The Observer

The Official Publication of the Lehigh Valley Amateur Astronomical Society

http://www.lvaas.org

610-797-3476

http://www.facebook.com/lvaas.astro

September 2016

Volume 56 Issue 9

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

Suppose you would like to own just one good camera, and use it for ordinary Terrestrial picture-taking as well as astroimaging of distant nebulae and galaxies. Thanks to our August speaker, Gary Honis, we now know that that camera ought to be a Canon 6D or a 450D, and that it should be modified to remove the IR filter, which Gary will help you with if you don't feel comfortable following the directions on his website. Also, you should have a snap-in filter to replace it, to restore the original color balance for day-to-day use. If you missed the meeting, you can take advantage of Gary's expertise by visiting http://dslrmodifications.com/.

We made the call a day ahead of time to move the August meeting from Pulpit Rock to South Mountain, because the cards were stacked against us, weather-wise, for having a good time outdoors and up on top. Not only was it just too darn hot, but also very severe thunderstorms were predicted. One was visible on the weather radar over the site at the time we would have been there, so we made the right call. But the meeting was well attended at HQ, and Gary's excellent talk was well received.

Our September meeting will be at South Mountain on Sunday, September 11 at 7:00 PM. Rob Teeter of Teeter's Telescopes will show us the process of creating his large Dobsonians. Also, we will have a business meeting to approve the budget for 2017, so please review it on the website (http://lvaas.org/) before the meeting and be prepare to vote.

We are also working on scheduling a "make-up event" for members that want to get some exposure to Pulpit Rock and training on the telescopes there. And don't forget that Megameet is scheduled for September 30th through October 2nd.

Our Special Event

Sometimes things happen quickly! Less than two weeks ago (as I write this) we were contacted by Bill Byassee, a long-time member of the Tilden Township Planning Commission. Tilden is where Cabella's and the other commercial establishments surrounding it are, not far from PR. It turns out that Mr. Byassee is a big supporter of LVAAS, behind the scenes. He has been working diligently to protect our dark-sky site by ensuring that new permits for outdoor lighting are properly shielded to allow as little light as possible to leak into the sky, which is vital to keeping the dark skies of Pulpit as dark as possible going forward.

Mr. Byassee called to request our support; he wanted us to host some of his colleagues on the planning and

zoning commissions in the area, up to Pulpit Rock to witness our activities there, and learn why protecting the dark sky is important. Well, this is obviously something we wanted very much to help him with, but we really had to scramble, because it turned out that the best time to do it came just over a week later on Friday, August 26. But we pulled it off, and the weather cooperated. We had a very nice night, with good turnout from both experienced viewers as well as relative newcomers, and pretty decent viewing! And our guests were impressed. So a big "Thank You" to everyone who responded to make the evening a success, and especially a very big "Thank You" to Dave Moll for stepping up to organize the event and for hosting our guests.

They were also impressed by the condition of the site. We owe a lot of appreciation to Ron Kunkel for the great job he does taking care of it. It's officially called Pulpit Rock Astronomical Park and Ron really takes that seriously, and as a result visitors such as we hosted that night can tell how much value we place on the site.

The Geometry of Space

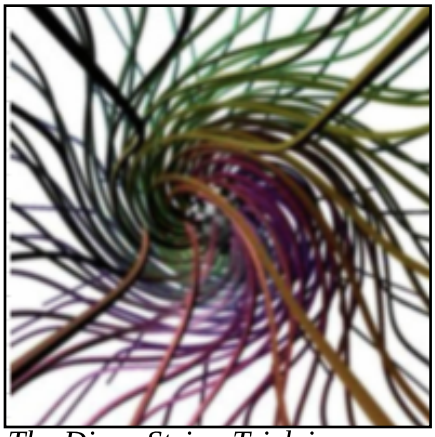
Over the centuries we learned the shape of the universe around us, mostly by looking up. We learned that the Earth is round, like the moon, and as we eventually understood, the sun and planets are as well. We found out that the stars are suns, and that the Milky Way is just one giant, bulging disk of them, and that there are many billions more. And eventually we understood that the black dome of the night sky, just out of reach to the ancients, is in fact a limitless void whose farthest reaches are shaded by the limits of light and time itself. The history of astronomy and of science itself is a story of reshaping the world as we understand it, of probing beyond what is immediately apparent to the eye, sometimes finding that the shape casting the shadow on the wall is itself just another shadow of something deeper and even harder to glimpse.

And the story isn't over yet.

Last year I was delighted to learn that Professor Sera Cremonini had joined the faculty of my alma mater, Lehigh University. I began my career taking advantage of Lehigh's excellence in teaching the practical applications of science- designing, making and testing the things in our world, and Lehigh's Physics faculty has traditionally concentrated on specialties that are aligned with the engineering orientation. But my interests have drifted more to the theoretical, to the drive to understand and explain the deeper mysteries rather than just manipulate them. Lehigh's focus has widened a little in the same direction, making room for a true theorist, a scholar of String Theory, in their plan. If you check out Professsor Cremonini's faculty web page (http://www.lehigh.edu/~sec415/research.html), you will find a list of questions that interest her, the first of which reads "What is the fundamental structure of spacetime?" I think this is a profound summary of the essential mystery of modern physics. As we try to grasp the deepest picture that the Universe shows us, we realize that we don't even know the shape of the paper on which it is drawn.

We've gleaned a few details that aren't common knowledge yet, and I will let you in on two of them. The first doesn't have much to do with astronomy — it relates to very small things instead of very large, to the realm explored by Quantum Mechanics, but it is just so interesting that I think more people should know about it. We usually model our world using geometry that we name after Euclid, and measure it in a manner defined by Descartes, and we do so because it seems to correctly describe our reality. If we rotate an object about some axis by an angle of 360 degrees, or 2π using radians, the angular measurement favored by mathematicians, then according to our eyes and according to Euclid, we have put it back right where it started. A 2π rotation is an "identity" operation. After 12 hours, the small hand of the clock has gone full circle and is back at the same point, and the clock looks the same again. (Even though it's not the same time of day.)

What Quantum Physics has discovered is that electrons and protons and other particles of the "fermion" family do the same kind of hidden bookkeeping as the hour hand of the clock. If you rotate an electron by 2π, it is not where it started: rotating it by another 2π is required to get it back to the initial state. The difference is invisible to the naked eye, and impossible or at least nearly impossible to reveal directly in an experiment, but it is so fundamental to the quantum mechanical description of an electron, which has been very thoroughly tested in numerous experiments, that we have to accept it as real. The "identity rotation" for an electron is not the 360 degrees of Euclid and of common sense, but 4π, or 720 degrees.

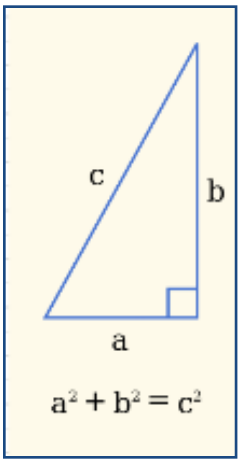


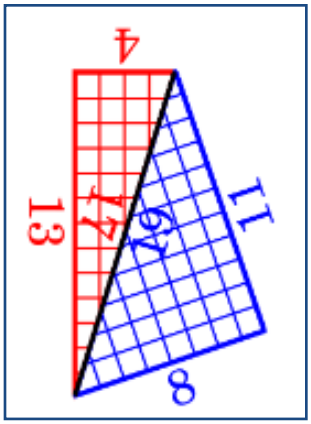
The Dirac String Trick is a geometric demonstration analogous to the 4π rotational identity property of an electron. See http://goo.gl/EyFtDG and http://goo.gl/x4Vlyj

I find this ghostly property fascinating. Right now there is an empty coffee mug on the table in front of me, with the handle facing to the left. I can easily imagine that is has an extra electron stuck to it, a very slight static charge. Now I reach out and turn it clockwise, a full turn so that the handle is again facing left. It looks the same, but I know that there is a hidden difference, one that I can't see and that there is no way to measure, but nevertheless it's there — in the shadow world of the electron wave function, it is upside-down or a negative image or something like that — and if I turn it one additional turn in the same direction, only then is it truly back where it started.

Relativistic Spacetime

As astronomers, we are more interested in the large scale, where we have to take into account the Theory of Relativity to explain everything that we see. And to really apply the Theory of Relativity, we need to be able to apply mathematics properly and precisely, and to do that we need to be able to measure the distances between points, or "events" as they are called in 4-dimensional relativistic spacetime. We will start with "ordinary" space of 2 and 3 dimensions, going back to Euclid and Descartes, and even farther back to Pythagorus. His theorem about the length of the right triangle gives us the basis for measuring distances in Descarte's rectangular ("Cartesian") coordinate system, which modern mathematicians call the "Euclidean Metric."



