SkyWAAtch

The Newsletter of Westchester Amateur Astronomers

June 2022

The While, The Pup and The Crowbar by Olivier Prache

These three galaxies are members of the NGC 4631 group, a collection of galaxies in Canes Venatici (where these three are located) and Coma Berenices. They lie about 25 million light-years from us. The brightest (mag 9.2) is spiral galaxy NGC 4631 itself, often called the Whale, with the companion mag 12.4 dwarf elliptical NGC 4627 (celled the Pup) just above it. To the lower left is NGC 4656, the Crowbar or Hockey Stick, another spiral, magnitude 10.5. The bright knot at the left tip of this galaxy is actually another galaxy, NGC 4657.

WAA June Meeting

Friday, June 10 at 7:30 pm

Live at David Pecker Conference Room, Willcox Hall, Pace University, Pleasantville, or On-line via Zoom

Urban Astrophotography Update

Mauri Rosenthal

Westchester Amateur Astronomers and Amateur Astronomy Association (NYC)

Mauri will discuss

- Living with Light Pollution: Perspectives from several years of doing and teaching urban astrophotography
- Catalogue of targets accessible from the NY metropolitan area without traveling to darker skies
- Updates regarding gear that makes this easier than ever
- Solar imaging update – also easier than ever and the sun is going nuts
- Bonus -- Good times for aurora chasers (albeit not in the metro area!)
- Everyday AI – ways in which cheap and readily available Artificial Intelligence is benefitting backyard imagers

Mauri combined longstanding hobbies of backyard astronomy and photography to begin astrophotography in earnest eight years ago. Surprised by the image quality achievable with small telescopes from his yard in Westchester, Mauri has been developing deep expertise in "Ultraportable Urban Astrophotography" and is on a mission to use new technology to extend the access of city-dwellers to the wonders of the night sky. Mauri has played a central role in developing and teaching New York City's Amateur Astronomers Association courses in astrophotography which have helped dozens of city dwellers to get started in imaging. Follow Mauri's imaging on Instagram and Flickr.

Check the WAA web site for the Zoom link.

> Call: **1-877-456-5778** (toll free) for announcements, weather cancellations, or questions. Also, don't forget to visit the WAA website.

WAA July Meeting (?)

Date, time and speaker to be announced.

We have traditionally not met in July and August, but members are eager to get together, so if the stars are aligned and the virus cooperates, we'll do it. We'll send eblasts to members as our program develops.

Starway to Heaven

Ward Pound Ridge Reservation, Cross River, NY

June 25, rain/cloud date July 2

New Members

Ramon Blandino	Yorktown Heights
Tom Morrissey	Pelham
Amanda Pollina	North Salem
Charles Scheinberg	White Plains
Katherine Troche	Elmhurst

Renewing Members

Paul Alimena	Rye
Satchi Anderson	Tuckahoe
Christopher Bruno	Cortlandt Manor
John Benfatti	Bronx
David Butler	Mohegan Lake
Donna Cincotta	Yonkers
Frank and Kathy Clemens	Larchmont
Jim Cobb	Tarrytown
Howard Fink	New York
Jeff Gershgorn	Wappingers Falls
Charlie Gibson	Scarsdale
Jon Gumowitz	White Plains
Nicole Heselton	White Plains
Frank Jones	New Rochelle
Arumugam Manoharan	Yonkers
Julia Marrinan	Stamford
Satya Nitta	Cross River
Anthony Ortega	Scarsdale
John Paladini	Mahopac
Charles Pevsner	Riverside
Deidre Raver	Mahopac
Daniel Rosenthal	New York
Neil Roth	Somers
William Sawicki	Bronx
Karen Seiter	Larchmont
James Sweeney	Larchmont
Ernest Wieting	Cortlandt Manor
Alexandr Zaytsev	Holtsville

ALMANAC For June 2022
Bob Kelly, WAA VP for Field Events

Bob Kelly | 1Q June 7 | Full June 14 | 3Q June 20 | New June 28

Band of Bright Planets

Our collection of four bright planets in the morning sky will become five when **Mercury** struggles out of the solar glare in the second half of June. When all five are visible, they are in order of distance from the Sun, in life and in our sky. We'll see Mercury closest to the horizon and **Saturn** furthest into the early morning darkness. When the **Moon** drops between **Venus** and **Mars**, on the 23rd through the 25th, the order of the brightest solar system objects will be perfectly like their order in the solar system from the **Sun**.

