military service during WW2. Following his service, he formed his own company, Spacek Instruments, in Pottstown, where he established a fully equipped optical shop. Initially engaged in manufacturing telescopes for the public, he developed a clientele needing special forms of optics and optical instruments. He was a sub-contractor for General Electric, the Goddard Space Flight Center, the U.S. Bureau of Standards, and the Army's Frankford Arsenal.



Announcement...

A complete line of DOMES and TELESCOPES is available from ONE source. To meet the widespread interest and demand for modern equipment, we have included telescopes of advanced design, suitable for visual and photographic applications. To house these instruments, we are also manufacturing domes for schools planning astronomy departments. Already approved and accepted by educators and architects, several installations have been completed and others are under contract. Typical design is the Spacek Observatory with 16-foot dome and 12-inch Cassegrain reflector, located near Pottstown, Pa.

Dome sizes from 10 to 20 feet in diameter are available. Also, a selection of reflecting telescopes (Newtonian-Cassegrain systems to 16-inch aperture) and refracting types to 10-inch aperture. Spacek Instrument Co. is now supplying schools, colleges and communities with major equipment necessary to establish astronomy programs... a great advantage to educators. And also significant, an optical department, combining optical design, manufacturing and product quality control, has been added. These new facilities enable us to fabricate a wide range of optics for scientific applications.

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- **Tube:** Seamless aluminum, painted black inside, with hammer-tone green finish.
- **Rack-and-pinion focusing:** Accommodates standard 1 1/4-inch eyepieces.
- **Finder:** 6 power, with achromatic objective, and mounted in adjustable bracket.
- **Pedestal:** Heavy-wall steel tube with collapsible legs. Guaranteed free from torque and wobble. Design allows tube to be swung in any position without bumping into legs. Pedestal, mount, and legs painted black crinkle finish.

\$89.50

- Three eyepieces: 50x Kellner, 100x and 200x Ramsdens.
- Instructions.

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RACK AND PINION (fits any size tube).....	\$ 8.50
6-POWER ACHROMATIC FINDER.....	\$ 7.25
MIRROR CELLS: 6-inch, \$4.50; 8-inch, \$10.50; 10-inch, \$19.50	

Prices are f.o.b. Pottstown, Pa.

Pennsylvania residents add 3% sales tax to all prices.

SPACEK INSTRUMENT CO.

1120 Sembling Ave.
Pottstown, Pa.
Telephone: Faculty 3-2825

He also produced optics for the Univac Corporation. Spacek was quoted as saying, "I guess I'm one who has turned a hobby into a business but who regards the business with the same fascination I regard the hobby." He not only manufactured telescopes, optics and optical instruments, he produced all the mechanical components, and even constructed complete observatories.

According to former LVAAS Director, George Maurer, Spacek's expertise in optical craftsmanship was joined with his clever and imaginative mind and he often had work that other firms did not wish to accept that he successfully produced. For several years, he was the sole supplier of hundreds of tiny two element lenses for the Spitz planetarium projectors. Mike became a friend to the Society and ready source of advice and materials at



1. Spacek built both the 8-inch refractor and the Kawecky Observatory

reasonable cost. Many LVAAS members had their homemade mirrors aluminized at his shop.

The 8-inch refractor that is housed in the Kawecky observatory was made by Mike. The objective is a Steinheil design that has the flint element in front of the crown. The late Paul Shenkle, an LVAAS member and an optical expert in his own right, had refigured the crown element while working with Mike and he noted that this objective style had also been used by the Brashear firm. Mike had used this refractor for a while in his own observatory. It had been removed and set aside at the time when LVAAS received the ownership of the Pulpit Rock site with the Kawecky Observatory. Coincidentally, Spacek had built that observatory of Henry Kawecky, and had supplied him with the 12.5 inch Cassegrain telescope in the observatory.

When this telescope was removed for repair, Mike offered his 8-inch refractor as a loan and it was installed.

It remains in service there to this day, an instrument particularly well-suited to lunar and planetary observing. When Mike officially gave the refractor to the Society, it came to mind that the roll-off observatory that the Society built in 1976 had never been named. The fact that the Newtonian telescope installed there was made by Mike appeared to make naming it the Spacek Observatory an obvious move, as a means of recognizing Mike's long record of service to the Society. This move was made in late 1983. The dedication was scheduled to take place at the annual August meeting at Pulpit Rock on the 8th of that month. Unfortunately, a heavy rain made the road impassable and so the official ceremony was held at a dinner at the Lenhartsville Hotel. Both Mike and his wife seemed touched and grateful for this honor. And so, after a lapse of seven years, the observatory received a proper name.