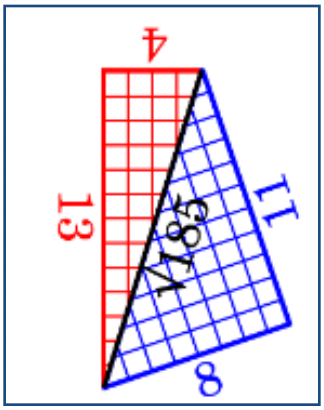


The Taxicab Metric is not invariant to rotation of the coordinate system.

So what's a metric, you ask? In math and physics, it's a ruler, or a rule for measuring distance. More than that, it is fundamental property of the mathematical model of physical space, and it provides a basis for building theories. Most theories are built on differential calculus, where we imagine the ruler getting smaller and smaller, so that it can fit tighter against things that aren't quite straight, until it vanishes. As this happens, we construct our theories based on the trends, or "limits", of these diminishing measurements: what happens to physical quantities as "Δx" becomes gets closer and closer to zero, where we refer to it as d*x*. But even in the limit, the metric needs to work: $ds^2 = dx^2 + dy^2 + dz^2$.

What makes a valid metric for a physical theory? Let's take a look at an alternative, the "taxicab metric", another way of measuring distance on a Cartesian grid: the distance that a motor vehicle must drive to get from one point to another in a grid of

city streets. If you are driving or walking around Manhattan, it makes sense, because generally you can't travel "as the crow flies" - you need to follow the grid. But in physics, the grid is artificial, something we impose for the purpose of doing math, and one key property that we require of our metric is that it must give the same answer, no matter how we impose the grid. The taxicab metric changes as we rotate our coordinate system, but the Euclidean metric does not. The Euclidean metric is invariant to rotation, an essential property for it to be useful for physics.



$4^2+13^2=11^2+8^2=185$
The Euclidean Metric is invariant to rotation.

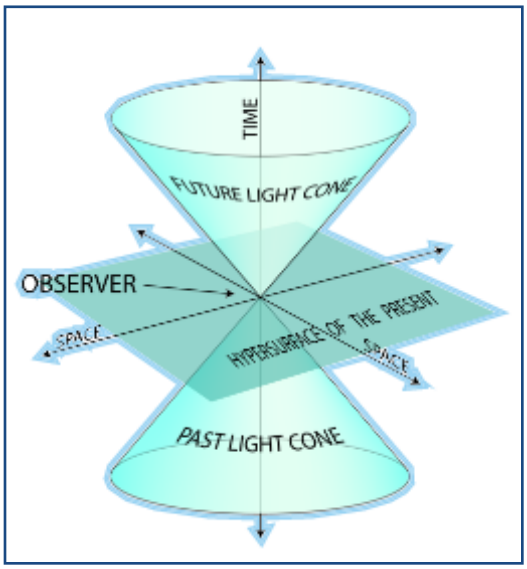
It seems clear that the Euclidean is the best metric for flat, 2- or 3-dimensional space, the home of Euclidean geometry. For 4-dimensional spacetime, however, it's not so obvious. In relativity, we need to include time as well as space into our grid, and we need to require an additional invariance. We know that neither distances nor durations in time are absolute: as something goes faster, it gets smaller in the direction it's going, and its clock runs slower, as seen by a stationary observer. Our theories concern themselves with "events," or things that happen at particular places and times, and we need to measure the "intervals" between them in way that is invariant not only to translation and rotation, but also to "boosts," or transformations caused by observing the system at different velocities. One of Einstein's teachers, Hermann Minkowski, realized that this was a requirement and worked out the math, shortly after Einstein published his theory. Now, we measure the intervals between two events in spacetime using the "Minkowski metric", which is similar to the Euclidean metric but with some important differences:

$$\Delta\tau = \sqrt{\Delta t^2 - \frac{\Delta r^2}{c^2}}$$

The key features of the Minkowski metric are that it includes space (r) as well as time (t), with the speed of light (c) used as a factor for converting the units, and that is has a subtraction! There are a couple of different ways that it can be formulated. As shown above, in the "proper time interval" formulation, the conversion of units is applied to the spatial dimensions so the result is in units of time; but you can choose to multiply the time dimension by c, instead, and get an answer in a unit of distance. (Or, if you want to play the game like a hard-core theoretical physicist, you can define your own unit that is applicable to space and time equally, and just make c equal to 1). You can also choose to reverse the subtraction so that the time delta is subtracted from the spatial delta. But I think it makes the most sense to formulate it as shown, and here is why:

First, notice that you can get an answer of "0" for two events that we would consider to be widely separated. Consider the emission of a red photon by a hydrogen atom in some distant emission nebula, and its subsequent capture by an electron in one of our astroimager's cameras. Though we think of this distance as enormous, from the point of view of the photon, the time and the distance do not exist at all. At the speed of light, the "Lorentz factor" goes to infinity, as do the relativistic time dilation and length contraction. To the photon, the events happen at the same time and place. The Minkowski interval between the emission of a photon and its absorption is zero.

You can also get intervals that are greater than zero, as long as they are closer in the spatial dimensions than they are in the time dimension (after the speed-of-light conversion) so that the subtraction produces a positive number. For any event, all of the other events that have a positive proper time interval are considered to be inside the "light cone" of the first event. If one event is inside another's light cone, it means that the one can affect the other; there is time for information to pass between the two, moving at less than the speed of light.



(Why is it called a "light cone?" Think of how it would look if spacetime were 3 dimensions (2 space, 1 time) and non-relativistic. Or just look at the illustration. For any point in time before or after an event, there is a circle in space (or a sphere, in real 3D space) that is just far enough away for light to reach the event in the time interval between the two. These expanding circles (or spheres), going backwards and forwards in time from the event, form a "past" and "future" light cone, each of whose apex is the event.)

Anything that has an inside, has an outside, and the same is true of light cones. There are events for which you cannot compute a proper time interval, at least not as a real number, because you would be taking the square root of a negative number. These events are not "causally connected," meaning that there can be no direct communication between them. (If Alpha Centauri blows up today, our future selves will learn of it in four years, and may recall reading this column four years in the past. So the event of reading this column and the event of Alpha Centauri exploding are both causally connected to the future event of seeing the explosion, but they are not directly connected to each other.) Although the Minkowski metric allows you to calculate intervals between non-causally-connected events, and even formulate them as proper time intervals with imaginary values, they aren't generally useful in physics.

So we started off asking how distances are measured in spacetime, and we end up realizing that they sort of aren't, that we only really measure time intervals! When we say "M31 is 2.5 million light-years away" we are really saying that it was 2.5 million light years away, 2.5 million years ago. Presumable it is still out there, but we have no direct way of knowing.

Where does the Minkowski metric get used? In any calculation of the effects of General Relativity, where large masses and/or high velocities are involved. We experienced a good test of such an application this year, in the observation of gravitational waves by the LIGO observatory. The mathematics explaining the generation and propagation of those waves used equations written for 4-dimensional spacetime with a Minkowski metric. The same is true for anything involving black holes, and also for examples of gravitational lensing, where the light of distant galaxies is focused by the warping of spacetime caused by nearer galaxies or galaxy clusters.

So just remember, in observing the night sky we are sometimes learning more than what's out there; sometimes we are learning about the shape of "out there" itself. Ad Astra!

— Rich Hogg

General Meeting at South Mountain
Sunday, September 11, 7 p.m.

From Concept to Cosmic Time Machine: Building a TeeterScope

Listen as Rob Teeter, owner of Teeter's Telescopes Custom Design & Fabrication Shop, discusses taking an order from concept all the way through finished product. Every telescope is painstakingly designed and built, with more details going into it than you may think. Rob breaks down the process to show how each client's dream telescope comes to fruition

ELECTIONS ANNOUNCEMENT

Nomination Of Officers Of LVAAS For 2017 Term

NOTICE -- A Business Meeting will be convened for Election of the 2017 Society Officers at the October General Meeting

The LVAAS October General Meeting will be held on its regularly scheduled date – October 9, 2016 at 7:00 PM, at South Mountain, during which a Business Meeting will convene for the purpose of election of our 2017 LVAAS Officers.

LVAAS Full Members in good standing (current dues paid) are entitled to vote and to be considered for office. Any society member in good standing may nominate qualified individuals until nominations are closed during the September General Meeting, scheduled on September 11, 2016. Nominees need to agree to accept a nomination at the time of the nomination in person, or in writing and signed by the nominee, should the nominee not be able to be present when nominated. Except as provided, no nomination shall be accepted by the Nominations Committee, nor shall additional nominations be placed on the ballot after the close of nominations during the September 11, 2016 General Meeting. In the event no qualified candidate is listed for one or more of the officer positions on the Election Ballot for any reason at the time of the election during the October 9, 2016 General Meeting, the election shall take place for the remaining offices. After the election results are verified, the Nominations Committee shall open the floor for the nomination of any qualified candidates to all vacant officer positions. Any candidates not elected to office in the just-completed election may be nominated for any position except a position that the candidate held for the immediate past two consecutive terms of office. The newly elected officers' terms begin at midnight November 30, 2016 and continue until midnight on November 30, 2017.