In the southern hemisphere, the Sun is moving toward their winter solstice, so this array will appear to stand up straighter in their skies than in ours. Plus, they don't have get up as early as we do to see it! Sigh.

Lunar Pointer

The Moon will act as a pointer from our point of view for each of the bright planets in the morning – next to Saturn on the 18th, Jupiter on the 21st, Mars on the 22nd, Venus on the 26th, and finally, Mercury on the 27th. This would be a great time to take a snapshot of each planet through a telescope to compare their size and surface brightness.

Oh, So Early in the Morning

This collection will be low in our pre-dawn skies – get up well before the earliest sunrise of the year

(5:22 a.m. on June 14th) to see the fainter members of the bright planet club. Earliest twilight for the year starts at 3:15 a.m. on the 17th.

Mercury is only magnitude +0.5 at its greatest elongation on the 16th. It gets a bit brighter as it gets lower in the sky during this appearance.

Saturn will be rising about 11 p.m. EDT. It's nearly up all night on August 13, when it's at opposition to the Sun. Saturn is near its largest apparent size for the year, so it's a good time to start observing its subtle atmospheric bands. Its rings are tilted 12.3 degrees from edge on, the least amount of tilt in 2022.

Fainter Brethren

Neptune and **Uranus** are also in the morning sky. Neptune will be to the right of Jupiter and Uranus between Venus and Mars. They are lined up 'out of order', but you can't have everything! Even Pluto is in the area, although it's not within reach of most amateur scopes. Minor planet Vesta, magnitude +6.8, will be about two Moon-widths above the Moon on the 19th.

What's up in the Evening?

No planets for our viewing in the evening. That will change in the fall. We still have the dusty, starry Milky Way low in the sky, opening up our sky to view more distant galaxies. Sorta like riding in the car with the top down.
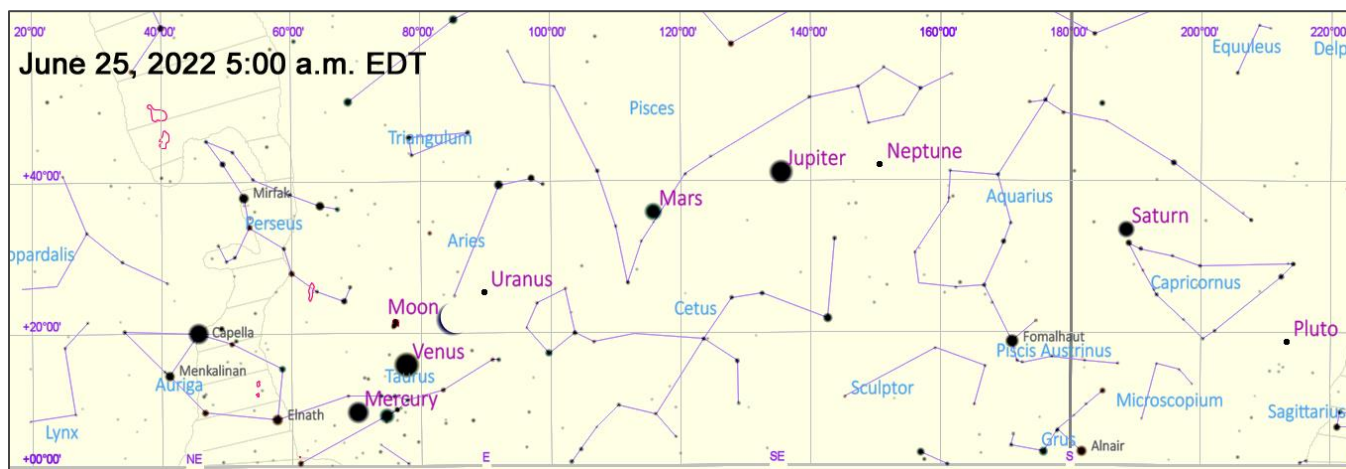
Comets – Any we can really see?

