The Observer

The Official Publication of the Lehigh Valley Amateur Astronomical Society

http://www.lvaas.org

610-797-3476

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April 2017

Volume 57 Issue 04

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

Dr. Asif ud-Doula's talk on Massive Magnetic Stars at our March meeting was evidence of his passion for his subject. I think his presentation had as much energy as the "hot winds" of the O and B stars that he studies! He also had trouble getting the animations of his simulations to play, just as he did at Lehigh last year, but he demonstrated his determination and commitment to his goals by refusing to give up, and we were able to enjoy the full presentation as a result. Thank you, Asif, for an excellent program!

We also met Dr. Agnès Kim, a colleague of Dr. ud-Doula's at Penn State Worthington Scranton, who accompanied him to our meeting. Dr. Kim does theoretical research on white dwarf stars, and we plan to invite her to come to speak to us at a future LVAAS meeting.

Hot Off the Presses!

In January, Eric Loch, our director of Public Relations, received an email from Cassie Miller, an editor and photojournalist with Harrisburg Magazine and Lehigh Valley Magazine. It seemed that LVAAS was destined to be the subject of a feature article! Eric did a great job in working out the arrangements in order that Ms. Miller could spend some time with LVAAS.

Cassie works out of Harrisburg, so the plan that we settled on was to meet her at Pulpit Rock for an afternoon of touring, and a possible evening of observing. We did this in mid-January, taking advantage of the unusually pleasant weather in the early part of this winter. LVAAS Secretary (and PR Maintenance Director) Ron Kunkel and I met Eric and Cassie at "the Rock," and we had a fine afternoon talking telescopes, taking pictures, and discussing astronomy as a science and a hobby.

The article appeared in the March/April issue of Lehigh Valley Magazine, and it now on-line! Check it out at http://www.lehighvalleymagazine.com/Lehigh-Valley-Magazine/March-April-2017/Adventure-Chick/. I think Cassie did a great job of capturing the excitement of astronomy and the important role that LVAAS has for astronomers in our area. Thanks to Eric and Ron for helping to make the afternoon a success, and especially thanks to Cassie Miller and Lehigh Valley Magazine for a great article about LVAAS. Ad Astra!

— Rich Hogg

Minutes for the LVAAS General Meeting of 12 March 2017

Director Rich Hogg promptly brought the meeting into session at 2:02 p.m. As is the case for our winter meetings, the meeting was again held at Muhlenberg College's Lithgow Auditorium, in the Trumbower room. Rich informed the membership of a very nice article about LVAAS written by reporter Cassie Miller for the Lehigh Valley Magazine. He then presented the agenda for the meeting, namely the speaker, a short break, then to be followed by the usual information sessions which included the introduction of new members and a brief treasurer's report. He then introduced Asif ud-Doula, our speaker for today.

Dr. ud-Doula is associate professor of physics from Penn State University's Worthington Scranton location. He is a leading researcher specializing in the magneto-hydrodynamics of massive stars and his topic was titled "Powerful Winds of Magnetic Massive Stars." Ud-Doula explained that all stars lose mass via their solar winds. Small stars like the sun lose about 10^{-14} solar masses per year. This solar wind is driven by gas pressure. But massive stars, O and B class stars, lose mass at much higher rates of 10^{-9} to 10^{-5} solar masses per year.

Additionally the solar wind of these massive stars is not due to gas pressure, but rather to scattering from electrons bound to their atoms. In other words, these bound electrons produce strong magnetic fields which then drive the emission of material to produce these strong solar winds. Theories of how these magneto-hydrodynamic processes operate are in very good agreement with observations. Dr. ud-Doula's talk also had additional pearls of knowledge concerning many other observations of star systems, and his talk, while being a bit technical, was nevertheless very interesting and enlightening.

After the talk a short break followed, and the attendees reassembled at about 3:40 p.m. Rich called on Membership Director Scott Fowler, who reminded the members present to renew their memberships for 2017 else they be dropped from the rolls by the end of the month. He then called for second readings, but there were none. Scott then conducted first readings for Dylan Dallago, Julie Knode, and Ethan Knode who introduced themselves to the membership.

Rich then called on Treasurer, Gwyn Fowler, for a report. Gwyn reported new income for the month of $1,290.25, all of it going into the General fund, with the other funds unchanged. She also reported new expenses of $2,195.59.

Rich then mentioned the planning underway for the 60th Anniversary Banquet. The Woods Dining Room at Lehigh University has now been reserved for November 3, 2017. Additional details, such as meal, speaker, and pricing, were being worked on and would be forthcoming.

He then called on facilities directors for updates. Bill Dahlenburg mentioned that the cistern at South Mountain was leaking and in need of repair. A porta-potty had been rented with the key being located in the bathroom vestibule. Frank Lyter mentioned that the coring of the 40” mirror was planned for warmer weather, and then it would be shipped out for coating.

Tom Duff mentioned that MegaMeet was scheduled for May 26-28.