Nominees to date include:

Director: Rich Hogg

Assistant Director: Sandy Mesics

Secretary: Ron Kunkel

Treasurer: Gwyn Fowler
Dave Moll

Regards,
Dave Binder, Nominating Committee Chairman
Bill Dahlenburg, Assistant

Minutes for the LVAAS General Meeting of 13 August 2016

The August General Meeting, usually held at our Pulpit Rock site, was instead held at our South Mountain headquarters in Allentown, PA due to the extreme heat and threatened severe thunder storms. The meeting started at 7:00 PM under heavily overcast and somewhat threatening skies. During the meeting, weather maps indicated a severe storm going over Pulpit Rock, so the change of venue was well warranted.

Director Rich Hogg welcomed everyone to the meeting and informed them of the intended agenda, namely the speaker, then a short break, followed by the usual information session which would include the new member introductions. He also mentioned that due to the change in venue for the meeting there would be additional options for members visiting Pulpit Rock, including the upcoming MegaMeet.

Shortly after 7:00 PM, Sandy Mesics, Program Co-Director, introduced the speaker, Gary Honis. Gary has been an amateur astronomer since 1987 and he modifies Canon DSLR cameras for better astroimaging. He is a member of the Greater Hazelton Astronomical Society. His presentation described how he makes the camera more red sensitive. His modified cameras, when using a custom white balance with an X-nite filter, still perform like unmodified cameras. He charges $330 for a full spectrum modification, which includes the filters. The Canon 6D camera in his opinion is the best for low noise and also the best for the features offered. The presentation was well received.

In the interests of reaching members leaving after the talk and before the information session, Rich called

on Frank Lyter to discuss his proposed LVAAS sponsored 2017 Eclipse Trip. Frank proposed leaving by bus Friday morning August 18th with a Friday night stay en route, and arriving in Nashville about noon Saturday. The remainder of Saturday and Sunday would be available for touring local attractions. Monday morning we would travel to the observing site, then observe the eclipse in the afternoon. Monday evening we would leave for home, with an overnight stay en route and arrive back home Tuesday evening. He needs a minimum of 25 people to commit to the trip to make it happen. More details will be coming to the membership via email.

Rich also presented Simon Porter, a 10 year LVAAS member, with a plaque recognizing his many contributions and support for LVAAS over the years. Simon was an active presenter at star parties, active in the astroimaging group, and was an elected officer, being Assistant Director who then filled in as Director after the resignation of the existing Director. Simon and his wife will be moving to Virginia, as the needs of his employment require. The wooden plaque was made and engraved by Frank Lyter.

Following a very short break at about 9:00 PM, Director Rich Hogg regrouped the membership for the usual information session.
Due to the recent vacancy at the Membership Director position, Sandy Mesics conducted the introductions of potential new members. There were no second readings and first readings were conducted for Mike and Tara Leonard, and Wilson and Nirla Moura.

Treasurer Scott Fowler discussed the 2016 and 2017 budgets. The 2016 budget had a planned $3000 deficit, but with more than anticipated revenue and less than anticipated expenses, he expects actually to break even for the fiscal year 2016. The proposed 2017 budget has been approved by the Board of Governors and it will be presented for a vote by the membership at the September General Meeting.

Details of the budget are to be published and available in the member-only section of the website. The 2017

budget again has a project deficit of $4280 but $1750 of that is for possible banquet support which might not be spent.

Rich then called on Dave Binder for a nomination committee report. Dave reported that Rich Hogg, Sandy Mesics, and Ron Kunkel, were all eligible for a second term in their current offices, and that they each had agreed to run again, but additional nominations for these offices were still desired. Scott Fowler is not eligible to run for Treasurer as he has already served two terms. Dave announced that Gwyn Fowler and Dave Moll had agreed to run for Treasurer. Additional nominations for these offices will be open until the September General Meeting, with elections then to be held at the October meeting.

Rich then discussed the various open positions on the Board of Governors. Membership Director is vacant due the sudden resignation of Don and Estelle Hines. Additionally, Member Services Director, will become vacant at the end of the year, with the resignation of Chuck Bradbury. Persons interested in these positions should contact Rich.

Sandy then mentioned the upcoming speaker schedule for General Meetings. September's speaker will be Rob Teeter of Teeter Telescopes. October's speaker is yet to be determined. For November, Josh Pepper will speak about Tabby's Star, and the December program for the annual Holiday Party will be a trivia contest.

Rich then called on Frank Lyter, Pulpit Rock Observatories Director, for an update on the 40" mirror. Frank reported coring of the mirror will be done by Mike Lockwood rather than sending it to a previously identified contractor. After coring, the mirror will then need to be transported to a contractor for coating. then back to Mike Lockwood in Illinois for preparation of the secondary mirror. Likely various members will do a road trip similar to when we took the mirror to Illinois to begin with. After the primary mirror is coated and back in Illinois, the secondary mirror will be finished, thus completing the optical set for the 40" telescope.

The meeting adjourned at 9:30 PM.

Minutes prepared and submitted by Ron Kunkel, Secretary.

LVAAS Director Rich Hogg presents Simon Porter with a plaque (R), thanking him for his years of dedication and service to LVAAS. We wish Simon well in his new endeavors. Clear skies, Simon!

LOOK GOOD WHILE LOOKING!

Your Red Shift Store at South Mountain is now fully stocked with clothing merchandise that you just must have for yourself or others.

What better to way to show off the organization that you belong to than by wearing apparel with one of the LVAAS Logos?

Ball Caps (one size fits all) in Navy Blue or Natural/Royal Blue
T-Shirts from size small to 2x large in Athletic Heather, Navy Blue or Black
Polo Shirts from size medium to 2x large in Black or Celadon Blue

And for the not-so-adults:
T-shirts from size small to large in California Blue, Pink, Neon Green, Island Yellow

And for those cooler months soon to come:
Fleece Jacket (real great windbreaker) from size medium to 4xxx large in Blue Glacier
Beanie (alright, call it a stocking cap) in Navy Blue
Sweatshirt from size small to 2x large in Navy Blue or Ash
Denim Shirt from size medium to 2x large in Light Blue

All this clothing merchandise is available now at the Red Shift store on Star Party nights and General Meeting nights.

Stop by, and we thank you for visiting the Lehigh Valley Amateur Astronomical Society's (LVAAS) Red Shift store. LVAAS is a 59-year-old 501(c)3 non-profit educational institution. Your purchase will help us carry out our mission of bringing astronomy to the public. Thank you for shopping, and for your support!