C/2017 PANSTARRS is drifting through Ophiuchus in the late evening sky. It may get to magnitude +9 this month. Its closest approach to the Sun will be in December, when it will be a Southern Hemisphere object. It's not close to us, about 175 million miles away, but Earth's and PANSTARRS' motions are closing the gap a bit, accounting for a slight increase in brightness.

ISS Sightings

After May's plethora of **International Space Station** sightings, we have very few at night in June. The ISS is visible in our area in the evenings through the 3rd and the mornings from the 24th onward.

Hide and Seek

The nearly full Moon covers the magnitude +2.3 star Dschubba in Scorpius between 10 and 11 p.m. EDT on the 12th. The brightness of the almost full Moon will make this somewhat hard to see visually. See how close Dschubba gets to the Moon while you can still spot it without aid. Use a telescope for the occultation itself.

Sun Stop

The summer solstice is June 21st at 5:14 a.m. EDT. Latest sunset is 8:31 p.m. on the 27th; latest end of twilight is 10:39 p.m. on the 24th.

The WAA Picnic, May 22

About 40 club members, some with family, came to the annual club picnic on May 22 at Pavilion 1 in Croton Point Park. Eva and Erik Anderson went far above and beyond to organize the event and supply food, drink, utensils and even a water cooler that could also dispense hot water for tea. The annual astronomy trivia contest had some challenging questions (Do you know what Toyohiro Akiyama did in 1990 to merit inclusion in an astronomy trivia quiz? Can you name all seven of the Mercury astronauts?) If you missed it, come next year!

"My Astronomically Bad Cartoons"   Eli Goldfine

Eli Goldfine, WAA's youngest member, is a budding cartoonist as well as amateur astronomer. We already detect an appreciation for the surreal in his young mind. He seems to have grasped the deepest question in astronomy: are Eva Andersen's cookies more attention-grabbing than even a great lecture? Eli says his main creative model is the New Yorker cartoonist Roz Chast. See Eli's profile in the March 2022 SkyWAAtch.—Ed.

There are astronomers everywhere!

On May 13th, Larry and Elyse Faltz were in Bologna, Italy. In the city's main square, the Piazza Maggiore, they encountered two amateur astronomers showing the Moon to curious passersby.

The church is the enormous Basilica of San Petronio, the fifth-largest church in Italy (not counting St. Peter's, since the Vatican is officially not Italy). It houses a 65-meter long meridian line installed in 1655 by Giovanni Domenico Cassini. This is the longest meridian line in the world. Cassini used it to determine the obliquity of the ecliptic and exact the length of the year, as well as to demonstrate Kepler's laws of planetary motion.

More Movie Telescopes: Spyglasses

Among the more dreadful movies we watched during the pandemic was *Cowboys and Aliens*. Even the combination of Daniel Craig and Harrison Ford couldn't make this conceptually ridiculous film exciting. If you really want to see an unusual confrontation of Earth people and extraterrestrials, I suggest the hilarious 10-episode Japanese series *Businessmen Versus Aliens*. It was on Amazon Prime some time ago but lately has not been available for streaming. A great send-up of this genre and a clever exposé of the Japanese character. See it if it comes around again!

Much more entertaining was the very stylish *The Mummy Returns* with Rachel Weisz and Brendon Fraser, seen here peering into the distance where, of course, more trouble awaits.

