The Observer

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

Our own Ron Kunkel gave another terrific presentation at the June meeting, and it turned out to be perfect timing, since only the second gravitational wave to ever be directly detected in all of human history hit the news just a few days after. I think it is like the early days of exoplanet research. Right now, every gravitational wave that washes up on LIGO's laser shores is big news, but in a few years we will start to get bored. Hopefully we will still take notice and think about them a little, at least the ones that prove to be exceptional once we have seen enough to get bored with the rest.

In other news this month, LVAAS was represented at the re-dedication of the Schanck Observatory at Rutgers, and we had a very nice night visiting and observing at the UACNJ site at Jenny Jump! Look for Sandy Mesics' article on her visit to Rutgers in August's newsletter, and check out Mike Morgan's pictures of the Jenny Jump evening on our Facebook page (https://www.facebook.com/lvaas.astro/).

Our July meeting will be our summer picnic, scheduled for 5:00 PM on Saturday, July 9, with July 10 as a rain date. Please plan to come early to help set up, and bring a covered dish or dessert to share. LVAAS will be providing burgers, hot dogs, and beverages. Our speaker will be Jason Kendall of William Paterson University, on the topic of "Life in the Universe!" For more information visit http://lvaas.org.

By the way, we have a couple of openings in our hard-working team that keeps LVAAS going, one right away and one coming up. We have decided that we would like to start having the 50-50 raffle again at the general meetings, and we need a volunteer to run it. Also, Chuck Bradbury has announced that at the end of the year, he is stepping down as operator of the Red Shift store, where snacks, beverages, and LVAAS apparel and swag are available for purchase at our events. Please be sure to thank Chuck for his dedication to LVAAS and his efforts in keeping the Red Shift going when you see him! And, if you would like to try your hand at running a small part-time retail establishment, please approach me.

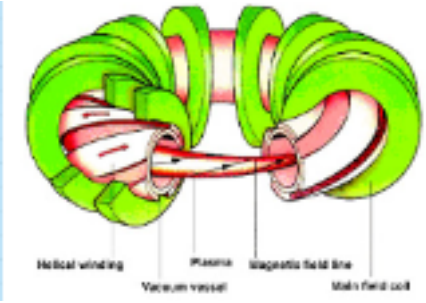
Energy Developments

One of the categories of "good news" that we see every so often these days, is the progress that is being made in replacing fossil fuels with renewable energy sources around the world. It's been over ten years since the windmills popped up north of Scranton, my old stomping grounds. (At the time they were constructed they almost seemed to materialize overnight.) And the declining cost of solar panels means that we are seeing new photovoltaic energy projects all over the place.

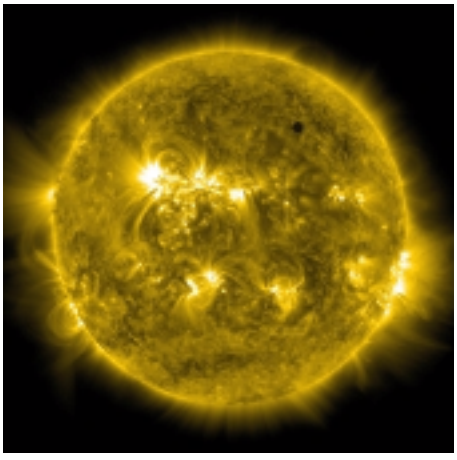
But it’s difficult, and frustrating, to try to get the big picture on this. There are places such as Iceland, Norway, and Denmark that are fulfilling almost all of their energy demands using renewables; but apparently, the U.S. will not even come close to this for many decades. The reasons are complicated and the subject is controversial, with the science and technology diluted by a lot of economics, politics, and entrenched business interests, and as a result quite a bit of misinformation gets published and accepted as fact. It turns it into a difficult subject and makes me want to go back to something easy, such as astrophysics.

Fusion energy is still in the mix of promising new technologies for the future, and there have been some optimistic stories about the state of fusion research in the past few months. Fusion, of course, is really the source of all of the energy we call “renewable.” It’s all ultimately driven by solar radiation, but in the long term — by which I mean, billions of years — the sun’s fusion energy sources will also run out on us. Earth-bound fusion is not technically “renewable” either, but the available fuel supply is so huge that we can overlook its finitude, just as we ignore the Sun’s, if we can ever get it to work.

Of course, we have gotten one version of it to work, most famously by so thoroughly blasting apart a remote Pacific island that its name became embedded in a style of beach fashion. Fusion of hydrogen atoms to release energy requires generating very high temperatures and pressures, and the H-bomb, using an A-bomb for a “pump,” generates the highest, but only for the briefest of times. The H-bomb is designed to use up its fuel in less than a millionth of a second.



The earth-bound fusion power reactor, several styles of which we are trying to build, is designed to operate at a more leisurely pace. The fuel turnover rate is more on the order of milliseconds to seconds, in order to warm up and light up a city just enough to make it comfortable, and the temperatures and pressures required are a lot lower compared to the H-bomb. There is a whole spectrum of pressure and temperature settings at which fusion should be possible, at various rates, and there are some less mainstream projects that attempt to exploit other points along the scale.



It’s interesting to think about where the Sun fits into this. I have seen the sun described as a long-lasting H-bomb, and the heat and fury of it--all of those prominences and intense magnetic fields-- certainly makes it seem like a decent comparison. But as we’ve noted, the sun’s fuel will last billions of years, quintillions of times longer than an H-bomb’s. Though they both release energy by fusing hydrogen nuclei into heavier elements, in actuality they could hardly be more different.

Note: I would like to credit the eminent Prof. Carlson Chambliss, whose conversation with me in the South Mountain parking lot last year was part of the inspiration for this column. (Though not this next part.)