Contributed by Chuck and Donna Bradbury, Member Services

Ron's Ramblings

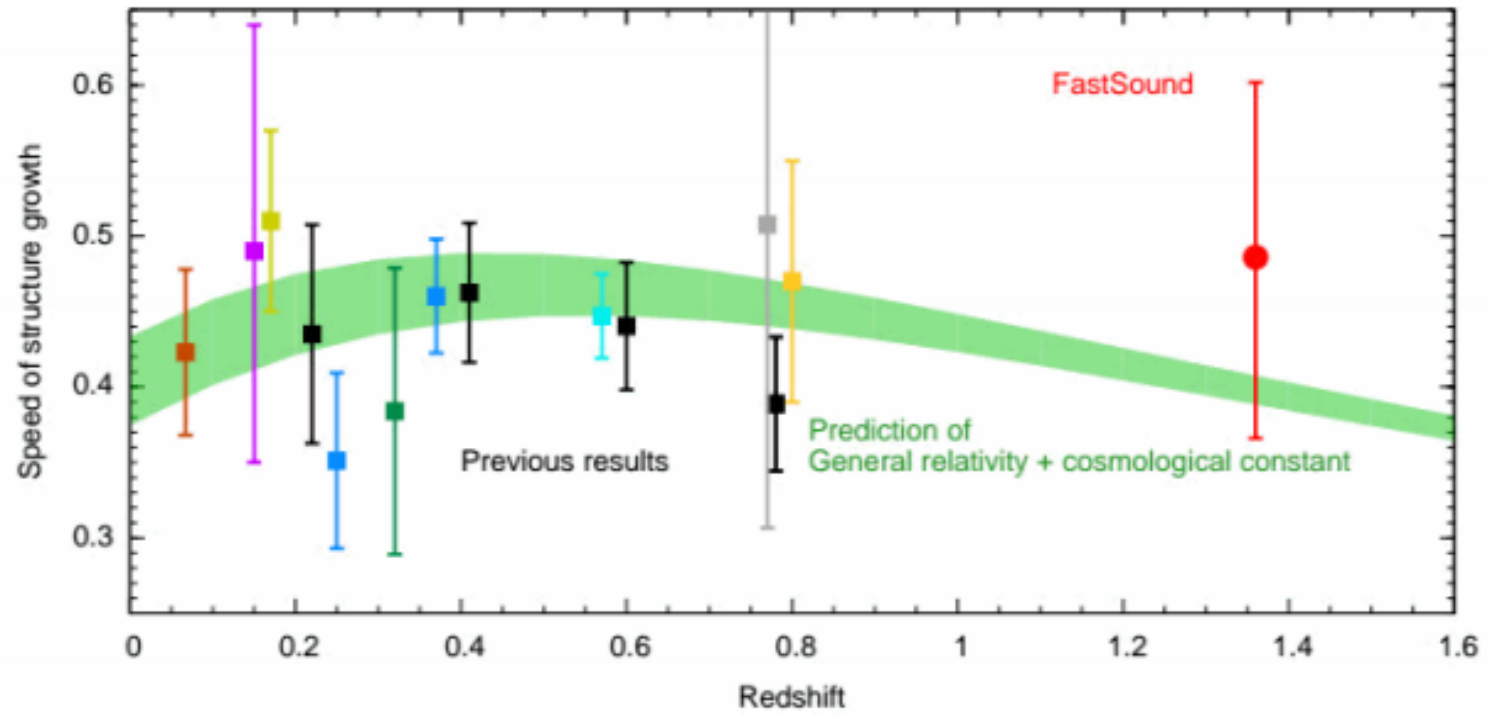
Ron's Ramblings is a monthly series of articles describing some recent or otherwise important event in astronomy. The ramblings will attempt to describe both the astronomical event and its significance. Obviously, the description will be that of a rambling amateur astronomer.

General Relativity's Cosmological Constant Tested

Einstein published his theory of General Relativity in 1915. At the time, astronomers thought the universe was static. But since Einstein's field equations for General Relativity implied an expanding universe, in 1917 he added a repulsive term called the "cosmological constant" to balance out the expansion, i.e. forcing a static universe. Then in the late 1920s Edwin Hubble discovered that the universe was not static, but rather expanding. Einstein then referred to the addition of his "cosmological constant" term as the biggest blunder of his life. But then in the late 1990's it was discovered that not only was the universe expanding, but that some mysterious repulsive force, called Dark Energy, was driving the accelerating expansion.

There are now two popular theories as to what constitutes this Dark Energy. The theory of Quintessence says the dark energy is a new force and it will eventually fade away. The other theory is that the cosmological constant properly represents the dark energy. The cosmological constant says that dark energy has been steady and constant throughout time, and will remain that way. It represents the energy density of empty space, the vacuum. To differentiate between Quintessence and the cosmological constant, scientists have been looking deeper and deeper into space to see if dark energy is constant or varying. Now a new survey, called the FastSound Survey has probed farther into space than any prior survey and they confirm that indeed dark energy could best be explained by General Relativity's cosmological constant.

In the chart below, the green band represents the prediction of General Relativity including the cosmological constant. The red data point represents the FastSound Survey result plotted at a red shift of 1.35, which represents the period roughly of 12.4 to 14.7 billion years ago. The results of this survey indicate that even far into the universe, General Relativity is valid, giving further support that the expansion of the universe could best be explained by the cosmological constant.



The FastSound Survey used the Fiber Multi-Object Spectrograph (FMOS) on the Subaru Telescope for its survey. The FastSound Survey looked at 3000 distant galaxies to analyze their velocities and clustering.

The Prime Focus Spectrograph, currently under construction, is expected to be able to study galaxies even farther away. It remains to be seen if the cosmological constant will continue to best explain dark energy, that mysterious force that seems to drive the expansion of the universe. It is a shame that Einstein is not alive to see the vindication of his cosmological constant.

References

http://subarutelescope.org/Pressrelease/index_2016.html#160510
https://astronomynow.com/2016/05/11/deepest-3-d-galaxy-map-suggests-einsteins-theory-stands-true/

The end of my ramblings until next month. Ron Kunkel

LVAAS Astroimaging Calendar 2017

We're getting closer to putting together our 2017 edition! We're hoping for clear skies and lots of opportunity before the **October 28, 2016 deadline** for submissions. If all goes well we should have the 2017 calendar available for sale at the November 13th General Membership meeting. We are always in need of LVAAS facility photos too, if you happen to have a camera handy when visiting.

Remember, we don't publish photos of individual people due to the need to obtain authorizations. Large group photos may be considered. Image size should be 3531 x 2354 or larger at 300 dpi.

The monthly Astroimaging meetings are set to resume on September 15th at 7:00 p.m.

Please check out Steve Altomare's invention: a dew heater control box that rivals an expensive off-the-shelf model. Steve's heater is available through the Red Shift store with proceeds benefiting LVAAS. Please go to: http://www.cafepress.com/lvaasredshiftonlinestore. Clear Skies!

-Sandra Repash, Calendar Editor

Above Calendar Photo Credits: **Gary A. Becker,** (L) upper: Pulpit Rock Astronomical Park and (R) lower: the Brooks Observatory at South Mountain Headquarters. **Dave M. Moll**, (R) upper: Sunrise at Pulpit Rock. **Rae Klahr**, (L) lower: Sunset over South Mountain Headquarters LVAAS.

StarWatch

by Gary A. Becker

Walking the Line

It's being touted as the Great American Eclipse, and although it's not a great eclipse with a duration of solar totality exceeding five minutes, its path traverses the entire continental US from the cool Pacific shores of Oregon to the sultry beaches of Charleston, South Carolina.

On eclipse day millions of Americans will be in the path of totality, and tens of millions more will be traveling to the centerline where the moon's shadow will be passing. Pete Detterline, director of the Boyertown Area School District Planetarium, and I spent five days this past summer following the centerline from mid-Nebraska through central Idaho in the hope of finding appropriate locations. We agreed that our most important priority was to view the eclipse and that the weather was far too iffy to pick a location east of the Mississippi; so we are counting on mobility, our capabilities to forecast the weather at least 24 hours in advance, and at least one night where my Jeep Sahara may also serve as our motel.

Minus the weather, the biggest concerns confronting western eclipse chasers will be the remoteness of the event and the fact that the infrastructure simply will not be able to handle the influx of eclipse enthusiasts. Wyoming's population is expected to double on E-day with Casper being the focal point. As many as 150,000 people from the greater Denver area may be driving northward on I-25 on Monday, August 21, 2017. The interstate will be gridlocked, and cars will simply run out of gas. We are packing extra fuel and water in our vehicle, as well as a cabaña for shade.

Shoshoni, Wyoming, west of Casper near the centerline, has one gas station. Glendo State Park, east of Casper and on the centerline, is expecting 50 times its normal daily volume of visitors. Pete asked me where I thought we would see the eclipse. My answer to him is in a cemetery in western Nebraska or more likely along a flat stretch of desolate highway in central Idaho. Regardless of our location, just getting to this eclipse will be an adventure. (Photos next page)

© **Gary A. Becker – beckerg@moravian.edu or garyabecker@gmail.com**

Moravian College Astronomy - astronomy.org

Gary on the Centerline: It's all quiet on the Wyoming front a year earlier, but this could be an entirely different scene on the morning of the eclipse. In fact, while we were surveying the location, a kind woman in a 4x4 truck stopped to ask if we were having car troubles. She knew about the eclipse. Smartphone image by Peter K. Detterline.

Spectacular Idaho: This stretch of road in central Idaho continued straight and flat like this for more than 20 miles. Watch out for the snakes in the grass. This is where I instinctively think we'll see it. Image by Gary A. Becker.

From the LVAAS Archives:

Atoms for Peace, Pulpit Rock, and another Fireball

By Sandy Mesics

Fifty years ago, on Sunday, September 4, 1966, 23 LVAAS members and family members met at the home of industrialist and amateur astronomer Henry C. Kawecki in Lenhartsville, at Mr. Kawecki's invitation. The purpose of this "meet and greet" was to discuss the possibilities of LVAAS having use of Kawecki's observatory and site at nearby Pulpit Rock. Kawecki was quite interested in having his observatory used by an established organization. The group spent some time eating, socializing, swimming in Kawecki's pool, and taking helicopter rides up to his observatory site atop Pulpit Rock. Yes, helicopter rides, with Kawecki at the controls!