Lastly, Rich mentioned that the next General Meeting would be held April 9 at 7:00 p.m. at the South Mountain headquarters.

The meeting adjourned at 3:55 p.m.

Minutes were prepared and submitted by Secretary, Ron Kunkel.

General Meeting: Open to the Public
Sunday, April 9 2017 at 7 p.m.

Grady Planetarium, LVAAS Headquarters

620B East Rock Rd., Allentown PA 18103

David Klassen, PhD
Professor and Chair of Physics and Astronomy
Rowan University

"Remote Sensing to Measure Water Content in Clouds on Mars"

Astronomy is perhaps the one science that really doesn't have an experimental side—you can't make a star or planet in the lab and study it. Thus, everything we know about the universe we know by simply "looking" at it. With a few exceptions, this is also mostly true for the worlds within our own solar system. What I will present is how "looking" becomes "remote sensing" and use my own research using ground-based and spacecraft data to illustrate this idea.

Schlegel Observatory Report

by Rich Hogg

April, 2017

Progress on the forty-inch has been very slow in the past month or so. This month's article will be mostly about "the other Schlegel," i.e. the Schlegel-McHugh Observatory, and about electronics hacking, since that is what I have been doing. If that doesn't interest you, feel free to skip it.

Eighteen Inch Experience

One reason that progress has been slow on the forty-inch is that I am still spending a lot of time on the eighteen-inch. I tend to allocate some portion of this time to sensible introspection and evaluation about the feasibility of my approach to the problem. To put it another way, I obsess about whether I am wasting my time going down the wrong path, because it is taking longer than I wanted it to. But so far, I have chosen to continue on one of the two paths I mentioned in last month's article.

The other alternative that I discussed is tabled, probably for good. When you try something new, there is likely to be a high ratio of "learning" to "accomplishing," but there is a point at which it becomes unacceptable, and ideally you stop when you know that point is coming. The problem is that this forces the ratio to infinity, because aside from learning, you end up having accomplished nothing. That makes it very painful. Another name for it is "giving up."

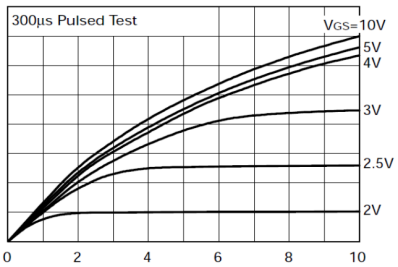
I abandoned the attempt to design my own inverter circuit before ever wiring up a single transistor. Working on silicon chips, I learned the value of using simulation to try out circuit designs, and I decided to apply that strategy here. In the chip business, we do it because it can cost a million bucks to "go to silicon" with your design, and the technique of simulation is so well-refined that when the silicon does not work, it is more often due to human oversight than inaccuracy of the simulation. In this project, I expected the cost of building the circuit would be less than the cost of going out for a nice dinner, but since it would involve at worst potentially lethal, and at least very painful, voltage levels, I decided to work out as much of it in simulation as I could. Beating your head against the computer screen is not as dangerous as detecting voltages over 100 with your fingertips.

So what did I learn?

I learned that there are quite a few free circuit simulation tools available, with varying degrees of usability. There are also a number of "schematic capture" tools that help you get the circuit design into the computer. I thought I would get the job done with EESchema and NGSpice, even though I had to write my own program to translate the design from EESchema format to NGSpice format, but in the end, NGSpice could not hold it together with this kind of circuit. Anyone who has done serious work in this area has learned to dread seeing the message "timestep too small." Often times the most accurate translation is "Abandon all hope, ye who enter here!" What it means is that the simulator is having trouble figuring out what your circuit will do at a particular point in time, and is trying to get around it by taking smaller and smaller steps forward, but it's not helping.

I learned that "device models" are a serious problem for the amateur circuit designer. These are the plug-ins to the circuit simulator that capture the performance characteristics of a particular make and model of transistor. They are often tidy little black boxes inside of which "timestep too small" problems can hide, resisting all efforts to defeat them. They are a pain for the professional, but silicon chips cannot be designed without simulators, so chip foundries cannot sell their services without providing good device models. But companies that make inexpensive "discrete" transistors don't want to work with amateur designers using free tools. There is just no money in it.

I learned how to make my own serviceable device models by matching the performance curves printed on the transistor data sheets. This kind of hack is a lot of fun for me, so when the idea to do something like this occurs to me, I have to question whether it is the best way to go for the project, or if I just want to do it for kicks.



I learned that the folks in the chip business whose job it is to solve all of these problems for the circuit designers really deserve their salaries. The same kinds of problems occur with the expensive professional tools, and they are counterproductive and frustrating when you want to concentrate on designing a circuit. That's why any decent-sized chip company will have a team devoted to testing out the simulators and the models and working out the problems between them.