To understand what is really happening in the Sun, I propose that we think about what happens in warm-blooded animals here on Earth.

Consider a spherical black puppy in a vacuum

Jokes about spherical critters, making fun of how scientists like to simplify things, have been around for a while. I think the original one involved a physicist who offered to help a farmer optimize his livestock management, and came up with a formula that was only valid for spherical cows. *The Big Bang Theory* used a version of the joke with spherical chickens.

So let me now introduce Phydo the Physics Pooch. He is a cute little fella, of a unique breed that always takes the form of a perfect, featureless mathematical sphere. His radius is exactly 10 centimeters, and his coat is a uniform, dark, dull black- an idealized material invented by science and known as a "blackbody." Of course he is completely imaginary. I have made him up with these properties so that I can easily do certain calculations on him.

His surface area is 1,257 square centimeters and his volume is 4,189 cubic centimeters. In each cubic centimeter of his roly-poly form he converts 1/300 of a watt of energy into heat, having about the same metabolism (on a per-unit-volume basis) as a typical, somewhat active juvenile dog. The only way he has to get rid of that heat is by "blackbody radiation" of mostly infrared light from each square centimeter of his surface; and in the comfortable surroundings of a typical home, to do so he needs to maintain a body temperature of about 100°F, or 310°K, again about the same a real puppy. At that temperature and under those conditions, the infrared radiation he emits exceeds what he absorbs from the warm environment by just enough to carry away the heat that he produces.

$$j^* = \sigma T^4$$

The Stefan–Boltzmann Law gives the thermally radiated power per unit area from a blackbody, as a function of absolute temperature

Now we are going to do something that would be cruel if Phydo were an ordinary puppy. Out he goes, into the cold, hard vacuum of outer space, without even a nearby sun to keep him warm! Phydo doesn't mind because he is the product of my imagination and I designed him that way. But, keeping his rate of heat generation at the same total of 14W, his temperature now drops to 210°K, since there is now no incoming radiation to be absorbed. Trust me, Phydo doesn't mind, he is still quite comfortable and thrilled to be such a useful example in a physics "thought experiment."

Those young'uns need to grow up, that's a fact of life, so what happens to Phydo when he gets to be twice the size he is now? Let's assume his metabolism per unit volume stays the same, while his radius increases by a factor of 2. His volume, and therefore the total energy he produces, will increase by a factor of 8. But his surface area only increases by a factor of 4! So now, each square centimeter of his ideal black skin must radiate twice as much energy, and his temperature must increase, to 218°K. (That's all it takes because temperature is raised to the 4th power in the Stefan–Boltzmann blackbody radiation formula.)

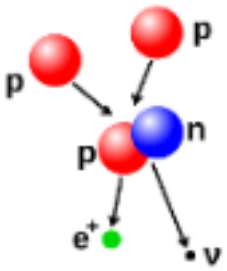
But now let's get back to the Sun. In this respect it has a lot in common with Phydo: it exists in a vacuum and only has one way to get rid of the energy it converts into heat. But the Sun has almost 7 billion times the radius of Phydo, and its volume has increased by a factor 7 billion times greater than the increase in its surface area. As a result, the Sun must run at a much higher temperature than our spherical puppy.

How much higher? If the Sun's metabolism, on a cubic-centimeter-by-cubic-centimeter basis, were the same as Phydo's, the amount of power released works would be 12,000 times as much as the real Sun's, and it would

need a temperature of over 60,000°K to radiate the energy into space. That is hotter than the hottest type-O blue stars.

But hold on; the energy of the sun is almost entirely generated in its core, which is maybe only 20% of the radius of the photosphere. Let's give our puppy-sun a break, and say that only the core has a puppy-level metabolism, whereas the entire photosphere can be used for radiating the energy. That drops the power output by a factor of well over 100 and drops the temperature by a lot-- to about 18,000°K-- a little over 3 times the temperature of the Sun! Now we have a blue-white star of spectral class B.

What's going on here? What will it take to get back to our actual, good old class-G2V Sun with its 5770°K photosphere that keeps us and our real puppies relatively comfortable here on Earth most of the time? It goes back to our discussion of the burn rate of different fusion reactors, from H-bombs down to the aspirational fusion power reactors, and continuing all the way down, down, down to the Sun. The Sun is a really poor fusion reactor. The pressure and temperature in the core of the Sun, as enormous as it is, actually isn't high enough to sustain hydrogen fusion! It only happens because physics, in the regime of quantum mechanics, offers a way to cheat, through a process known as "tunneling." There is an energy barrier, from the repulsion of like charges, that prevent two hydrogen nuclei from fusing together, and the energy of the particles in the Sun is not high enough to overcome it. It only happens at all because quantum mechanics allows tunneling through the barrier, instead of over it.



But only very rarely! And most of the time, when it does happen, the nuclei pop apart again into two separate hydrogens before releasing any energy. In order for them to stick, one of them must undergo β+-decay and turn into a neutron at the same time. Once this happens, a few other reactions occur relatively quickly, and then the energy is finally released, and a helium nucleus is created. An average hydrogen nucleus in the sun's core will spend billions of years, colliding with other protons a hundred billion times per second, before it "sticks" and becomes part of a helium.

So the Sun only gets as hot as it does because of its enormous size. The volume of hydrogen producing this energy--at even this incredibly low level--is so huge compared to the surface area that it requires the photosphere to take on the furious heat that we are familiar with to get rid of it.

Have you ever thought, maybe you could trade in your puppy for a little bucket of the sun's core to keep your lap warm instead? (Actually, neither have I.) But anyway, even if you could maintain solar-core conditions in a small, isolated container, the power generating capability of a bucket of Sun would be a big disappointment. You would get more satisfaction out of a bucket of wet leaves. The "metabolic rate" of the core of the Sun is only about the same as an active compost heap.