Henry Kawecki's helicopter at Pulpit Rock in November 1966

At that time, Kawecki's private Pulpit Rock site featured a 12-1/2" Cassegrain telescope in a 16 foot domed observatory, with a generator for power. According to George Maurer, former LVAAS member, the observatory was a sturdy brick building and the telescope was built by Mike Spacek, who owned Spacek Instruments in Pottstown. Unfortunately, skies were cloudy that night, so there was no observing, but LVAAS came away with an offer to have the Pulpit Rock site and the Kawecki Observatory. The offer was contingent on LVAAS constructing a roadway to the site, and immediately, bids were sent out for the work. The offer was unanimously accepted at Board of Governors meeting the next week. Kawecki joined LVAAS that month.

So who was Henry Kawecki, and how did he come to own a mountain?

Born in 1912, Kawecki graduated from the Massachusetts Institute of Technology in 1934 with a degree in electrochemical engineering. He went to work at the Beryllium Corporation, where, from 1936 to 1965, the company extracted beryllium hydroxide from beryl ore, and produced beryllium salts and various types of beryllium metal and alloys. He eventually established Kawecki Chemical Company (later KB Alloys). Kawecki Chemical merged with BerylCo after BerylCo moved to Temple, Pennsylvania from Maryland and Henry ran the combined operation. The headquarters continued to be in Boyertown after the merger, and Henry flew his helicopter from his home to the Boyertown location. Thanks to research done by Dave Moll, in the 1940 census, Kawecki was 27 years old, and made $2,400 a year. This would be about $40K in 2015 dollars. But with the advent of World War II, his fortunes would dramatically improve.

During World War II, even though the work that Kawecki Chemical was doing was most likely classified, it was fairly common knowledge that they refined beryllium primarily for the Atomic Energy Commission. According to Dave Moll, it is likely that they may have also machined the Be neutron concentrator spheres for “The Bomb.”

At end of World War II, the Beryllium Corporation was stuck with a plant owned by the Atomic Energy Commission for which they wanted a peace-time use. Wayne Martin, a colleague of Kawecki’s, suggested that it be used to make potassium titanium fluoride. The entire aluminum industry uses it to grain-refine aluminum. Kawecki obtained a 1951 patent for production of potassium titanium fluoride (and a 1961 patent for the extraction of lithium.) Kawecki Chemical Company manufactured potassium fluoride, in the process becoming a multimillion dollar firm. The company made $2.5 million in 1956, and soon Kawecki owned a yacht and a home in Fort Lauderdale.

The extraction of beryllium hydroxide from beryl ore was discontinued in 1965. From 1965 to 1992, operations of the plant included the production of beryllium copper, beryllium nickel, and beryllium-aluminum alloys; casting, heat treatment, and rolling of beryllium alloys; and chemical and mechanical cleaning of beryllium alloys.

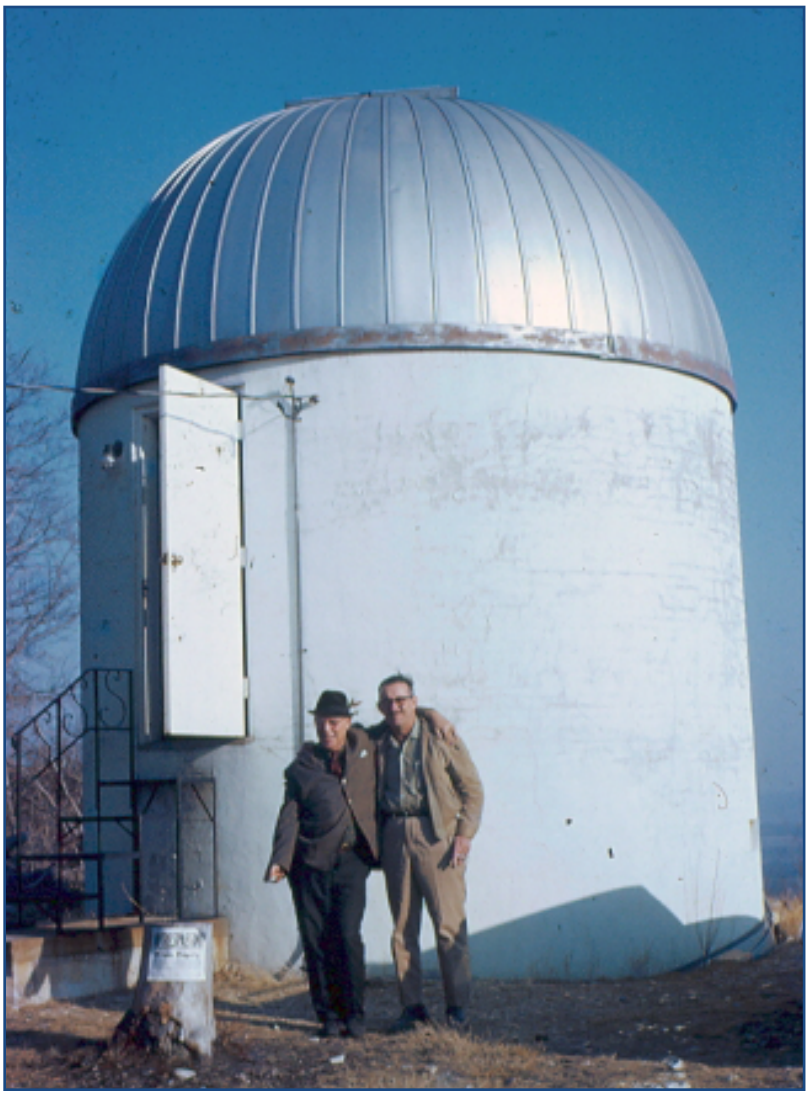
At the time of the LVAAS meeting with Kawecki, he was 54 years old. He was President and Director of Kawecki Chemical, and employed 11 chemists and 4 additional personnel. He held 11 patents. As Dave Moll recollects, “I just remember him as a regular guy, much older than me of course. He never talked about astronomy to my knowledge. I got the impression that he built the observatory on a whim, but he didn't use it very often.”

According to George Maurer, “Mr. Kawecki had been an amateur astronomer as a young man and had made a reflecting telescope. An article he wrote about it was published in the Scientific American. In the late 1950’s, he purchased a large tract of land on the mountain that included Pulpit Rock and proceeded to build his observatory there. This was done with great difficulty as the only access to the summit was by means of an old and very rugged logging trail. He used a jeep to haul bricks and material to the site. The rugged trail caused the jeep to break down several times during the period of construction. Once the observatory was completed, he used his helicopter to reach the summit.”

Dave Moll has memories of both the jeep ride, and the helicopter ride: “I went to Pulpit Rock twice before it was transferred to us (LVAAS.) The first time was by Jeep, up the old trail. It was very rough. Being the "young guy," I got to ride in the cargo area in the back of the Jeep, a VERY rough ride. The second time was much more fun. We went from his house to Pulpit Rock in the helicopter. It was one of those full plastic dome things like on MASH. ... We flew up in his helicopter that did not have a door on my side. I stupidly mentioned that I had never flown in anything before. Upon hearing that he promptly laid the chopper over onto my side. When I looked to my right I was looking straight down. Scared the cr*p out of me. Then I stupidly asked what happens when a helicopter has engine failure. He promptly shut of the engine and disconnected the rotor. While we were losing altitude he explained the principle of autorotation. Then he re-started the engine. I was beside myself, but I realized I really liked the guy! We landed at Pulpit Rock in the vicinity of the roll-off.”

George Maurer reported that “It was in the early part of 1966 that one of our members who lived in the Hamburg area came upon Kawecki's observatory while hiking along the mountain trail and he reported this to the Society. It was proposed that the Society try to make contact with the owner, whom we did not know at the time, to see if we might visit his observatory and possibly use it occasionally. We were able to contact Mr. Kawecki directly in late August of 1966 and explain our interests. He was quite cordial in his response and invited a group of our members to his home in September 1966 for a discussion.” Initially, Kawecki had offered the use of his facility to Albright College, but that institution had no astronomy program, and therefore wasn’t interested.

The observatory site at that time was fairly primitive. According to Dave Moll, “It was very primitive. Just a big clearing (about the size it is now, in my recollection), with the original observatory at the east end.” However, at that time, it could truly be described as a dark sky site. George Maurer remarked, “When the Society held its early star parties there, one member said he had a problem recognizing constellations because of so many stars.” Dave Moll recalls “It was very, very dark. Absolutely the darkest skies I had been under up to that time. It was summer, and the Milky Way through Cygnus was incredible. I get very depressed when I am up there now at new moon and I don't even need a flashlight to find my way around because of the sky glow from Hamburg, I-78, and the Cabela's development.”