2. Spacek Observatory at Pulpit Rock. Spacek built the 12.5-inch Newtonian telescope

Although Mike Spacek passed away some time ago, his home, observatory, and shop remained in his family's hands until quite recently. Most of his equipment has been sold off, but in a trip there a couple of years ago, I captured these images of the observatory, and the remaining instrumentation, including an eight-inch folded refractor. The observatory itself is a two-story structure. The ground floor was his shop, and the observing floor featured piers for two telescopes. The roof rolled off in two segments, and joined in the middle when closed. It was quite an impressive facility.



3. Spacek observatory and shop in Pottstown.



4. Eight-inch folded refractor a the Spacek observatory in Pottstown.

Sources

Pottstown Mercury, October 24, 1964

“The History of LVAAS Observatories” by George Maurer.

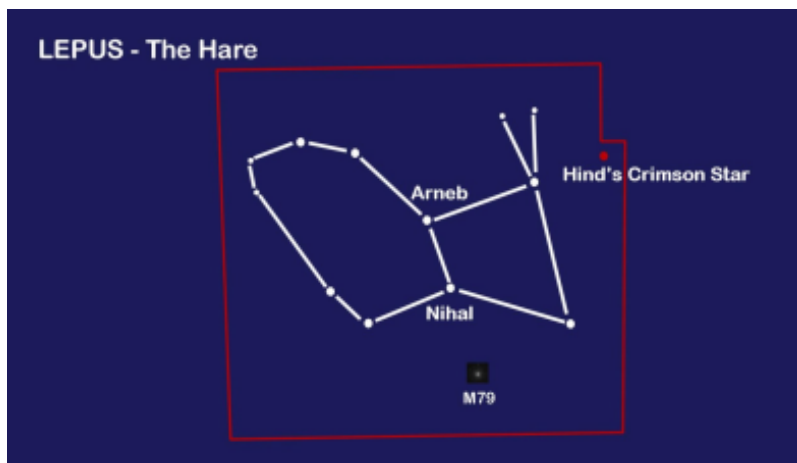
Highlights of the March Sky

by
Carol Kiely



As winter approached, I couldn't wait to see Orion in the night sky. Being able to see the individual stars of the Trapezium Cluster in the Orion Nebula always gives me goosebumps. But now I am of the opinion that he is just a big show off, so I would like to tell you about a couple of less prominent constellations close by.

One of these is Lepus - The Hare. This is the very faint constellation that lies directly under Orion's feet. The brightest star in this constellation is called Arneb - the Arabic word for "hare."



This F-class supergiant, over 2,200 light years away from us, has a diameter almost 75 times that of our Sun. This star is thought to be dying, as it has ceased fusing hydrogen in its core. Spectral measurements show a nitrogen content five times higher than our Sun. It also has twice as much sodium. One of the most fascinating stars in this constellation, however, is a carbon star known as Hind's Crimson Star (R- Leporis) named after the English astronomer John Russell Hind who

discovered it in October 1845. He described its appearance as "a drop of blood on a black field." It is a Mira-type variable - a star in the latter stages of its life which has begun to slowly pulsate, shedding material from its outer layers in the process. This expansion and contraction leads to changes in temperature and therefore changes in its luminosity. From Earth, its apparent magnitude varies between 6 and 11.5 every 430 days. At the moment, its magnitude is around 7.2 and it is getting brighter. Its red color is due to the large concentration of carbon compounds in its outer atmosphere which absorb any blue light being emitted. Unfortunately, its color intensity diminishes as the star becomes brighter, but it is still worth a look.

Monoceros - The Unicorn lies to the east of Orion's right arm. This constellation is often overlooked as it doesn't contain any really bright stars. It does, however, contain a triple star - β Monocerotis. William Herschel, who discovered it in 1781, said that it is "one of the most beautiful sights in the heavens."

All three stars (A, B and C) are hot, blue-white B-type stars, each being 1,000 times more luminous than our Sun. B and C have an orbital period of about 4,000 years, while A takes 14,000 years to complete its orbit around the BC pair.