Deep Sky Object of the Month: NGC 4236

NGC 4236	
Constellation	Draco
Object type	Galaxy
Right Ascension J2000	12h 16m 42s
Declination J2000	+69d 28m 00s
Magnitude	9.6
Size	21.9' x 7.2'
Distance	14.5 MLy
Other designation	Caldwell 3
Discovery	W Herschel, April 6, 1793

This barred spiral galaxy is a member of the M81 Group, but it is some distance from the center of the group. Herschel included it in his third listing of deep sky objects (https://is.gd/Herschel3) as an object of the "Fifth Class, Very Large Nebulae." He described it as "about 25' long, and losing itself imperceptibly, about 6 or 7' broad." The galaxy has fairly low surface brightness (15.0) so it will be a challenge in smaller instruments, and averted vision is needed. It might be better to use lower magnification, according to Stephen James O'Meara in *The Caldwell Objects*.

Visibility for NGC 4236			
10:00 pm EDT	6/1	6/15	6/30
Altitude	59° 33'	56° 11'	51° 36'
Azimuth	344° 33'	337° 58'	333° 47'

NGC 4236 has a mass of 6.6×10^9 M$_\odot$ and a diameter of 34,00 light-years. It is receding from the Milky Way at only 2 km/sec due to its proper motion countering the Hubble expansion, and so its red shift is listed as zero.
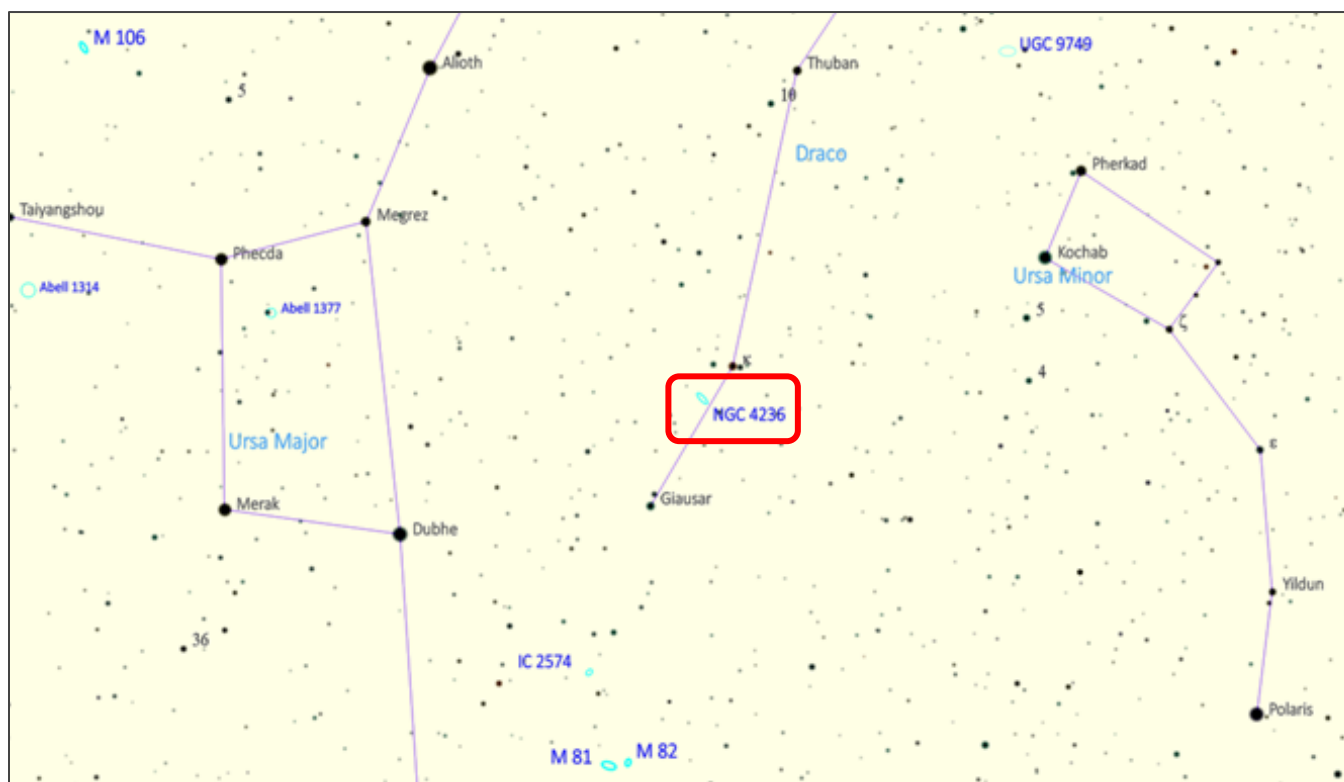
Somewhat Random Thoughts From the Editor   **Larry Faltz**