LVAAS Director Ernie Robson (left) and Henry Kawecki at Kawecki Observatory

Henry Kawecki maintained his membership in LVAAS, but never became an officer or board member. On May 3, 1966, he was invited to the White House for an observance of the Polish Christian Millenium and Constitution Anniversary and signing of a proclamation by Lyndon Johnson. In November 1968, Kawecki was listed as a scientific advisor to the National Investigations Committee on Aerial Phenomena (NICAP), a group dedicated to solving the UFO riddle. He presumably believed in the existence of Extraterrestrial beings.

In 1971, Kawecki Berylco joined with French Company Tréfimétaux to form Tréfimétaux Berylco SA, with its headquarters in Paris. In 1979, Tréfimétaux sold the shares owned by Cabot Corporation, the company became 100% its subsidiary through Cabot International Capital Corporation. TMB changed its brand name and became Berylco-Cabot Special Metals (BCMS). In 1986, the Japanese group NGK Insulators Ltd., acquired Cabot Corporation, and became NGK Berylco.

Kawecki died on September 28, 1973 at the age of 61 while on his yacht off Australia. He left an estate valued at $150,000 to his surviving relatives, including his wife, Clara, his daughters Margaret and Elizabeth, and son Henry. This would roughly be about $834,000 in 2016 dollars.

According to George Maurer, although LVAAS has always referred to the observatory as the Kawecki Observatory, Mr. Kawecki, modestly declined the name during his lifetime. Following his death however, it was formally named the Kawecki Observatory with the approval of his family as a remembrance to him and his generosity.

His 12-1/2 Cassegrain telescope was eventually removed for refurbishment and an 8 inch refractor, also built by Mike Spacek, was installed in Kawecki Observatory. Time showed that the building was best suited for the refractor and so it remained. Some years later, the refractor's optics were refigured by LVAAS's own expert optician, Bill McHugh. The brick building was also covered with ribbed aluminum which prevented the brick walls from heating excessively in the sun and also allowed the building to cool down faster after sundown. The fine performance of the 8 inch refractor along with its favorable location has made it a favorite with many of our members to this day.

In next month's column, we will talk about how LVAAS built a road to the site, and the early development of other facilities at Pulpit Rock.

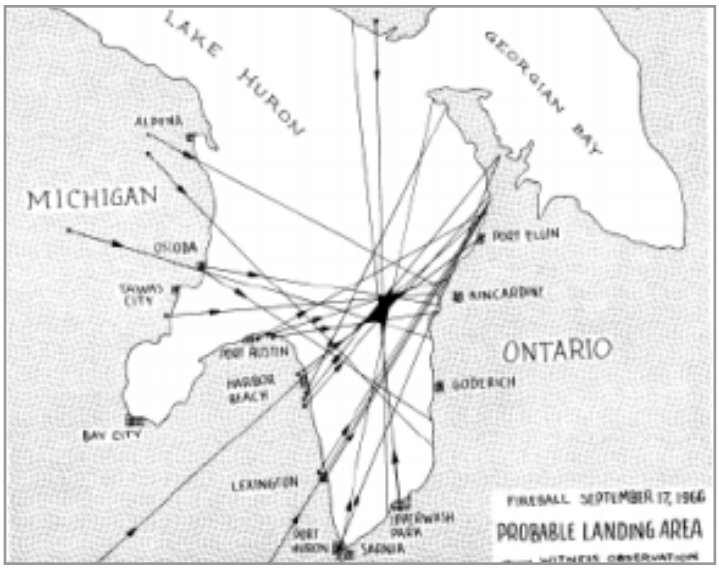
Outstanding photograph of September 17, 1966 fireball taken at Hamilton, Ontario by professional photographer James C. Fish

Great Balls of Fire Redux...

Coincidentally, on Saturday, September 17,1966, a couple of weeks after that first meeting at Kawecki's, he hosted the LVAAS field meet. At 7:47 p.m. on the way to the field meet, LVAAS members Ernie and Marion Robson, Jack Flory and Curtis Rinsland observed a large fireball coming out of the northwest, described as brighter than the full moon and moving straight down. Flory reported that there were two separate flashes, and the total duration of the event was about 5 seconds. This fireball was widely seen in the Great Lakes region and even photographed:

As reported in the 1968 book Geological Survey, Bulletin 5, Meteorites of Michigan, by von del Chamberlain, "This fireball was bright enough to momentarily light the evening sky to a pearly glow almost as light as day.

At several communities in the thumb of Michigan the intensity was sufficient to automatically turn off the photoelectric controlled street lights. Typical fireball sights and sounds were witnessed along both the Canadian and United States shores of southern Lake Huron. At least two photographs were taken. Confused reports of falling objects and fires followed. Because the author was alerted within minutes after the event he was able to locate the train remaining in the sky. With a reliable bearing on the end-point, the region of greatest interest in the United States was quickly determined to be along the Michigan shore of Lake Huron. Some observers in this area were then interviewed. Results indicated a southeast to northwest trajectory ending, unfortunately, over Lake Huron about 50 miles east and slightly north of the tip of the thumb of Michigan."



Observations of September 17, 1966 fireball. Arrows point to the endpoint of the fireball as reported by witnesses at several different locations, indicating the fireball ended off shore from Kincardine, Ontario.

REFERENCES

"In Memoriam: Wayne Martin"
http://arthritistrust.org/wp-content/uploads/2012/10/InMemoriamWayneMartin.pdf

"Meteorites of Michigan," von del Chamberlain, Geological Survey, Bulletin 5, 1968.

Thanks to Dave Moll for his contribution. Other material from the LVAAS archives.

Highlights of the September Sky

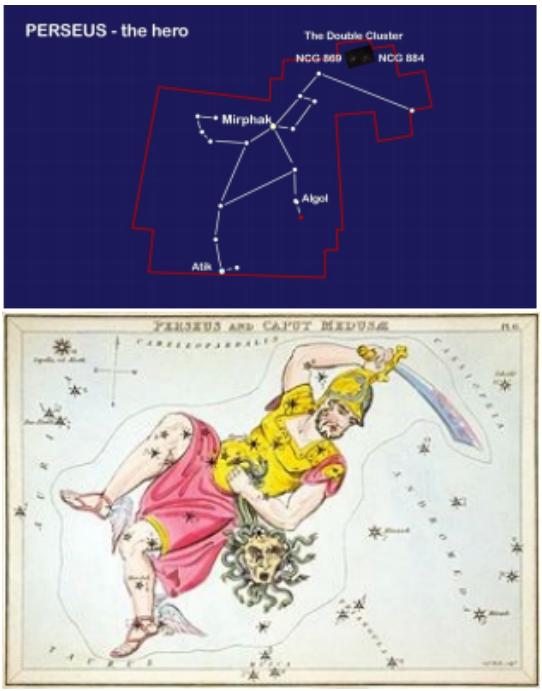
by

Carol Kiely

The past couple of weeks has been a real treat for those of us who like looking at the planets. On Saturday, August 27th, just after sunset, Venus and Jupiter were so close in the western sky, you could see them both in the same eyepiece. Then in the southern sky, there were Saturn and Mars in Scorpius. You will still catch a glimpse of Venus this month shortly after sunset. Mars and Saturn will be also be visible. Unfortunately Jupiter will be well below the horizon but for those who are already missing Jupiter, just take a look at NASA's website:

http://www.nasa.gov/feature/jpl/nasas-juno-successfully-completes-jupiter-flyby

The latest images taken by the cameras onboard the Juno spacecraft are amazing! Towards the end of the month, you may be able to catch a glimpse of Mercury close to the horizon in the east just before sunrise.



Above is a schematic diagram showing the bright stars in Perseus together with one of the constellation cards from Urania's Mirror depicting Perseus carrying the head of the Gorgon Medusa.

However, if you are tired of planet gazing, there are plenty of other things to look at.

Perseus, a constellation named after one of the most famous Greek heroes, will be visible just above the horizon in the northwestern sky. The brightest star in this constellation is Mirphak - a yellow-white supergiant in its latter stages of evolution, approximately 510 light years away from earth.

The most well-known star in this constellation however, is Algol, an eclipsing binary, consisting of two stars in close orbit. One of these stars is much brighter than the other. Together they have a magnitude of 2.1 but every 69 hours the fainter star passes in front of the brighter companion and the combined light from this pair drops to a third of its normal value - a change that is noticeable even to the naked eye. The eclipse lasts for five hours.

One of the most interesting deep sky objects in Perseus can be found above his sword. It is the so-called Double Cluster, made up of two open star clusters, NGC 869 and NGC 884. They lie more than 7,000 light years away in the Perseus spiral arm of our galaxy. See if you can spot the red giant stars in NGC 884.

The story of Perseus is one of the most famous of all the Greek legends. It involves a gorgon called Medusa who had snakes instead of hair, and any man or animal that looked directly into her eyes was turned immediately into stone. The King did not like having such a powerful creature in his kingdom so he told Perseus to chop-off her head and bring it back to him. Even though Perseus had the strength to overpower the gorgon, it would be very difficult to kill her without looking directly at her. There was also the chance of being bitten by one of the snakes.