I learned that modern transistors perform really well, but not quite well enough to make my initial idea for the circuit design perform well enough. Being able to figure out something like this is one reason you need decent models. I wanted a design in which a transistor would be turned on by a simple resistor, unless another transistor was turning it off, but for the amount of power I needed to control it, the transistor was too hard to operate. It's "gate capacitance" would be too high, which means the circuit would need to waste too much power in either the resistor (to turn on the transistor quickly) or in the transistor (if I allowed it to turn on too slowly.) The only way to fix this requires a more complicated circuit, with more transistors.

More transistors means more device model problems, and more potential for the simulation results to be different from the actual circuit, and more points of failure in the finished product. I think I could eventually have gotten something to work, but could I get something that would last ten years in service at Pulpit Rock? If it broke when I was not around, who would fix it? When you are only building one instance of a design, with limited time for testing, you need to be sensible.

I was also concerned about electromagnetic interference, or EMI. This is very difficult to simulate and it is the kind of thing that can sink a circuit design that looks good in the computer. Circuits that do high-frequency, high-voltage switching are particularly prone to this kind of trouble. I read one application note that suggested I would not be able to test my circuit without implementing it on a carefully designed, 2-layer printed circuit board. So, this was another reason to decide that I was asking for more problems than I wanted for this project.

By the way, at the time I tabled this effort I had switched from using EESchema and NGSpice to a program called LTSpice, which combines the functions of the other two, and a lot of other nice features (and it comes with a big library of device models!) It is also much more user-friendly than any other system I have tried. I didn't use it enough to form a comprehensive opinion of it, but my initial impressions were good. If I take on another circuit-design project, it is probably the tool with which I will choose to start.

Switching Gears

At about that time, I was expecting delivery of an already-working circuit from a vendor on ebay. I mentioned last month that I had placed a bid on a "pure sine-wave inverter," which converts 12VDC to 120VAC in much the same way that the original Tinsley-designed circuit was intended (only better), and I got the unit at a reasonable price.

The unit performed very well when I unpacked it and plugged it in. I had also bought a 14-watt synchronous motor to use as a stand-in for the actual RA motor in the eighteen-inch, and it purred like a kitten when driven by the smooth sine wave power from the inverter. The waveform looked exactly like line current from the wall when viewed on my oscilloscope (which is what we are after, since the RA motor in the 18" works well on line current.) And as I hoped, it had an EG8010 chip at its heart, creating the baseline signals to generate those waves! Rubbing my hands in glee, I ordered the precision-timing chip that would allow me to get the exact frequency I wanted out of this thing. I placed the order with Adafruit in New York, one of my favorite vendors for electronic odds and ends.

The fabled EG8010 chip, and the 12MHz crystal (in the shiny can) before removal.

The EG8010 chip has two pins called OSC1 and OSC2, and the datasheet instructs the designer to wire a 12MHz (12 million oscillations per second) quartz crystal between the two pins. Internally, whatever comes into OSC1 is amplified and sent back out of OSC2, and combined with the crystal this forms an "oscillator" circuit that generates the required reference frequency as selected by the crystal. My plan was to remove the crystal and feed the frequency that I needed into OSC1.

It was easy to program it for the correct frequency (12.033MHz) for sidereal tracking, and no problem to remove the quartz crystal from the inverter and inject the precision frequency into OSC1. Said frequency was observed coming back out of the OSC2 pin, using my Dad's old oscilloscope. The only problem was the motor wasn't turning.

I spent a few days messing around with this setup, swapping the original quart crystal in and out of the circuit multiple times to make sure the unit was still working. I eventually got the idea that the voltage level I was feeding in to the chip was not quite high enough, so I did some more designing and ordered some more parts. When they came in, I constructed a circuit to feed the drive frequency in at a slightly higher, adjustable level. I am happy to report that this has resulted in a provisional victory - I have succeeded in getting the inverter to run, driven by the precision timing chip, and even to vary the motor speed every couple of seconds, under control of a little computer board, simulating tracking inputs. But it is finicky! The OSC1 input on the EG8010 chip seems to be an electronic "Goldilocks," causing the whole system to shut down if the signal level is a little too low, or a little too high. So now, I am making plans and ordering more parts to deliver the signal at a level that will be "just right," and I think it will give us stable and reliable operation.

Stay tuned.

Current Status and Activities: Completion of the machining on the main mirror is still awaiting warmer weather, as I explained last month. The same goes for further work on the observatory building. And as explained above, I have been concentrating on the repair for the 18-inch.

We have also selected a coating vendor and informed them that we are planning to use them, once the mirror is ready.

Ron's Ramblings

Ron's Ramblings is a monthly series of articles describing some recent or otherwise important event in astronomy. The ramblings will attempt to describe both the astronomical event and its significance. Obviously, the description will be that of a rambling amateur astronomer.

The Staying Power of General Relativity

General Relativity celebrated its 100th anniversary in 2015. In the intervening years since it was first proposed, it has passed every test to which it has been subjected, and passed those tests with not a hint of problem - and we are talking about exquisitely minute details.