Calculating the Universe

It's fairly unpleasant to think about the world now: war in Ukraine, Covid-19 pandemic, inflation, supply chain problems, unstoppable climate change, political polarization, conspiracy theories, even misbehavior on stage at the Oscars. How can we escape, at least temporarily, from the burdens and prevarications of modern life, to achieve at least a temporary respite from dread? I have to admit I often do it by watching the Simpsons. But how about a more Zen-like approach: contemplating a single profound bit of knowledge, something incontrovertibly true and ultimate? One could invoke art, of course: lose yourself in the last piano sonata of Beethoven, Velasquez' *Las Menenas* or Jackson Pollock's *Autumn Rhythm #30*. I recently watched the fine 1941 British war propaganda movie "49th Parallel," in which Leslie Howard has the line "Wars may come and go, but art is forever." That's a pithy comment to give his character, considering Howard's fate two years later at the hands of the Germans, some of whom he tangles with in the film. Art, though, isn't factual, or absolute. It's made by people, and thus it can used for non-art purposes, "Soviet realism" being a prime example.

I'm also not thinking of that kind of Buddhist meditation that calls for focusing on breathing or chanting of a mantra in order to empty one's head of all non-autonomic impulses. The achievement of nothingness isn't my goal. Could we dwell on a single element of reality, independent of its creator, or maybe not created at all, not subject to critique, or change, inarguably true and somehow embodying all of existence? I was drawn to something in mathematics that might be such an avatar.

$$e^{i\pi} + 1 = 0.$$

This is Euler's identity, which Richard Feynman called "the most remarkable formula in mathematics." It is wonderful because it combines in one brief statement eight of the most basic mathematical concepts: equality, addition, exponentiation, the numbers one and zero, the irrational numbers *pi* and *e* (the root of the natural logarithms) and the square root of -1. It is actually just a special case of Euler's formula,

$$e^{ix} = \cos x + i \sin x.$$

To show this, take x=0, then on the left side the exponent is zero (anything times zero is zero, even *i*), and anything raised to the zeroth power is equal to one, even an irrational number. On the right side of the equation we have cos(0)=1 and sin(0)=0, so the equation reduces to 1=1, an obviously true statement. To derive Euler's identity take x in radians. If x=π, cos(π)=-1 and sin(π) is zero and so the equation reduces to Euler's identity after adding 1 to each side.

The number *i* is just another number. It's called "imaginary" to differentiate it from the real numbers (the infinite set of all integers, fractions and irrational numbers like pi and e). But it's an actual number, just not one we think about in our integer-based conception of "number." It's critical to the description of wave motion and is profoundly important in quantum mechanics. Facility with the mathematics of complex numbers (of the form a+*I* b) is necessary for any physicist and many astronomers. If you have any mathematical interest at all and want to know more, I call your attention to a fine book, *An Imaginary Tale: The Story of* $\sqrt{-1}$ by Paul Nahin (Princeton University Press, 1998).

There are several proofs of Euler's formula, reflecting the relationships among the various branches of mathematics. It can be proven by differential calculus, by using power series, and by using polar coordinates. This range of proofs got me thinking about the beauty and consistency of mathematics and Galileo's comment that "Mathematics is the language in which God has written the universe."