So the gods decided to help him. Hermes - the gods messenger - gave him a pair of winged sandals so that he could fly; Hades - the god of the underworld - gave him a helmet of darkness that made him invisible, and Athena - the goddess of wisdom - gave him a highly polished bronze shield which he used as a mirror to avoid the direct gaze of Medusa.

Finding Medusa was relatively easy. All Perseus had to do was follow the trail of stone statues of men and animals. He then waited until Medusa and the snakes on her head were asleep. Looking only at her reflection in the brightly polished shield, he managed to cut off her head with one blow of his sword. To his surprise, a winged horse sprung out of Medusa's body. This horse was called Pegasus. Perseus quickly grabbed Medusa's head and put it into a sack so that he would not accidentally look at it, and with the help of the winged sandals, he jumped onto the horse's back and started to make his way home.

Zeus was so impressed with Perseus's heroism that when Perseus died, he placed him in the sky holding Medusa's head, but he forgot the sack. Now in some parts of the world, Algol is thought to be the eye of Medusa and she is slowly winking at us. Fortunately for us, she is over 90 light years from Earth, so you won't be turned into stone when you look at this region of the sky.

As many of you will realize, I have cut the story of Perseus short. Quite a lot happened on his way home. If you would like to find out more and how the story of Perseus can be used it to identify several other constellations in this region of the sky, then why not come along to the next LVAAS Lunatics and Stargazers Night (Friday, September 9th) and/or this month's Star Party (Saturday, September 10th.)

Happy Stargazing!

Stellafane 2016 Report

By Thomas Duff

Bill Dahlenburg and I decided to attend the 2016 Stellafane Convention again this year, which was held Thursday through Sunday, August 4-7, 2016. The five hour drive to Springfield Vermont is a long one but Bill and I filled it with stories of our families and past events we have attended, like the Northeast Astronomy Forum (NEAF) and the Cherry Springs Star Party. Bill has been attending this event periodically for the last fifteen years, and I have joined him the last few events. We also met Christine and Bob Mohr while we were there. They have been attending this event for many more years than Bill and I.

The Stellafane Convention was created in 1926 to give amateur telescope makers an opportunity to gather to show off their creations. The event includes various speakers both professional and amateur talking about telescope making and mirror-grinding techniques. Hundreds of curious attendees come each year to see all the various telescopes both commercial and homemade. Homemade telescopes can be entered into different classes to try and win awards. These classes include Masters Classes in Craftsmanship, Compound Optics, and Mechanical Design; Regular Classes like Innovative Components, Antique Restoration, and Special Awards; and a Junior Class. There are also mirror grinding and telescope-making demonstrations, and technical lectures on telescope making. This year Stellafane changed their food vendor and the new vendor received a standing ovation during the awards ceremony.

A few years ago we attended and it was during the Perseid Meteor Showers. We were rewarded with clear skies and the ability to see an exceptional display of meteors in the night sky.

This year’s award winners in included:

Masters Classes

Craftsmanship – Richard Parker and Allen Hall – 6inch F15 Refractors
Compound Optics - Richard Parker and Allen Hall – 6inch F15 Refractors
Mechanical Design - Richard Parker and Allen Hall – 6inch F15 Refractors

Regular Classes

Craftsmanship – Alan Ward 4 inch F12 Refractor
Innovative Components – Steven Bellavia - Differential Thread Helical Focuser
Antique Restoration – Tom M Kiehl – 6 inch F10 LE Brower Newtonian
Special Award – Jack Gelfand – Microwave Radio Telescope

Junior Class – Corrine Wilklow - 9.5 inch F5.6 Newt/GEM

I would also be remiss if I did not mention the Stellafane Swap Meet which has a large selection of used items for sale.

If you get a chance to attend you will not be disappointed.

Thomas Duff

Stellafane 2016

Stellafane Bowling Ball Telescope

Stellafane's pink clubhouse in background

The Porter Turret Telescope

Master Class Winners for Mechanical Design and Craftsmanship, Richard Parker and Allen Hall.

Visitors set up at Stellafane's observing field

Images courtesy of Bill Dahlenburg and Tom Duff

Is there a super-Earth in the Solar System out beyond Neptune?

by Ethan Siegel

When the advent of large telescopes brought us the discoveries of Uranus and then Neptune, they also brought the great hope of a Solar System even richer in terms of large, massive worlds. While the asteroid belt and the Kuiper belt were each found to possess a large number of substantial icy-and-rocky worlds, none of them approached even Earth in size or mass, much less the true giant worlds.

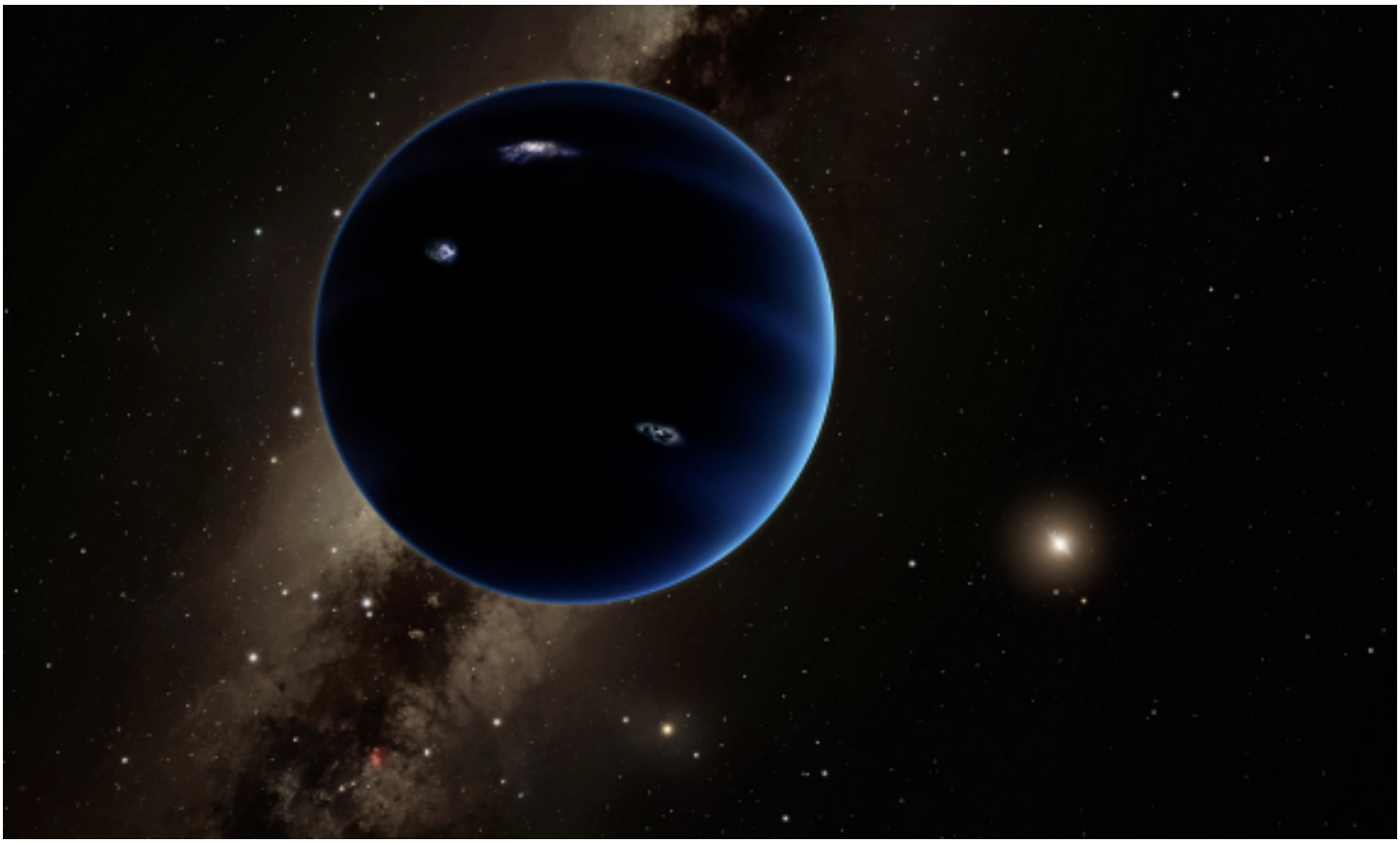
Meanwhile, all-sky infrared surveys, sensitive to red dwarfs, brown dwarfs and Jupiter-mass gas giants, were unable to detect anything new that was closer than Proxima Centauri. At the same time, Kepler taught us that super-Earths, planets between Earth and Neptune in size, were the galaxy's most common, despite our Solar System having none.