Most recently, and likely the science discovery of the year 2015, LIGO's detection of gravitational waves is but confirmation of one of GR's most startling and long-term unproven predictions. Now that's not to say GR doesn't have some known shortcomings, as it is famously in contradiction with Quantum Field Theory when it comes to the realm of very small dimensions and high mass concentrations. Now, surprisingly, the very detection of gravitational waves, which was a major victory for GR, may also actually reveal yet another problem with GR, and point to some new and exotic physics.

According to GR, the event horizon of a black hole is essentially invisible. Matter, or anything crossing the event horizon, shouldn't even notice it until it is too late. But according to Quantum Field Theory (QFT), the event horizon should be a cosmic firewall, a ring of high-energy particles that would incinerate any matter that crosses it. Thus QFT and GR offer drastically opposing views of the event horizon of a black hole.

Now for the first time, with LIGO's detections of gravitational waves originating from two merging black holes, scientists can finally get a look at the event horizon of a black hole. Physicist have now proposed that if there is any sort of exotic physics -- such as a firewall-- then the gravitational waves detected by LIGO should be followed by a series of echoes. Physicists Jahed Abedi, Hannah Dykaar and Niayesh Afshordi now claim that, in analyzing the publically released data from LIGO's three gravitational wave detections, they have uncovered these echoes that contradict GR's predictions. They claim they have identified the echoes for all three LIGO detections at the exact intervals predicted by QFT.

Their results still need to be peer-reviewed, and even the LIGO team is reanalyzing their data set to see if they also see these echoes. So while GR was known to break down in the extreme case of the heart of a black hole, if these echoes are confirmed, it would mean that GR also fails at the edge of the black hole, at the event horizon.

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

StarWatch

by Gary A. Becker

Eclipse Dreaming

On August 21, 2017 the US will be treated to a total solar eclipse, when the moon's shadow will sweep from coast to coast. Last summer, my friend, Pete Detterline, and I traveled along the path of totality from central Nebraska to central Idaho, and picked about a half-dozen excellent sites where we could view the event. Our main focus became Guernsey State Park in eastern Wyoming, where statistically we have a 95 percent chance of successfully viewing the event under favorable conditions.

I've been waiting for this eclipse for decades. The telescope that I will be using is set up in my study, so that I can analyze all of the possibilities of capturing the 2 minutes and 13 seconds that I will be immersed within the moon's shadow. I recently dreamed about this eclipse and would like to share some of its more sobering moments.

Although Guernsey is completely open with a perfect sky, in my dream, when I wake up on eclipse morning, there are trees everywhere, and they are growing rapidly. I calculate the arc of the sun and discover a spot which will be open during totality. I have two hours before the eclipse begins, and plenty of time to disassemble and reassemble my equipment, right down to the last nut and screw, to make certain that all is set for the big event.

While I'm reassembling, a tree starts growing right in front of me, so I take the scope and all of the disassembled bits and pieces to a new location. I continue my reassembly efforts, but when I think the telescope and mount are fully together, I have a small cadre of brass nuts, bolts, and a couple of springs in my assembly tray. Heavens, where do they go? I hastily search and find the places where the missing pieces should be attached, but now racing towards the sun are high clouds coming in from the east.

It is hopeless, and now looking down at my shirtless body, I realize that I look surprisingly a lot like Tarzan. A bus pulls up and out prance 27 women that look a great deal like Jane. "Me Tarzan, you Jane(s)," I speak. The heck with seeing this eclipse… I wake up. No eclipse! No girls! Another astronomical nightmare…!

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From the LVAAS Archives:

April 1967—Horseplay and Harlow Shapley

by Sandy Mesics

Apparently, things were getting rowdy around LVAAS in April, 1967. From the Treasurer's report that month: "Preston (Smith) commented on being the victim of harassment, horseplay, and vandalism. A discussion followed. The matter will be mentioned at our next meeting. Meanwhile, we need another treasurer. .... Due to the increasing problem of maintaining discipline during our meetings, it was decided to appoint Bob Brown as sergeant at arms. Various other matters were touched upon, as well."

In the July, 1967 Observer Editor Dick Trumbore wrote: "At the June meeting, both Director Ernie Robson and Mike Meiley, the Coordinator of Observations, felt it necessary to comment on that old bug-a-boo of the society, "horseplay." This undesirable form of behavior has long been a source of irritation to the majority of members. It has been directly responsible for more than a little damage in Knecht Observatory, has occasionally disrupted society meetings and has frequently made a shambles of a field meet.

"We know how embarrassing it must have been for Director Robson to have to mention it at a general meeting, particularly with a distinguished guest present. Nevertheless, we are in agreement that it had to discuss and we can only hope that the new measures adopted by the board, as yet unannounced, are effective in bringing it to an end. Let us hope that drastic steps will not be necessary. Perhaps the spotlight of disapproval in itself will be enough to discourage this nonsensical behavior from now on.