And our puppies, kittens, ferrets, horses and what have you? On a cubic-centimeter-by-cubic-centimeter basis, we--and our mammalian companions--burn, literally, with the heat of 10,000 suns. How's that for a happy thought to end on. Ad Astra!

— Rich Hogg

Minutes for the LVAAS General Meeting of 12 June 2016

The June General Meeting was held at the LVAAS South Mountain headquarters in Allentown, PA. The meeting was called to order at 7:00 PM by Director Rich Hogg.

Assistant Director Sandy Mesics introduced member and Society Secretary Ron Kunkel, who gave a presentation on gravitational waves. Ron explained the differences between Newtonian gravity and Einstein's General Relativity. Next, he discussed the various tests of General Relativity and the properties of gravitational waves, followed by a description of the LIGO detectors, and the actual gravitational wave signal detected. He closed his presentation with a discussion of the significance of the detection of gravitational waves. Judging from the large number of questions asked, the presentation was very well received.

Following a break at about 8:30 PM, Director Rich Hogg regrouped the membership to conduct the usual information session-type meeting. He announced that he had appointed Eric Loch, former LVAAS Secretary, to serve as Director of Public Relations.

Rich then called on Treasurer Scott Fowler for a brief financial report. Scott reported that income for the year was ahead of budget and expenses were a bit under budget. With these positive trends the projected budget deficit for the year could be lower than originally expected.
Rich then called on Membership Directors Don and Estelle Hines for their report. Don Hines held second readings for Kathleen Borger, Roy Borger, Lezheng Fang (Lef), Steve Favorito, and Jacqueline Olexa. A first reading was held for Somesh Rahul.

Rich then reminded the membership that the July General Meeting--our annual picnic--would be held Saturday, July 9th at 5:00 PM at South Mountain; and that the August General Meeting would be Saturday, Aug 13th at 7:00 PM at Pulpit Rock. Programs Director, Sandy Mesics mentioned that the speaker for July would be Jason Kendall and for August, Gary Honis.

Lastly Carol Kiely, Education Director and Star Party Coordinator, announced that she and Fred Bomberger would be conducting sessions on how to run the planetarium projector for anyone interested.

The meeting adjourned at 8:50 PM.

Minutes prepared and submitted by Ron Kunkel, Secretary.

Library Announcement

Annual Inventory

All books, videos and CDs are due back to the library by July 31, 2016 for the annual inventory. The library will be closed from August 1 to the middle of August for the inventory. If I am not present, please put the returned library materials on the desk in the library. Sorry for the inconvenience and thanks.

Used/like new books for sale

Do you want to have some summer reading while you are on vacation or sitting by your door waiting to run outside to get those astroimages when the clouds and haze clears? Well, the Red Shift has used and like-new books for sale starting at around $3.00 a book. Drop by to browse and support the library and LVAAS.

New books to the library

Sojourner (Mars Rover)
The Ultimate Guide to Stars and Planets
The Little Guides (revised edition)
Curiosity (Mars Rover)
Smithsonian Guides: Planets
The Astronomy Bible
The Interstellar Age
Mission to Mars
Flying Saucers & Science
Constellations
Neutrino Hunters
The Asteroid Threat
Our Sun

New DVDs to the library

Dr. Kevin Lumen: The Search for Planet X
NOVA: Inside Einstein's Mind
American Experience: Spacemen
Ron Kunkel: Gravitational Waves

Submitted by Dave Raker, LVAAS Librarian

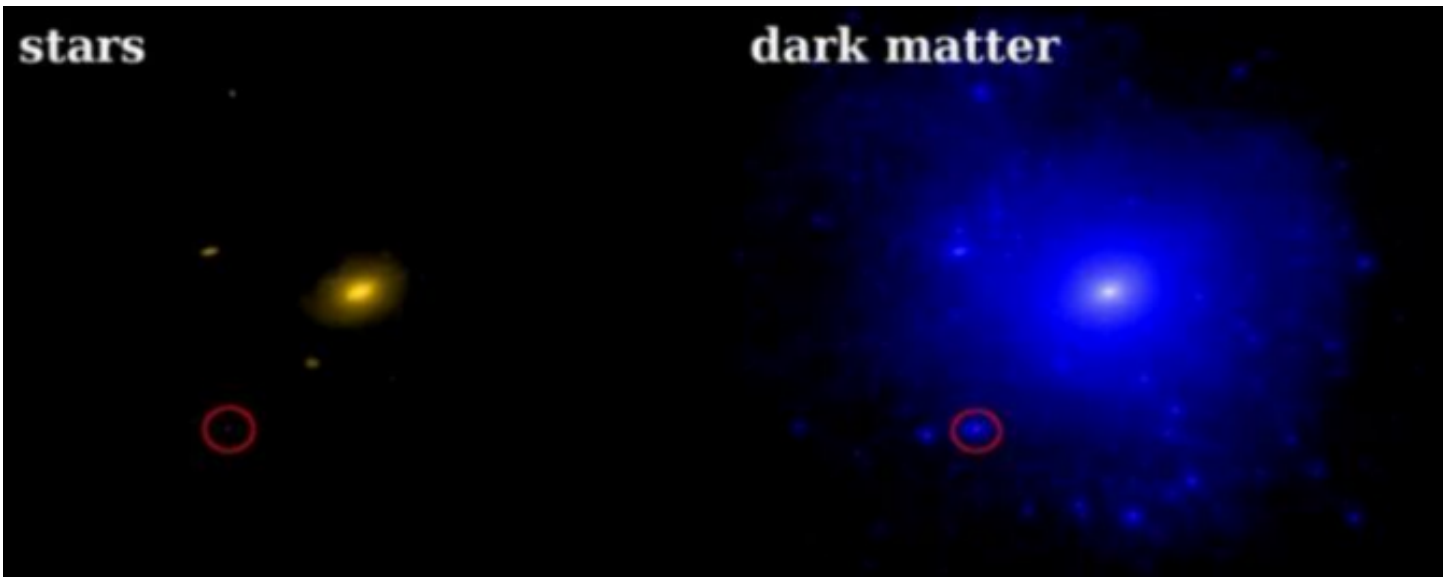
Ron's Ramblings

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.