The discovery of Sedna in 2003 turned out to be even more groundbreaking than astronomers realized. Although many Trans-Neptunian Objects (TNOs) were discovered beginning in the 1990s, Sedna had properties all the others didn't. With an extremely eccentric orbit and an aphelion taking it farther from the Sun than any other world known at the time, it represented our first glimpse of the hypothetical Oort cloud: a spherical distribution of bodies ranging from hundreds to tens of thousands of A.U. from the Sun.

Since the discovery of Sedna, five other long-period, very eccentric TNOs were found prior to 2016 as well. While you'd expect their orbital parameters to be randomly distributed if they occurred by chance, their orbital orientations with respect to the Sun are clustered extremely narrowly: with less than a 1-in-10,000 chance of such an effect appearing randomly. Whenever we see a new phenomenon with a surprisingly non-random appearance, our scientific intuition calls out for a physical explanation.

Astronomers Konstantin Batygin and Mike Brown provided a compelling possibility earlier this year: perhaps a massive perturbing body very distant from the Sun provided the gravitational "kick" to hurl these objects towards the Sun. A single addition to the Solar System would explain the orbits of all of these long-period TNOs, a planet about 10 times the mass of Earth approximately 200 A.U. from the Sun, referred to as **Planet Nine**.

More Sedna-like TNOs with similarly aligned orbits are predicted, and since January of 2016, another was found, with its orbit aligning perfectly with these predictions. Ten meter class telescopes like Keck and Subaru, plus NASA's NEOWISE mission, are currently searching for this hypothetical, massive world. If it exists, it invites the question of its origin: did it form along with our Solar System, or was it captured from another star's vicinity much more recently? Regardless, if Batygin and Brown are right and this object is real, our Solar System may contain a super-Earth after all.



A possible super-Earth/mini-Neptune world hundreds of times more distant than Earth is from the Sun. Image credit: R. Hurt / Caltech (IPAC)

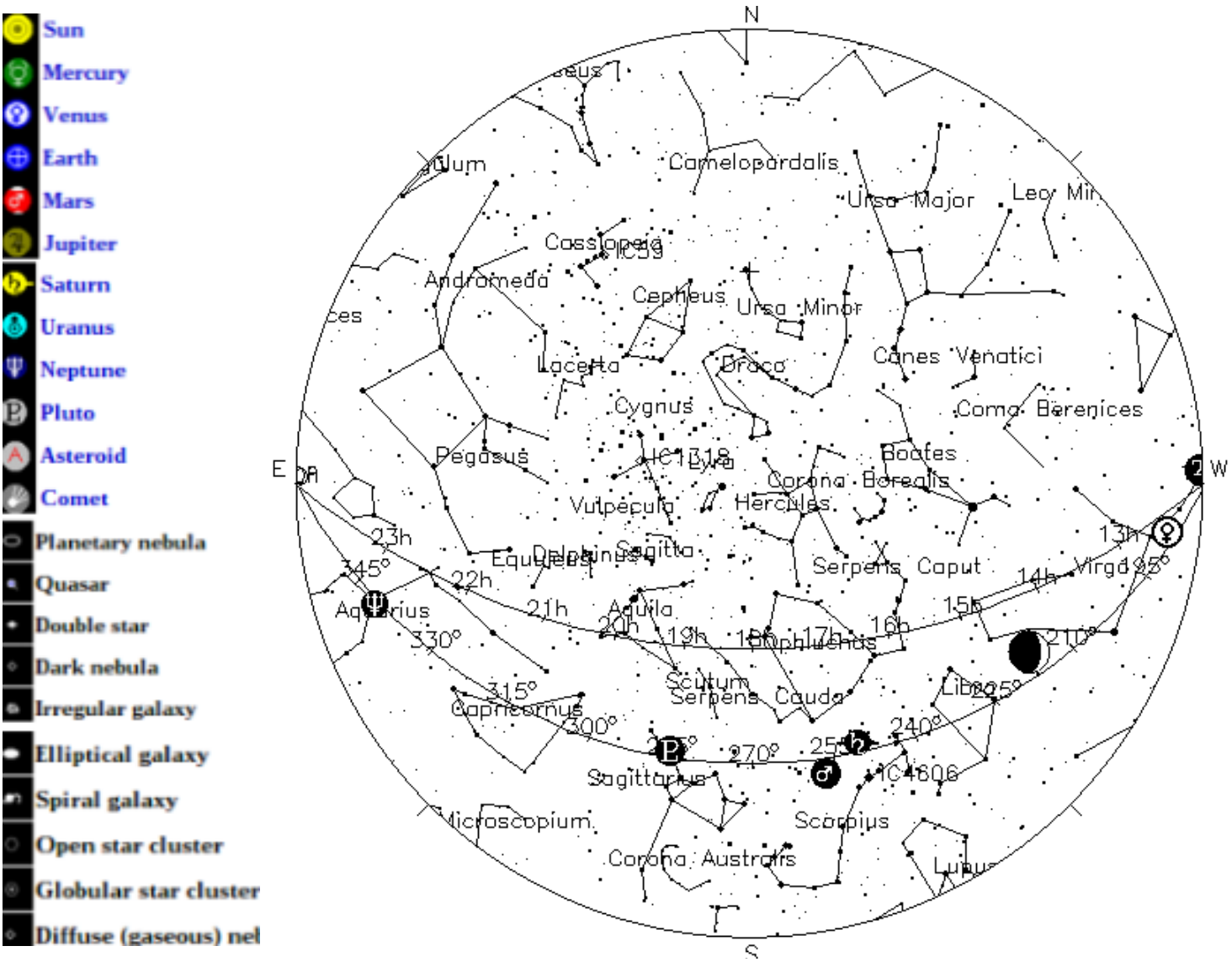
Oh, Snap!

"...Merrily, merrily, merrily, merrily;
Life is but a dream...."
- Childrens' folk nursery rhyme

The waning crescent moon, in high summer
photographed above Gettysburg, PA
on July 30, 2016, 6:15 a.m.
by Dave Raker.

Oh, Snap! is a monthly feature of LVAAS members' astronomy-related works which are generously shared for the enjoyment of our readers. Kindly submit your original photos, videos or other material to editorlvaas@gmail.com

Sky above 40°33'58"N 75°26'5"W at Sat 2016 Sept 5 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]

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

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

SEPTEMBER 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				01 New Moon	02	03
04	05	06	07	08	09 First Quarter Moon	10 Star Party
11 General Meeting - South Mountain	12	13	14	15 Astro Imaging	16 Full Moon	17
18	19	20	21 LVAAS Scout Group - South Mountain	22 LVAAS Scout Group - South Mountain	23 Last Quarter Moon	24
25 LVAAS Board of Governors Meeting	26	27	28	29	30 MegaMeet New Moon	

OCTOBER 2016

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

2016 LVAAS Event Calendar

2016 LVAAS Event Calendar												
	Sundays			Thursday	Saturdays		Mondays	Multi-Day Weekends	Moon Phase			
	General Meeting	Board meeting		Astro-Imaging		Star Parties	Scouts at S. Mountain	Scouts at Pulpit R.	New	First	Full	Last
January	2:00 PM 10-m	31		21		no mtg		no camping	9	16	23	2 31
February	2:00 PM 14-m	28		25		13		no camping	8	15	22	
March	13	20		24		19		no camping	8	15	23	1 31
April	10	24		21		16		22-24	7	14	22	29
May	15	22		19		14		20-22	6	13	21	29
June	12	26		no mtg		11		24-26	4	12	20	27
July	05:00 PM 9-s	31		no mtg		16		15-17	4	11	19	26
August	13-sp	28		no mtg		6		19-21	2	10	18	24
September	11	25		15		10		16-18	1 30	9	16	23
October	9	30		13		8		14-16	30	9	16	22
November	2:00 PM 13	27		17		5		11-13	29	7	14	21
December	2:00 PM 10-sc	18		15		3		no camping	29	7	13	20

(-s) = Saturday meetings - Rain date on Sunday
(-m) = Muhlenburg College
(-sp) = Saturday meeting at Pulpit Rock
(-sc) = Saturday Holiday Party at Grace Community Church
All meetings 7:00 PM unless noted otherwise

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 astro-images), 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.

If all else fails, trust The Observer's photo editor, Dave Moll, to edit your image for publication. He's a bit of a wizard.

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.

Photo editor is Dave Moll, Polaris41N@outlook.com

Society members who would like to submit an article or photo 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 submission are greatly appreciated. Articles may be edited for publication. Your comments and suggestions are invited.

To update LVAAS information or to make member contact changes or corrections, please email LVAAS Director Rich Hogg theotherplanb@gmail.com or Asst. Director Sandy Mesics astrosandy@gmail.com.