"On the subject of "horseplay" and distracting behavior during a field meet, Mike Meiley makes the good point that if all those in attendance who have telescopes would bring them, more individuals would be absorbed in observing and fewer in foolishness. Amen!

Harlow Shapley Visits Lehigh University

Figure 1. Harlow Shapley.
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The Rockefeller University.

On April 20, 1967, Dr. Harlow Shapley was scheduled to speak on "Cosmic Evolution and the Origin of Life" in the University Center, Room 403, on the Lehigh campus at 8: 15. At the time, a talk by Shapley would be equivalent to a visit from Carl Sagan or Neil deGrasse Tyson in more modern times. He was one of the most well-known astronomers of the century, and was colleagues with such notable individuals as Albert Einstein, Edwin Hubble, George Ritchey, George Ellery Hale, and E.C. Pickering, to name a few.

In his autobiography, Shapley wasn't afraid to share his opinions of these notable individuals. Shapley acknowledged that Edwin Hubble was a better observer than he, but also said that the work on galaxies that Hubble did was by using Shapley's methods, namely the five brightest stars as a criterion of distance. Shapley was miffed

that Hubble did not give him credit, “but there are people like that.” (Shapley, 1969). Shapley went on to say that Hubble just didn’t like people in general. “... but I like everybody I can think of.” (Shapley, 1969). He also related that George Ritchey was difficult to get along with, and George Ellery Hale, director of Mount Wilson Observatory, barely tolerated him.

Perhaps Shapley’s greatest contribution to science was his 1918 discovery of the dimensions of our galaxy and the location of its center. According to Bart Bok (1975), “Shapley did for the Milky Way system what Copernicus had done for the solar system: He placed our sun and earth in the outskirts of the Milky Way system. He proved conclusively that our sun and earth are definitely not located close to the center of our galaxy.”

In 1920, Shapley and Heber Curtis, director of the Allegheny Observatory and formerly of Lick Observatory, engaged in the “Great Debate.” Curtis argued that the Universe is composed of many galaxies like our own, which had been identified by astronomers of his time as ``spiral nebulae''. Shapley argued that the “spiral nebulae'' were just nearby gas clouds, and that the Universe was composed of only one big Galaxy. In Shapley's model, our Sun was far from the center of this Great Universe/Galaxy. In contrast, Curtis placed our Sun near the center of our relatively small Galaxy. Ultimately, neither astronomer was entirely correct. Shapley was proved correct about the size of our Galaxy and the Sun's location in it, but Curtis was proved correct that our Universe was composed of many more galaxies, and that “spiral nebulae'' were indeed galaxies just like our own.

Shortly after the “Great Debate” Shapley became director of Harvard Observatory. While there, he made great use of the Harvard’s stations in Peru and South Africa to study the Southern Hemisphere, particularly the Magellanic Clouds. His major discovery of the 1930s was the discovery of the first two dwarf galaxies in the southern hemisphere. While at Harvard, he helped launch the careers of astronomers such as Bart Bok, Donald Menzel, and Fred Whipple.

In the 1930s, Shapley was active in rescuing European scientists from countries threatened by Nazi Germany. He was instrumental in rescuing nearly a hundred individuals. Following the war, Shapley was one of the founders of UNESCO, the United Nations Educational, Scientific, and Cultural Organization. Shortly after that, Shapley ran afoul of the House Un-American Activities Committee. He had always been a liberal, and in fact, was a close friend of former Vice-President Henry Wallace, himself a liberal Democrat. Ultimately, Shapley was able to squelch Senator Joseph McCarthy’s efforts.

Figure 2. Photograph of Progressive Citizens of America party members. Left to right, seated, are Henry A. Wallace and Elliott Roosevelt; standing are Dr. Harlow Shapley and Jo Davidson. *Public domain image.*

By the time of his 1967 visit to Lehigh, Shapley was 82 years old, an elder stateman of the scientific community. He had been retired from Harvard Observatory for 11 years by then, but continued to write and lecture.

About 30 LVAAS members attended the lecture. Shapley was introduced by Lehigh professor Dr. Ralph Van Arnam as “one of the most distinguished men of science to ever visit the Lehigh campus” and the “Christopher Columbus of space.”

Originally, Shapley was to speak about cosmic evolution and the origin of life, but instead spoke about the origin of the universe. He described how he used the light intensity of stars to determine that our solar system is at the outer fringe of the Milky Way rather than at the center. He went on to discuss the three theories of the origin of the universe that were prevalent at the time: the big bang theory, the steady state theory, and the pulsating universe theory. He explained that many objects in the universe are created from novae.

According to the Lehigh University newspaper, The Brown and White, the talk was delivered with humor and was accompanied by slides. He reportedly asked the audience to hold their breaths so that he could count the Argon atoms in the air. This demonstration pointed out that a person's breath will contain more than 400,000 of the argon atoms that Gandhi breathed in his long life. Shapley also related this story in his book, *Beyond the Observatory*, published in 1967. The Brown and White reported "Shapley's wit and smooth delivery made his lecture seemingly pleasing to the large audience although some said they were a bit disappointed that he did not speak on his scheduled topic, 'Cosmic Evolution and the Origin of Life.'"