Cosmology, which started out by assuming that the universe was carried on the back of a tortoise or was created in six days (but we're never told how…He just did it) has become a quantitative science. The physical condition of the universe seems fairly well described going back to 10^{-32} seconds after the Big Bang, and there are rational guesses back to 10^{-43} seconds. Big Bang nucleosynthesis, beginning a second after the Big Bang and ending twenty minutes later, is very well understood. These come from applying mathematical rules and calculations to properties of the constituents of today's universe that we have measured. We have to ignore, for the moment, that we aren't sure about the nature and origin of dark

matter (dark energy played no role in the earliest universe, it would seem) although we're comfortable measuring its presence. As a result of the strength and consistency of mathematics, an area of credible and respected astronomical research now consists of simulations: applying various equations to reasonably predict conditions in the cosmos it evolves over time. While initial conditions and various parameters may be chosen by the investigators, the mathematical rules are absolute. The laws of physics have to operate within the rules of mathematics.

A recent example is the THESAN project (https://thesan-project.com/), which is described as

> … a suite of large volume radiation hydrodynamic simulations that self-consistently model the reionization process and the galaxies responsible for it with unprecedented physical fidelity. In fact, from a numerical perspective THESAN provides higher resolution than previous simulations of comparable volume and employs galaxy formation models known to produce physical properties in concordance with observations down to the present-day Universe. Such an approach is ambitious but essential to push the frontier in our understanding of the intergalactic medium and its connection to galaxies during the first billion years after the Big Bang.

The overall design is fairly simple. Put in some initial conditions and the equations of the laws of physics, and then use the tools of mathematics to evolve the scenario over time. Compare the outcome to observations before, during and at the end.
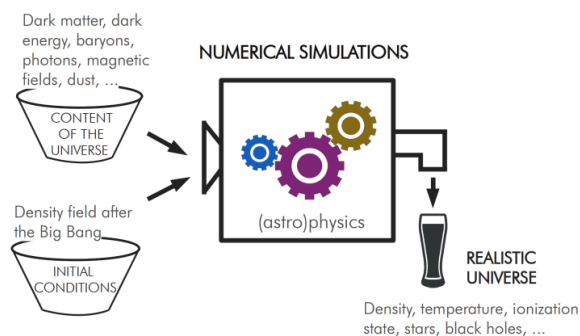

Fundamental design of the THESAN project (thesan-project.com)

The THESAN project points out that

> Numerical simulations have risen to be a third pillar of research in the last few decades, flanking theoretical and experimental (or observational) efforts. They are particularly relevant in astrophysics because nature prevents scientists from performing controlled experiments due to the large distances, physical sizes, long timescales, or

extreme densities and energies involved. In fact, in cosmology the experimental setup cannot be altered as it coincides with part or all of the Universe, a disadvantage that is partially alleviated by the wealth of passive observational data collected by telescopes and detectors across the electromagnetic spectrum. Thus, numerical simulations provide synthetic and controllable versions of the Universe that effectively allow astrophysicists to better understand reality by transcending it.
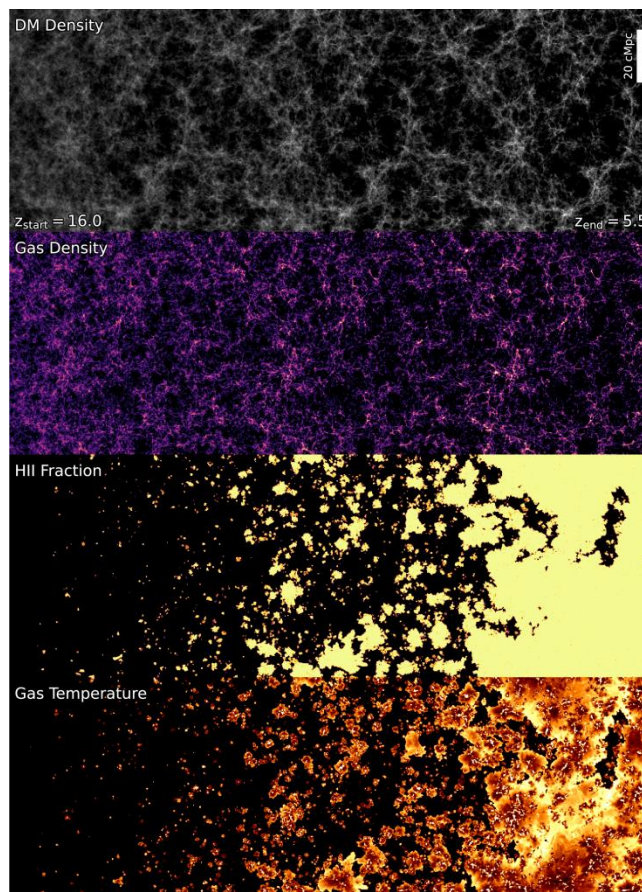
THESAN data from (L→R) earliest (z=16) to most recent (z=5.5)