Dark Matter Dominated Nearby Dwarf Galaxy

Dark matter is called "dark" for a very good reason. Dark matter particles are elusive. Their existence is inferred by their gravitational influence in galaxies. And although dark matter particles outweigh particles of regular matter by more than a factor of 5, no one has ever directly observed signals from dark matter. November of 2015 was the announced discovery of a dwarf galaxy -- Triangulum II -- with the highest concentration of dark matter of any known galaxy; and it may be a candidate for directly detecting a dark matter signal.

Triangulum II is small, faint galaxy at the edge of the Milky Way. It is made up of only about 1,000 stars, has the luminosity of about 450 Suns, and only six of its stars -- ones that are whipping around the center of the galaxy -- are luminous enough to be seen with the giant 10 meter mirrors of the Keck Telescopes. By measuring the velocity of these stars, astronomer Evan Kirby of Caltech was able to infer the gravitational force exerted on the stars, and thereby determine the total mass of the galaxy. The total solar mass to solar luminosity ratio is an astounding 3600. The ratio of dark matter to luminous matter is thus the highest of any galaxy ever observed.



The red circle models the Triangulum II in star light and the predicted density of dark matter.

This extremely high dark matter content is one reason Triangulum II is an excellent target for detecting dark matter. Astronomers are looking to detect dark matter by looking for an annihilation signal -- gamma rays -- that occurs when two dark matter particles collide and self destruct. Additionally, because Triangulum II has so few stars, it is referred to as a very 'quiet' galaxy. It therefore lacks the gas and dust necessary to form stars, particularly pulsars which also produce gamma rays which would interfere with the detection of the dark matter annihilations.

Thus Triangulum II is an excellent candidate for directly detecting the signature of dark matter particles. This is of course true if Kirby's inferred mass of the galaxy is correct. However, not all astronomers agree that Kirby has measured the total mass of Triangulum II by measuring the velocities of the six stars near its center.

Another group, led by researchers from the University of Strasbourg in France, measured the velocities of stars just outside Triangulum II and found that they are actually moving faster than the stars closer into the galaxy's center, which is the the opposite of what's expected. This could suggest that the little galaxy is being pulled apart, or "tidally disrupted," by the Milky Way's gravity, in which case Kirby's calculated mass of the galaxy may be inaccurate.

Bottom line: Astronomer Evan Kirby at Caltech measured the velocities of six stars in the nearby dwarf galaxy Triangulum II. This measurement let them infer the mass of the galaxy, which has only 1,000 visible stars. The surprising result was that Triangulum II may have the highest concentration of dark matter of any known galaxy. It may be a long sought-after dark matter galaxy -- one which is mostly dark matter with few visible stars -- or is there another explanation?

References:

https://www.caltech.edu/news/dark-matter-dominates-nearby-dwarf-galaxy-48790
http://earthsky.org/space/a-nearby-dark-matter-galaxy-triangulum-ii
https://en.wikipedia.org/wiki/Triangulum_II

The end of my ramblings until next month. Ron Kunkel

The Orion Nebula, M42 (right) and the Running Man Nebula, NGC 1973/5/7 (left), imaged on February 29, 2016. Astro-Tech AT111EDT scope, SBIG 8300C camera, Lodestar X2 with PHD2 guiding, iOptron CEM-60 mount. 30 X 2-minute frames for one hour total integration, aligned, stacked and pre-processed in Nebulosity4, Photoshop CC process. David M. Moll photo©.

LVAAS Astroimaging Calendar 2017

Thanks again to all the photographers who submitted content for the 2016 LVAAS calendar. Alpha Graphics did a fine job with the print quality, producing images that maintained the integrity of the photographers' art. We also want to thank all the astronomy enthusiasts who purchased a copy to support the club. We sold about ninety copies out of the one hundred that were ordered. Congratulations to everyone who contributed their time and talent to make this project a success.

It's that time of year again to start thinking about a 2017 edition. Despite the bad weather, I've seen some wonderful images produced so far this year. We'll hope 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 meeting at South Mountain is on summer hiatus, with meetings set to resume on September 15th at 7:00 p.m. Meeting highlights included presentations by LVAAS calendar contributors: Steve Walters shared his expertise in a DSLR astrophotography presentation; Simon Porter demonstrated his planetary imaging methods and donated his power-point presentation on Planetary Imaging; Lynn Kryzan brought his homemade cable-control system for an educational show and tell; Steve Altomare gave us a look at his imaging train setup and his 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.) Mike Tapper presented several Adobe Photoshop astro-photography videos that include an Adam Block tutorial from his private collection. Feel free to join in with your expertise and/or questions. 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

Living in the Matrix

Isaac Asimov's short story, ***The Last* Question**, poses the query whether entropy -- the wearing down of a system (in this case the universe) -- could be reversed. The story begins in 2061, but spans trillions of years as humanity expands into the cosmos, eventually populating it in its entirety.

During the seven segments of the story, an "automatic computer" continues to reinvent itself, assuming more and more responsibility for the regions of space into which humankind has advanced. With each reinvention, the computer grows smaller and more powerful until in the end, it becomes the consciousness of the universe, joining as one the minds of all humanity stretched across the vastness of space and time. In each segment of the narrative the computer is asked, "Can entropy be reversed?" After trillions of years of analysis, the computer finalizes an answer which is both shocking and yet benign in every aspect. Read ***The Last Question*** at http://www.physics.princeton.edu/ph115/LQ.pdf to find out.