Fig. 3. Shapley (center, with back to camera) at Lehigh, with LVAAS members.

Following the talk, LVAAS members attended a social gathering with Dr. Shapley, where he reflected on his poetical reading over the years and quoted a sampling of verse, some of which he admitted he "improved." He also related a much-quoted anecdote about a dinner at which both he and Albert Einstein were guests: "The award speeches were very long, detailed and exceedingly dry. Near the end of the ordeal of having to listen to the speakers verbally expand every conceivable minute virtue of the persons who were to receive the awards, Dr. Einstein was seen to whisper something to the Polish ambassador that nearly convulsed him with laughter. Later it was learned that Dr. Einstein had stated, 'I have found a new meaning for eternity.'" Shapley also related this story in his 1969 autobiography, *Through Rugged Ways to the Stars.*

Shapley died five years after this talk, on October 20, 1972. He had five children, all of whom were active in science.

Sources

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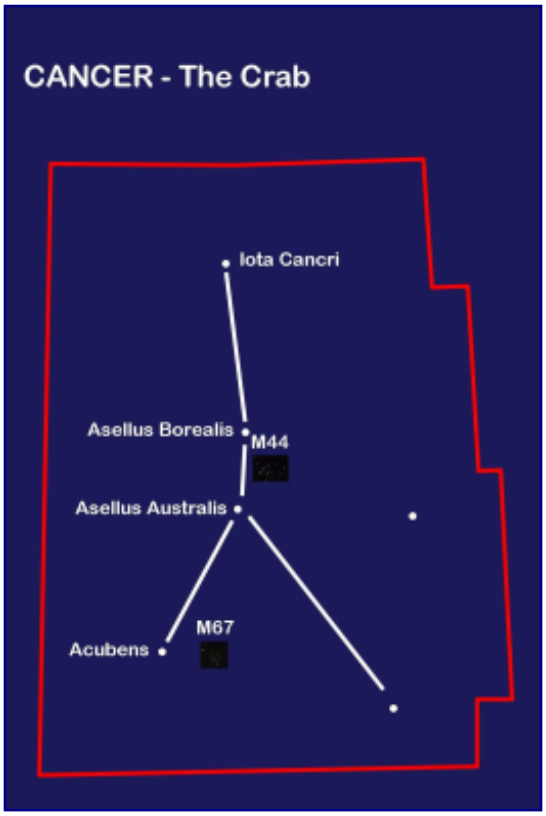
Highlights of the April Sky

by

Carol Kiely

I am really sorry for saying that Orion was “just a big show off” in last month’s article because at our last star I took a look at the Orion Nebula through an oxygen filter on the eyepiece of the 12” scope. The stars of the trapezium cluster were an amazing green color and it seemed as though I was viewing the nebula in 3D!



As most of you know, the Trapezium cluster is a relatively young star cluster (~300,000 years old) that has formed from gas in the Orion Nebula. There is a much older star cluster, M67, located in Cancer - the crab. At the grand old age of 4 - 5 billion years (a similar age to our Sun), it is the oldest open star cluster in the Messier Catalogue. This faint star cluster is often overlooked as most observers go straight to much younger (600 million years old) and brighter M44 - the Beehive Cluster - which be seen with naked eye in a dark sky. M67 contains over 100 stars that are very like our Sun together with numerous red giants.

M44 is sometimes called Praesepe - the Latin word for manger. As late as the 15th century, this constellation was depicted as two donkeys, the two bright stars Asellus Borealis and Asellus Austalis representing their heads, feeding from a manger (M44.)

Now before you leave this constellation, take a look at Iota-Cancri. This is a beautiful double, the brightest star being a magnitude 4 G type star with a yellow hue. Its companion is a white main sequence star of magnitude 6.5 but when you look at it through a high power eyepiece it appears to have a bluish tinge. Iota-Cancri is sometimes called the spring Albireo so it could be a really good object to show our star party visitors this spring. But are the colors we perceive real? There was a really good article in last December’s Sky and Telescope written by Bob King where he talks about how your mind can play tricks when you look at double stars.

http://www.skyandtelescope.com/observing/colored-double-stars-real-and-imagined/

There is another lovely double star called Algieba in Leo. When some people look at Algieba through a telescope they see two golden yellow stars while others see an orangey-red and a greenish yellow star. Why not compare the views of Castor - in Gemini, Iota-Cancri and Algieba through your own telescope or one of the Club's telescopes as all three are high in the evening sky at the moment.

If the sky is really dark and the seeing conditions are good, there are a few other treasures to be found in Leo. M65, M66 and NGC 3628 are three spiral galaxies, known as the Leo Triplet. They can be found close to the hind leg of the lion. There is another group of galaxies just under the belly of the lion. One of these, an elliptical galaxy known as M105, contains a supermassive black hole.