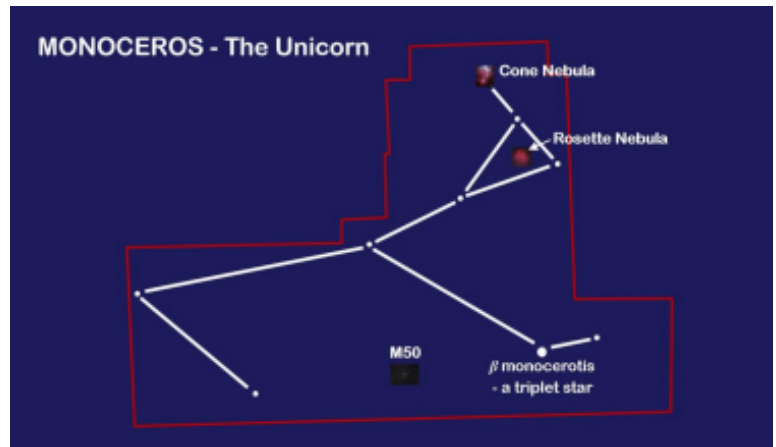
What it lacks in bright stars, Monoceros more than makes up for in star clusters and nebulae. The most celebrated of these is the open cluster NGC224 that contains several

super hot O-type stars, the brightest being over 400,000 times more luminous than our Sun. This cluster is surrounded by a glorious emission nebula known as the Rosette Nebula. The cluster is easily seen with a small telescope, however, you need a dark sky to see the nebula. Another cluster/nebula pair in this constellation are NGC2264 and the Cone Nebula. Both of the Rosette and Cone nebulae are favorite targets among astrophotographers. Another open cluster in this constellation is M50. This cluster can easily be seen with binoculars but it requires a telescope to resolve the individual stars.

The constellation that lies above Monoceros is Gemini. The two brightest stars in this constellation represent the heads of Castor and Pollux, the inseparable twins. Their mother was Queen Leda of Sparta and, according to Greek legend, each twin had a different father: Castor was the son of Leda's husband, King Tyndareus, and Pollux was the son of the god Zeus. This meant that although they were twins, Castor was mortal while Pollux, being the son of a god, was immortal.

With the naked eye, these two stars look very similar, Pollux being slightly brighter than Castor; however, through a telescope they are very different. Pollux is an orange giant. Castor, on the other hand, is dazzling white and when viewed using a high magnification eyepiece, you can see two bluish-white stars. There is even a third star, a 9th magnitude red dwarf, but it is very difficult to see. All three stars are, in fact, spectroscopic binaries, which makes Castor a six star system.

These are just a few highlights of the March sky. I am sure you can find many more.



Happy Stargazing!

P.S. On Valentine's Day around 8.30pm, I saw the most amazing fireball/meteor travelling east to west in the northern sky. It was orange/yellow in color and was the brightest meteor I have ever seen. I was not alone; 63 other people reported the sighting to the American Meteor Society.



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

Solar Eclipse Provides Coronal Glimpse

By Marcus Woo

On August 21, 2017, North Americans will enjoy a rare treat: The first total solar eclipse visible from the continent since 1979. The sky will darken and the temperature will drop, in one of the most dramatic cosmic events on Earth. It could be a once-in-a-lifetime show indeed. But it will also be an opportunity to do some science.

Only during an eclipse, when the moon blocks the light from the sun's surface, does the sun's corona fully reveal itself. The corona is the hot and wispy atmosphere of the sun, extending far beyond the solar disk. But it's relatively dim, merely as bright as the full moon at night. The glaring sun, about a million times brighter, renders the corona invisible.

"The beauty of eclipse observations is that they are, at present, the only opportunity where one can observe the corona [in visible light] starting from the solar surface out to several solar radii," says Shadia Habbal, an astronomer at the University of Hawaii. To study the corona, she's traveled the world having experienced 14 total eclipses (she missed only five due to weather). This summer, she and her team will set up identical imaging systems and spectrometers at five locations along the path of totality, collecting data that's normally impossible to get.

Ground-based coronagraphs, instruments designed to study the corona by blocking the sun, can't view the full extent of the corona. Solar space-based telescopes don't have the spectrographs needed to measure how the temperatures vary throughout the corona. These temperature variations show how the sun's chemical composition is distributed— crucial information for solving one of long-standing mysteries about the corona: how it gets so hot.

While the sun's surface is ~9980 Fahrenheit (~5800 Kelvin), the corona can reach several millions of degrees Fahrenheit. Researchers have proposed many explanations involving magneto-acoustic waves and the dissipation of magnetic fields, but none can account for the wide-ranging temperature distribution in the corona, Habbal says.

You too can contribute to science through one of several citizen science projects. For example, you can also help study the corona through the Citizen CATE experiment; help produce a high definition, time-expanded video of the eclipse, use your ham radio to probe how an eclipse affects the propagation

of radio waves in the ionosphere; or even observe how wildlife responds to such a unique event.