Related to Asimov's story is the query of whether our universe is, in reality, a computer simulation. It was the topic of the 17th Annual Isaac Asimov Panel Debate (Google this) held on April 5 at the American Museum of Natural History in NYC. The group included three theoretical physicists, a cosmologist, a philosopher, and host, Neil deGrasse Tyson. During the discussions, members described the successes that we have achieved in our attempts to model quarks, the building blocks of matter/energy in the universe, and cosmic rays. If the universe is completely quantifiable, then with a computer large enough, we should be able to simulate it. Like computer programs, glitches occur and the universe is no stranger to these. It defied the laws of nature just after its creation, allowing for the formation of hydrogen and helium that eventually evolved into sentient beings as well as its brief expansion faster than the speed of light. In the end, the panel -- except for Tyson -- felt strongly about the premise that the matrix was not for us.

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Moravian College Astronomy - astronomy.org

From the LVAAS Archives:

The Ursa Major Astronomical Society

By Sandy Mesics

Postwar baby boomers were becoming teenagers in 1966. Many of them were interested in astronomy because of space exploration and the race to the moon. LVAAS started to see an influx of junior members: in 1966 LVAAS had a membership of 79. Of these, there were 26 junior members and 53 senior members. And of the 53 senior members, at least 5 were in their early 20's. It wouldn't be long before the younger members began to organize. The result was the Ursa Major Astronomical Society (UMAS).

Early UMAS presentation at South Mountain

The true origins of the UMAS are lost in the mists of time, but surviving documents and testimony of those who remember reveal that the decision to found this group was made during a field meet at the Robson house in Kempton, PA in the late summer of 1964. The original members, sometimes referred to as “the founding fathers” were Robert Robson, Curtis Rinsland, John Flory, and Arthur Fox. Limited by lack of membership and funds, as well as a stubborn refusal by LVAAS to grant them recognition, at this time the organization set quite modest goals. A newsletter, “The Messenger of the Skies,” was begun under the editorship of Curtis Rinsland. Small observing parties were held, usually in conjunction with the senior meets.

The UMAS finally achieved recognition by LVAAS in 1966, and was allowed to use the South Mountain Headquarters for their meetings, which usually immediately preceded the monthly LVAAS meetings. The UMAS held its first meeting on May 1, 1966. Bobby Robson was director, Curt Rinsland secretary-treasurer, and Jeff Schaffer the assistant director. The aim of the UMAS was to get the juniors of the LVAAS together and active. Nine members attended the meeting, which featured the demonstration of a Questar telescope by Paul Shenkle. Paul was the advisor to the fledgling group, and at the time was also a Questar employee. At that meeting, the group also viewed a movie about the new communications satellite, Telstar.A.

UMAS members inspect mount for their 10 inch scope: L to R: Stan Wilkes, Curt Rinsland, Jeff Shafer, Paul Shenkle. Note the "monitor" fridge for sodas.

In 1966, an influx of new members, together with official recognition by the LVAAS, sparked an upturn in the fortunes of the UMAS. Individual observational projects, such as Gary A. Becker’s program of meteor observing and Jeff Shafer’s deep sky program became society projects. A fund drive was initiated and the money gained thereby was channeled into a special Pulpit Rock construction fund for

a proposed observatory. The Messenger of the Skies was revamped and expanded and additional contacts were made with other junior societies around the nation. By 1967, the UMAS had 27 members, and about 17 of these members attended meetings on a regular basis.

By far the most ambitious project undertaken by the UMAS in the early years was to persuade the Astronomical League to organize a junior section. This campaign was begun in cooperation with the Dallas and Miami juniors at the Astronomical League convention in 1966. This effort bore fruit at the 1967 Washington AL convention when a large block of time was allotted to presentations by young astronomers and meetings of junior astronomical societies.

The Arthur Fox Observatory at Pulpit Rock. Note the Schlegel-McHugh Observatory in the background.

The UMAS also undertook a project to construct an observatory at LVAAS's new Pulpit Rock site. The observatory would be a 10-foot square roll-off observatory housing a 10-inch f/4.5 Newtonian reflector, with a wooden tube and optical window. Over 400 letters were sent to business leaders in the Lehigh

Valley to solicit support for this project. Considerable support was forthcoming from Phillip Berman, who at the time operated 18 trucking companies, including Berman Leasing Co. of Pennsburg, and was vice president of five others. He eventually went on to purchase Hess's Department store in 1968. LVAAS member Ernie Robson contributed considerably, and Paul Shenkle supplied most of the materials.

It was then decided to name the observatory after founding member Arthur Fox, who had been killed by a motorist while walking near his home. Stan Wilkes designed the wooden observatory and Jeff Shaffer ground the mirror. The tube, mount, etc. were all scrounged up. All the supplies were delivered to Stan's home, where the group began the pre-fab job. This took a good part of the summer of 1968. The parts were numbered then moved to Pulpit Rock via Jones Trucking Co., who donated their services. Construction finally began in late summer of 1968. The observatory was the first new facility built at Pulpit Rock after LVAAS acquired the site.

At about this time the UMAS was probably the best junior group in the country, unrivaled only by the Junior Texas Astronomical Society. The group received considerable publicity in the Review of Popular Astronomy.

The Emmaus station and its 12½-inch reflector used by the members of the Ursa Major Astronomical Society, one of the junior societies of the Astronomical League whose activities are described on the following pages. Photo by Gary Becker, UMAS.

JUNIOR ACTIVITY IN THE ASTRONOMICAL LEAGUE

By David Gordo

The Aug.-Sept. issue of *Review of Popular Astronomy* featured the UMAS.