Can we trust simulations? Is it science or cooking, as alluded to in their graphic (well, maybe brewing, since the output looks like a glass of beer)? Simulations, like cooking or brewing, depend on initial conditions (ingredients) and a recipe. Ptolemy's simulation of the universe held sway for 1500 years, yet because the initial conditions he chose were wrong (the Earth is not the center of the universe, planets do not move with purely circular motion) the model failed once observations became accurate enough. Of course, his initial conditions were extrapolated from the simplest observations: human beings staring at the heavens and seeing that it appeared to rotate around them. The recipe was guided by presumptions

about cosmic motion that were logical but devoid of any connection to reality. At least the initial conditions for THESAN are the result of an additional two millennia of ever more accurate and consistent data, accompanied by advances in the mathematics used to describe them (Newton's equations, calculus, linear algebra, matrices) and a modern tool, the digital computer.

Of course, even if the simulation comes out right, that's not proof that the conditions and equations chosen were the ones that nature used. While physical laws are time-reversible, it is probably not true that the simulation is time-reversible. Nature could have used a different route to arrive at the current universe. But the simulation at least suggests that nature's exact mechanism could not have been too different from the astronomers' guesses.

Even more basic than mathematics is logic. In their monumental *Principia Mathematica*, Alfred North Whitehead and Bertrand Russell showed that all the tools of mathematics can be derived from logical principles. As Russell put it, the goal was "to show that all pure mathematics follows from purely logical premises [using] only concepts definable in logical terms." So mathematics might be considered an "emergent property" of logic. The symbols that are used in logic, and even those in the rest of mathematics, are clearly invented, but logical concepts, such true, false, and, or, if, then, and else, among others, might be eternal.

Some rather deep questions then arise. Some cosmologists have suggested that it is possible that the laws of physics might have been subtly different at the earliest stages of the Big Bang. As I mentioned in my article last month, this variability was even proposed as an explanation of Olbers' Paradox. But although the laws may have been different, the mathematics behind them would not be. The meaning of "equals" or the rules for exponentiation or the value of pi would not vary. Just the equations themselves might need adjustment. Nor would logic have different rules. For example, the proposition known as *modus Tollens:* If A is true, B must be true. We find B to be false, ergo A must be false. It had to be "written in stone," even before there were stones.

Do we invent logic and mathematics, or do we discover them? Was Euler's identity true before the Big Bang? Was *modus tollens* true? Even assuming there are multiple universes of the Susskind's cosmic landscape or Linde's eternal inflation, do logic and mathematics follow the same rules in each of them? Now, the first thing we have to do in thinking about this is to leave the Almighty out of it, because once we let Him (or Her) in, we really can't ask any more questions. All we could say then is "Thank you, Lord, for these wonderful quadratic equations, but why couldn't You have made finding the roots easier?"

Does the existence of logic form the basis for making a universe? Are there illogical universes? (Don't cavil that our universe is illogical. Life may be illogical, but not the universe!) What could an illogical universe mean? What would their math look like? Can we even think of such a thing without being labeled psychotic?