Otherwise, Habbal still encourages everyone to experience the eclipse. Never look directly at the sun, of course (find more safety guidelines here: <https://eclipse2017.nasa.gov/safety>). But during the approximately 2.5 minutes of totality, you may remove your safety glasses and watch the eclipse directly—only then can you see the glorious corona. So enjoy the show. The next one visible from North America won't be until 2024.

For more information about the upcoming eclipse, please see:

NASA Eclipse citizen science page

<https://eclipse2017.nasa.gov/citizen-science>

NASA Eclipse safety guidelines

<https://eclipse2017.nasa.gov/safety>



Want to teach kids about eclipses? Go to the NASA Space Place and see our article on solar and lunar eclipses! <http://spaceplace.nasa.gov/eclipses/>



Illustration showing the United States during the total solar eclipse of August 21, 2017, with the umbra (black oval), penumbra (concentric shaded ovals), and path of totality (red) through or very near several major cities. Credit: Goddard Science Visualization Studio, NASA

Oh, Snap!



 **Doug Wheelock**  @Astro_Wheels · Feb 9

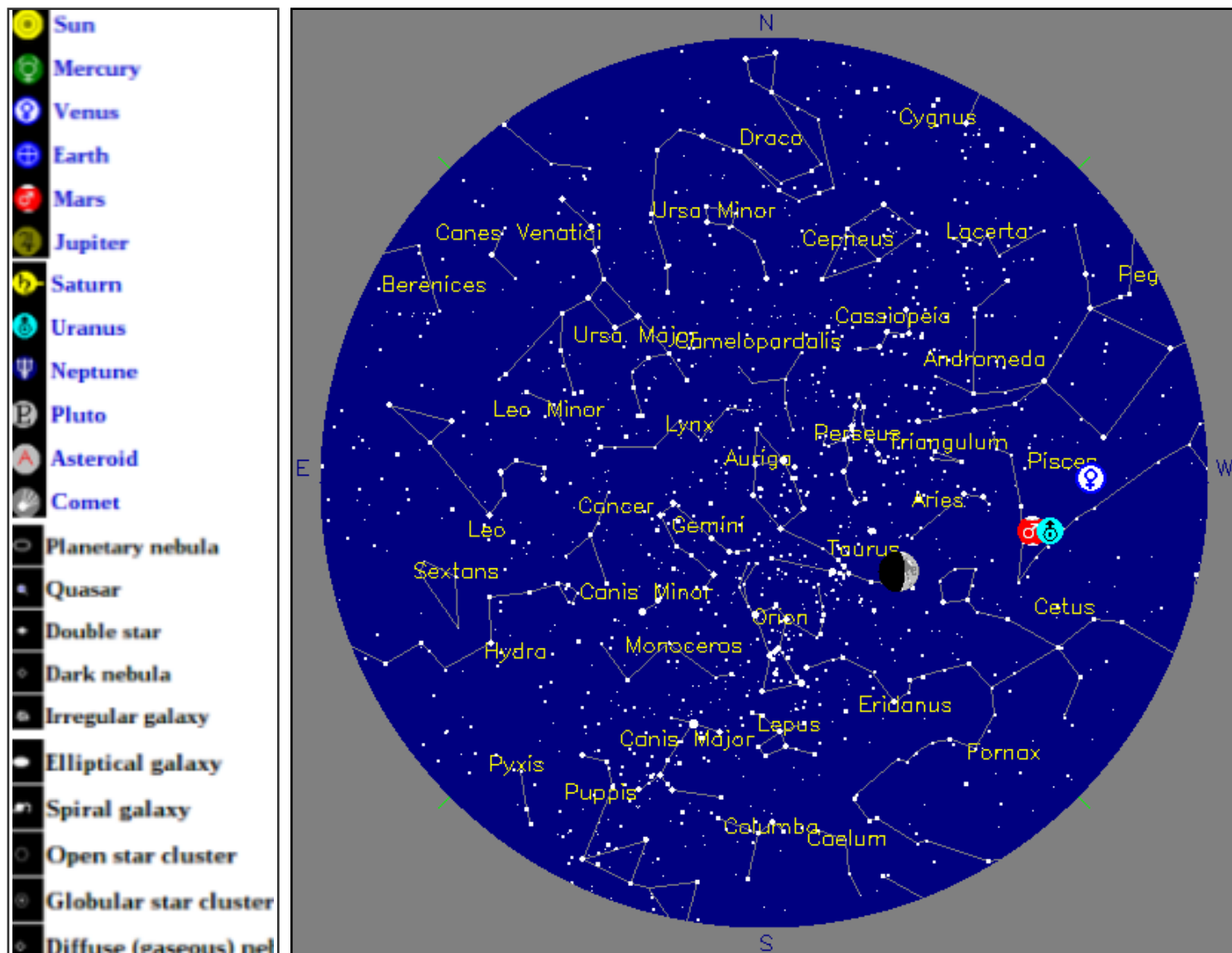
Time...our most precious gift
A gift of freedom to think
A gift of opportunity to love
A gift to recreate ourselves anew