However, by 1978 many of the younger members had gone off to colleges and careers. At this time, UMAS membership had dwindled to 13. In an attempt to revitalize the group, the UMAS met on January 30, 1978 to organize an Explorer Post. At that time more than 2000 individuals aged 15 to 20 participated in 70 Explorer Posts in the Lehigh Valley, and invitations were sent out to over 400 scouts who expressed an interest in astronomy. The first meeting was held on January 27, with over 100 persons attending. At that meeting it was decided that members of the “old” UMAS would now be members of the Ursa Major Explorer Post (UMEP). The group held two meetings a month, one for observing, and one for business.

However, this success was short-lived. In June 1979, the explorer charter expired, and the LVAAS Board of Governors disaffiliated LVAAS from the Explorer Group Program and disbanded the UMEP. This decision was made because of a steady decline in interest and membership, which had now declined to six members. The Board anticipated that a new junior group would form, independent of any outside agencies. The juniors started by reorganizing their constitution. In September, UMAS Director Randy Plessor informed LVAAS membership that there were currently only three active UMAS members. By October 1979, the juniors were no longer meeting on a regular basis.

In April, 1980, in another attempt to revive UMAS, the first meeting of the new UMAS was held, but only five members were in attendance. The group discussed getting back on its feet, and repairing the Arthur Fox Observatory. Meetings continued into January 1981, but after that, the group fizzled again. There was another attempt to revive the group in 1981, and still again in 1990, but these attempts were unsuccessful. In 1996, LVAAS formed an Astronomy Explorer post, and about 29 individuals participated. Under the leadership of Glenn and Martie Bachman, and then Scott Fowler, this post continued until September 2010. There has been no attempt to revive a junior group since then.
The Fox Observatory outlived the UMAS, but in the summer of 1989, after twenty years of service, the wooden structure, having suffered repeated vandalism, and suffering from a lack of upkeep, was leveled.

Demographic evidence shows that amateur astronomy is “graying.” No doubt many of the former UMAS members are still amateur astronomers. To be sure, young people are not embracing the hobby as they did in the 1950s and 1960s. Generation Xers and Millennials don’t feel the need to join astronomy clubs, at least in the traditional sense, and it’s too early to tell what Generation Z kids will do. However, without a doubt, in its short 15 year history the UMAS was instrumental in the personal, intellectual, and professional development of many fine individuals.

Highlights of the July Sky

(and a little lunacy)

by

Carol Kiely

In Carol's absence, please read the following tribute to the many fine astronomers of LVAAS who routinely take the time necessary to guide those who are less experienced on their journey through the stars. Carol is LVAAS's Education Chair . This letter is addressed to Assistant Director Sandy Mesics. Then, please find **highlights of the July sky** courtesy of Gary A. Becker: http://astronomy.org/StarWatch/July/index-7-16.html

"Sandy,

I just wanted to send you an email thanking you and really everyone in the club who has helped me, a new member, feel so welcome there.

I am generally not a joiner of clubs, and because of that, I have struggled on my own to try to understand some of the deeper things in astronomy for a number of years, wrestling my 8” Dob around in my light polluted backyard. Websites and magazine articles are great but they can’t help you when you’re alone in the dark fiddling with your scope and have questions. After deciding late last year to combine my 30+ year interest in photography with astronomy resulting in some very feeble early attempts at astrophotography, I realized that *now* was the time to seek deeper wisdom on all the minutia required in order to take passable photos with minimalist equipment. Mike Tapper and the Astro-imaging group meetings have been helpful and very informative.

The Lunatics and Stargazers event that I went to was also excellent, with lots of people willing to help someone new and answer my many questions. Carol has a real gift for planetarium shows and just general ease out under the stars when dealing with a beginner. The polar alignment “lesson” that I got was worth the trip alone. I also had an opportunity to see some of the best views of Jupiter that I have yet seen through a small scope. We even glimpsed the ISS pass over when a club member got an alert on their phone. A memorable evening!

I really look forward to getting out to Pulpit Rock at some point, maybe camping with my wife there. We would both love to get to Cherry Springs eventually. Thanks for helping to make the night skies much less frustrating.

Steve Magditch

Nazareth"

YORK COUNTY STAR PARTY 2016

Shreveport North Airport
380 Kralltown Road
Wellsville, PA

July 27-31, 2016 Help us celebrate our 1ST year!

http://www.yorkcountystarparty.org

Many people have attended a star party at this site for many years.
Same location, same volunteers, same chairperson, just a new name.
It is all geared for a fun and relaxing time for the entire family.
Some of the events and activities are listed here below:

A dark site, 2,600 foot grass runway, camping,
bathrooms with flush toilets, showers, and hot water,
event speakers, raffle prizes, and vendors

The Busy Bee Food Vendor will be on site during the entire party!

The horizon is extremely flat, stars are visible at less than 10 degrees above the horizon, the night is fairly dark, and the Milky Way is easily visible.

For complete information and registration/T-shirt orders, more photos, please go to: **http://www.yorkcountystarparty.org**

Hubble's Bubble Lights Up The Interstellar Rubble

by Ethan Siegel

When isolated stars like our Sun reach the end of their lives, they're expected to blow off their outer layers in a roughly spherical configuration: a planetary nebula. But the most spectacular bubbles don't come from gas and plasma getting expelled into otherwise empty space, but from young, hot stars whose radiation pushes against the gaseous nebulae in which they were born. While most of our Sun's energy is found in the visible part of the spectrum, more massive stars burn at hotter temperatures, producing more ionizing, ultraviolet light, and also at higher luminosities. A star some 40-45 times the mass of the Sun, for example, might emit energy at a rate hundreds of thousands of times greater than our own star.