There are some other galaxies that might prove easier to find this time of year are the Cigar Galaxy (M82) and Bodes Galaxy (M81) in Canis Major.

It is also a good time for planet gazing. Early in the month, just as the sun sets, you will get a chance to see Mercury close to the western horizon; higher up and a little to the south, you will be able to see Mars , and then as night sets in (after 9pm) Jupiter will shine brightly in the southeastern sky. You have to wait until 3am to see Saturn and then just as the sun rises Venus will make an appearance in the eastern sky close to the circlet of Pisces. These are just a few highlights of the April sky. I am sure you can find many more.

Happy Stargazing!

P.S. As some of you might know, I go back to the UK several times a year to see my Mam and Dad. One of the things they love to do is walk along the beach - the Northumberland coastline is beautiful. When I see the Moon in the sky along with the waves crashing in at high tide, I have to stop myself explaining to my parents how the Moon influences the tides and why there are two high tides each day...."Yes, we know that dear." Then, to my disbelief, I saw an episode of the BBC program "Coast" during which they gave a different explanation to the one I have always believed - they said the tidal bulge on the side of the Earth facing the Moon is due to the gravitational pull whereas the one on the opposite side is caused by inertia ("centrifugal force"). This incorrect explanation also appears on the NOAA website, in several books and is given by some "famous" physicists in YouTube videos. For the correct explanation visit https://pumas.gsfc.nasa.gov/files/01_25_11_1.pdf where Stephen J. Edberg from NASA's Jet Propulsion Laboratory has kindly done the calculations to prove that "centrifugal acceleration" contributes ~ 7% to the tidal bulge on the side of the Earth facing away from the Moon. The main contributor is the difference in Moon's gravitational pull between the surface and the center of the Earth.

*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!*

What It’s Like on a TRAPPIST-1 Planet

By Marcus Woo

With seven Earth-sized planets that could harbor liquid water on their rocky, solid surfaces, the TRAPPIST-1 planetary system might feel familiar. Yet the system, recently studied by NASA’s Spitzer Space Telescope, is unmistakably alien: compact enough to fit inside Mercury's orbit, and surrounds an ultra-cool dwarf star—not much bigger than Jupiter and much cooler than the sun.

If you stood on one of these worlds, the sky overhead would look quite different from our own. Depending on which planet you're on, the star would appear several times bigger than the sun. You would feel its warmth, but because it shines stronger in the infrared, it would appear disproportionately dim.

"It would be a sort of an orangish-salmon color—basically close to the color of a low-wattage light bulb," says Robert Hurt, a visualization scientist for Caltech/IPAC, a NASA partner. Due to the lack of blue light from the star, the sky would be bathed in a pastel, orange hue.

But that's only if you're on the light side of the planet. Because the worlds are so close to their star, they're tidally locked so that the same side faces the star at all times, like how the Man on the Moon always watches Earth. If you're on the planet's dark side, you'd be enveloped in perpetual darkness—maybe a good thing if you're an avid stargazer.

If you're on some of the farther planets, though, the dark side might be too cold to survive. But on some of the inner planets, the dark side may be the only comfortable place, as the light side might be inhospitably hot.

On any of the middle planets, the light side would offer a dramatic view of the inner planets as crescents, appearing even bigger than the moon on closest approach. The planets only take a few days to orbit TRAPPIST-1, so from most planets, you can enjoy eclipses multiple times a week (they'd be more like transits, though, since they wouldn't cover the whole star).

Looking away from the star on the dark side, you would see the outer-most planets in their full illuminated glory. They would be so close—only a few times the Earth-moon distance—that you could see continents, clouds, and other surface features.

The constellations in the background would appear as if someone had bumped into them, jostling the stars—a perspective skewed by the 40-light-years between TRAPPIST-1 and Earth. Orion's belt is no longer aligned. One of his shoulders is lowered.