[#DeepSpaceThoughts](#)

Source: ISS Astronaut Doug Wheelock on Twitter posted February 9, 2017.

Oh, Snap! is a recurring feature of LVAAS members' celestial and astronomy-related items which have been generously shared for the enjoyment of our readers. Society members, kindly submit material to editorlvaas@gmail.com.

Sky above 40°33'58"N 75°26'5"W at Sat 2017 Mar 4 0:00 UTC



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

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

ppmto.gif.c - read a portable pixmap and produce a GIF file

Based on GIFENCOD by David Rowley [mgardi@watdscu.waterloo.edu].

Lempel-Zim compression based on "compress".

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

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

MARCH 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			01	02	03 Lunatics and Star gazers Night	04 Star Party
05 First Quarter Moon	06	07	08	09 Astro Imaging 7:00 PM	10 LVAAS Scout Group - Girl Scout Troop 865	11
12 Full Moon General Meeting - 2:00 PM Muhlenberg	13	14	15	16	17	18
19 Deadline for submissions to the Observer	20 Last Quarter Moon	21 LVAAS Scout Group - Girl Scout Troop 6903	22	23	24	25
26 LVAAS Board of Governors Meeting	27 New Moon	28	29	30	31 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather) Lunatics and Star gazers Night	

APRIL 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						01 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather) Star Party
02 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather)	03 First Quarter Moon	04	05	06	07 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather)	08 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather)
09 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather) General Meeting - South Mountain 7:00 PM	10	11 Full Moon	12	13 Astro Imaging 7:00 PM	14 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather)	15 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather)
16 Astronomy Merit Badge - Pulpit Rock - Troop 347 (Pending Weather)	17	18 LVAAS Scout Group - Cub Scout Pack 50	19 Last Quarter Moon	20	21	22
23 Deadline for submissions to the Observer	24	25	26 New Moon	27	28	29
30 LVAAS Board of Governors Meeting						

2017 LVAAS Event Calendar

2017 LVAAS Event Calendar

	Sundays		Board meeting	Thursday	Friday	Saturday	Mondays	Multi-Day Weekends	Moon Phase			
	General Meeting time	location		Astro-Imaging	Lunatics and Stargazers	Star Parties	Scouts at S. Mountain	Scouts at Pulpit R.	New	First	Full	Last
January	2:00 PM 8	Muhlenberg	29	12	no mtg	no mtg		no camping	27	5	12	19
February	2:00 PM 12	Muhlenberg	26	9	no mtg	no mtg		no camping	26	3	10	18
March	2:00 PM 12	Muhlenberg	26	9	3 & 31	4		no camping	27	5	12	20
April	9	S.M.	30	13	no mtg	1		7 - 9	26	3	11	19
May	7	S.M.	21	11	5	6		19 - 21	25	2	10	18
June	11	S.M.	25	no mtg	2	3		9 - 11	23	1 30	9	17
July	05:00 PM 8	S.M.	30	no mtg	28	29		14 - 16	23	30	9	16
August	12	Pulpit	27	no mtg	25	26		4 - 6	21	29	7	14
September	10	S.M.	24	7	29	30		8 - 10	20	27	6	13
October	8	S.M.	29	5	27	28		6 - 8	19	27	5	12
November	2:00 PM 12	S.M.	26	2	no mtg	25		3 - 5	18	26	4	10
December	2:00 PM 9	Grace Community	17	7	no mtg	no mtg		no camping	18	26	3	10

MegaMeet May 26th to 28th

July, Aug & Dec are Saturday meetings with rain date on Sunday
Jan., Feb., and March meetings are at Muhlenberg College
August meeting is at Pulpit Rock
December meeting / Holiday Party is at at Grace Community Church
All meetings 7 P.M. unless otherwise noted

Publishing images is a balancing act!

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

Put the quality in:

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

But watch the "waistline"!

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

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

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

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

Members please use above email address for submissions.

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

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

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

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