The Bubble Nebula, discovered in 1787 by William Herschel, is perhaps the classic example of this phenomenon. At a distance of 7,100 light years away in the constellation of Cassiopeia, a molecular gas cloud is actively forming stars, including the massive Oclass star BD+60 2522, which itself is a magnitude +8.7 star, despite its great distance and its presence in a dusty region of space. Shining with a temperature of 37,500 K and a luminosity nearly 400,000 times that of our Sun, it ionizes and evaporates off all the molecular material within a sphere 7 light years in diameter. The bubble structure itself, when viewed from a dark sky location, can be seen through an amateur telescope with an aperture as small as 8" (20 cm).

As viewed by Hubble, the thickness of the bubble wall is both apparent and spectacular. A star as massive as the one creating this bubble emits stellar winds at approximately 1700 km/s, or 0.6% the speed of light. As those winds slam into the material in the interstellar medium, they push it outwards. The bubble itself appears off-center from the star due to the asymmetry of the surrounding interstellar medium, with a greater density of cold gas on the "short" side than on the longer one. The blue color is due to the emission from partially ionized oxygen atoms, while the cooler-yellow color highlights the dual presence of hydrogen (red) and nitrogen (green).

The star itself at the core of the nebula is currently fusing helium at its center. It is expected to live only another 10 million years or so before dying in a spectacular Type II supernova explosion.

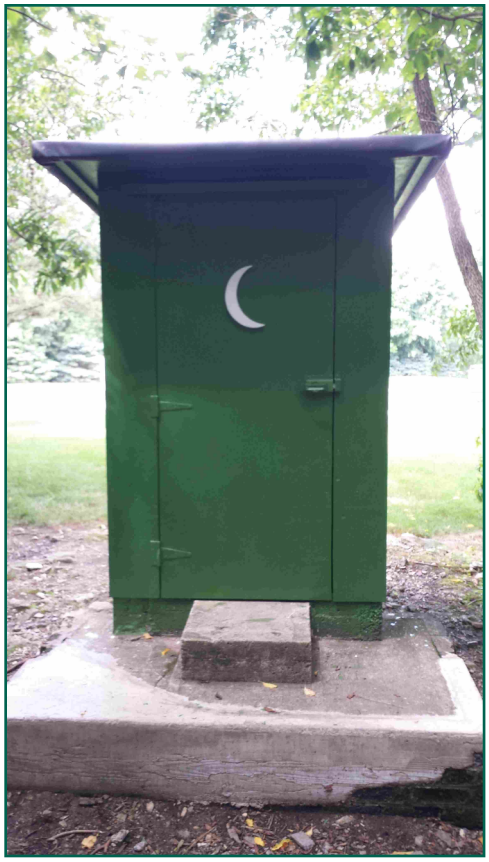
Image credit: NASA, ESA, and the Hubble Heritage Team (STScI/AURA), of the Bubble Nebula as imaged 229 years after its discovery by William Herschel.

What's Happening at Pulpit Rock

Our observatories and grounds at Pulpit Rock and South Mountain require regular maintenance, and many renovations are currently being planned. Members who are willing to devote some time and energy to help keep our facilities in top working condition, please watch this space for updates on work in progress or being planned. Per ardua ad astra!

Newly Renovated 'Green Observatory'

"Previously (like last summer) Frank (Lyter) and I rebuilt the walls, made a new door, and installed a totally new roof. We then primed it and it was that way over winter. Then this past Saturday the Boy Scouts painted it green. And then of course today I finished the rehab of the building with the new seat and crescent moons. This rehab is now done with the possible exception of a coat of white paint on the interior." - Ron Kunkel



Cosmic Chuckles

moderated by

Dave Moll

An astronomer is on an expedition to Africa to observe a total eclipse of the sun which will only be observable there, when he's captured by cannibals. The eclipse is due the next day around noon. To gain his freedom he plans to pose as a god and threaten to extinguish the sun if he's not released, but the timing has to be just right. So, in the few words of the cannibals' tongue that he knows, he asks his guard what time they plan to kill him.

The guard answers, "Tradition has it that captives are to be killed when the sun reaches the highest point in the sky on the day after their capture, so that they may be cooked and ready to be served for the evening meal."

"Great!" the astronomer thinks.

The guard continues, "But because everyone is so excited about it, we're going to wait in your case until after the eclipse."

* * * *

—* *

The New York Times, among other papers, recently published a new Hubble photograph of distant galaxies colliding. Of course, astronomers have had pictures of colliding galaxies for quite some time now, but with the vastly improved resolution provided by the Hubble Space Telescope, you can actually see lawyers rushing to the scene.

NASA just disclosed details why the Rover wouldn't accept any commands. They took a picture of the Rover's built-in display which showed a Windows screen and the text, "press any key to continue."

Have an astronomy-inspired joke or cartoon you'd like to share ? Send it along to Dave, Polaris41N@outlook.com *or to the Observer editor* editorlvaas@gmail.com. *Interested in doing illustrations for this section? Contact* editorlvaas@gmail.com.

Oh, Snap!

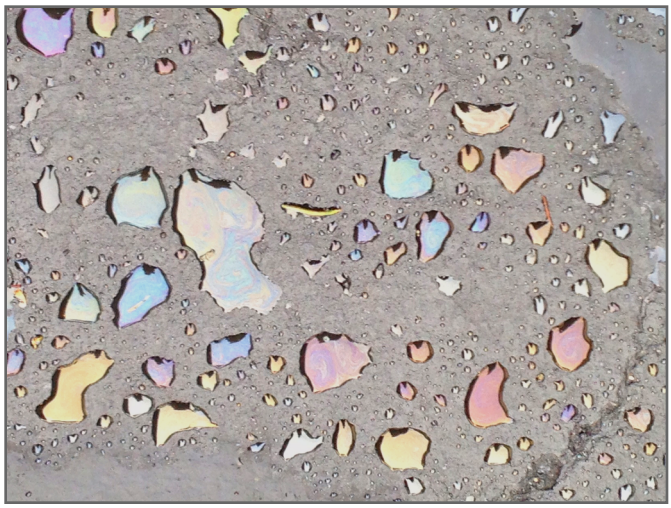
Reflections

Sunset colors above, and below, sunlight mirrored in tiny puddles...