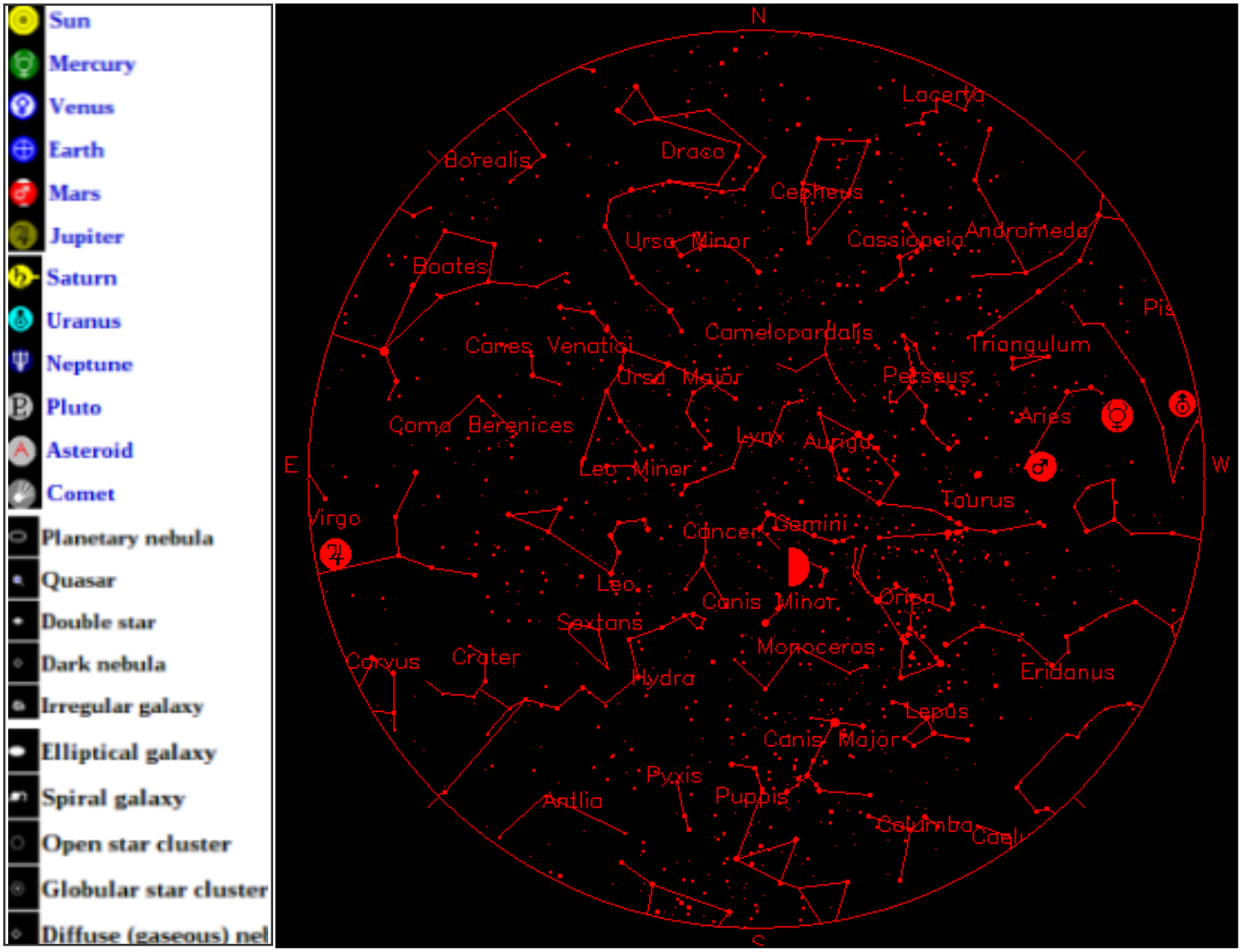
And, with the help of binoculars, you might even spot the sun as an inconspicuous yellow star: far, faint, but familiar.

Want to teach kids about exoplanets? Go to the NASA Space Place and see our video called, “Searching for other planets like ours”: https://spaceplace.nasa.gov/exoplanetsnap/

This artist's concept allows us to imagine what it would be like to stand on the surface of the exoplanet TRAPPIST-1f, located in the TRAPPIST-1 system in the constellation Aquarius.

Credit: NASA/JPL-Caltech/T. Pyle (IPAC)

Sky above 40°33'58"N 75°26'5"W at Tue 2017 Apr 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 ppmtogif module of Jef Poskanzer's pbmplus toolkit, of which many other components were used in creating the images you see here.

ppmtogif.c - read a portable pixmap and produce a GIF file

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

Lempel-Zim compression based on "compress".

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

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

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

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						

MAY 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01	02 First Quarter Moon	03 LVAAS Scout Group - East Hills Moravian Church	04	05 Lunatics and Star gazers Night	06 Star Party
07 General Meeting - South Mountain 7:00 PM (early due to Mothers Day)	08	09	10 Full Moon LVAAS Scout Group - East Hills Moravian Church	11 Astro Imaging 7:00 PM	12	13
14	15	16	17	18 Last Quarter Moon LVAAS Scout Group - Homeschool Group	19	20
21 Deadline for submissions to the Observer LVAAS Board of Governors Meeting (early due to Memorial Day)	22	23	24	25 New Moon	26 MegaMeet	27 MegaMeet
28 MegaMeet	29	30	31 LVAAS Scout Group - Cub Scout Pack 50			

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

Contributed by Bill Dahlenburg

Publishing images is a balancing act!

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

Put the quality in:

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

But watch the "waistline"!

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

Tip: If you're not Photoshop-savvy, you can re-size and compress undemanding images ("human interest", not astroimages), with an online tool such as http://www.ivertech.com/freeOnlineImageResizer/freeOnlineImageResizer.aspx. It will also tell you the pixel size and file size of your original, even if you don't download the processed copy.

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