Sunset June 18 2016
as the summer
solstice approaches.

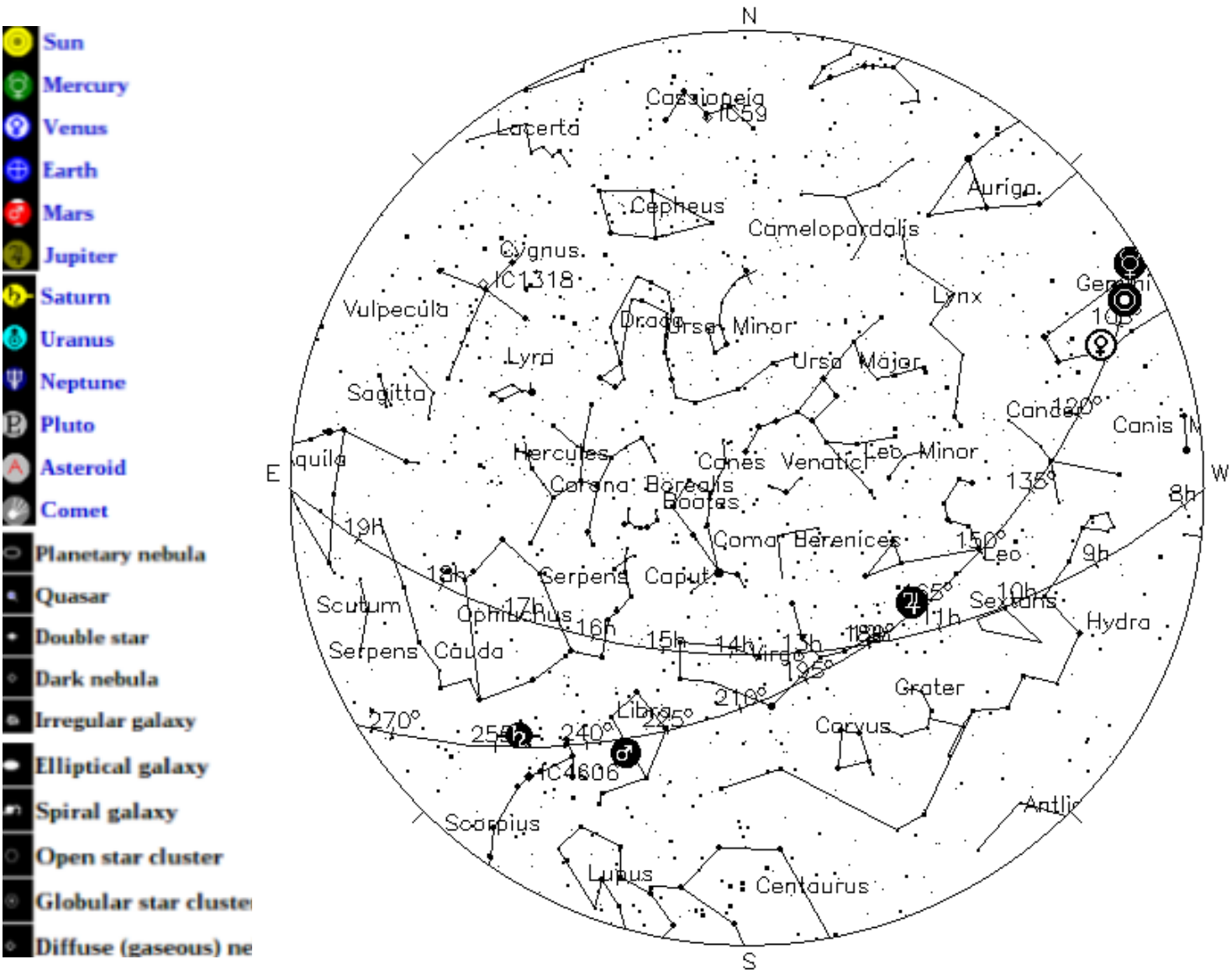
Bethlehem, PA

~ Sunlight Jigsaw ~
Water and Oil on Macadam



Oh, Snap! is a monthly feature of LVAAS members' celestial photographs which are generously shared for the enjoyment of our readers. Kindly submit your photos (or videos) to editorlvaas@gmail.com

Sky above 40°33'58"N 75°26'5"W at Sun 2016 July 3 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-date calendar information

JULY 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					01	02
03	04 New Moon	05	06	07	08	09 General Meeting/Picnic - 5:00 PM South Mountain
10	11 First Quarter Moon	12	13	14	15	16 Star Party
17	18	19 Full Moon	20	21	22	23
24	25	26 Last Quarter Moon	27	28	29	30
31 LVAAS Board of Governors Meeting						

AUGUST 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	01	02 New Moon	03	04	05	06 Star Party
07	08	09	10 First Quarter Moon	11	12	13 General Meeting 7:00 PM Pulpit Rock
14	15	16	17	18 Full Moon	19	20
21	22	23	24 Last Quarter Moon	25	26	27
28 LVAAS Board of Governors Meeting	29	30	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 member contact changes or corrections, please email LVAAS Membership Chairpersons Don and Estelle Hines at waterdoc@ptd.net Please visit our website www.lvaas.org for more information.