Is this better than worrying about Covid or Russia? Now I'm not so sure. But Euler's identity is a wondrous and beautiful thing. And it's nice to be logical.

An Evening with NdGT

These musings brought a memory from more than a decade ago. Back around 2009, some of us participated in a remarkable observing event. A silent auction prize offered at a charity fund-raiser was an evening for you and your group with none other than Neil de Grasse Tyson, by then already the most famous astronomer in the country but still willing at that point to be someone's private entertainment. The winner donated the prize to a Cub Scout troop. WAA was contacted and asked to have some members bring telescopes to enhance the scouts' experience. The event was to be held on a Saturday night in North Salem on a large property behind some stables. Fortunately for all of us, the night was crystal clear. We assembled well before dusk, driving onto a field scattered with the various paraphernalia used for equestrian training. I brought my CPC800 with a Mallincam video camera and an 80 mm refractor just to show Jupiter. Dave Butler brought his LX-90. Doug Baum brought the club's 20-inch obsession and one of the earliest BiPH night-vision devices, and there were several other members and scopes there.

As it began to grow dark, an excited group of a dozen or so scouts came up the hill and sat in a circle, and shortly thereafter Tyson appeared, a big guy clad in leather with a broad-brimmed hat, looking to me

more Crocodile Dundee than Carl Sagan. After introductions, he started talking. He was able to slide effortlessly from topic to topic: the constellations and their mythology, the colors of the stars, the Milky Way, galaxies, cosmology, planets, star names, meteors, space missions, a seemingly limitless range of information on the tip of his tongue and all delivered in his eloquent, entertaining style and mellifluous voice. When he would mention something, I'd try to find an object that would illustrate it, and with the Mallincam had no problem finding many faint objects such as NGC 891 or the Owl Nebula. The only problem was that the kids were so enraptured by Tyson that they didn't want to get up and look in the telescopes, not even the gigantic 20-inch. We had to interrupt a few times and call them over to look at the wonders of the heavens, which they seemed to do in a rather diffident way. Neil was a better show than the universe, it seemed!

I recalled this event while writing about Euler's identity because of the way Neil ended the evening. As we were started to take down our equipment, I overheard Neil urgently trying to explain to these 10- and 11-year old kids the importance of the square root of minus one. "It's just a number," he said. How he got on the topic I don't know, but it must have flowed inevitably from a question about the nature of light. It's hard enough to make sense of *i* even in a formal math class setting, but to do it in the dark, without a blackboard, for a bunch of tired kids, says something about scientific idealism. It's important, it got into Neil's head, a proper explanation of whatever the subject was required it and so out it came. At some point, if you know about waves, you simply can't explain them without invoking *i*. As great an explicator of science to the masses as he is, Tyson was a prisoner of his own knowledge. The guy couldn't stop himself. It's a problem for many of my fellow physicians: the inability to escape technical language when dealing with a patient in spite of making every effort to do so. No matter how often we advise students and residents to avoid the jargon of their fields, there will always be someone who will lapse into technical argot in spite of efforts to stay simple. Once you learn something, it's hard to unlearn it.

In spite of the frustration of seeing the actual universe play second-fiddle to Neil deGrasse Tyson, the evening was fun, except for poor David Butler, who

tripped in the dark over one of those horse obstacles and broke his nose. The good news is that Dave went to the hospital and got fixed up; had he been a horse they probably would have put him down. Dave is one of our most loyal and enthusiastic star party attendees, always willing to share views in his SCT and wowing the crowd with his BiPH night-vision device. And then there's a different matter relating to that evening's event involving $100, a story that many of the club members from those days know all about, but that I'm not comfortable putting into print. Ask me if you see me.

Amateur Astronomers Making Professional-Grade Parts

There are a whole range of astronomy vendors who supply the various after-market bits and pieces that you need but that the scope manufacturer didn't think of, or at least didn't include in the original package. I've purchased parts from many of these stores: Adorama, B&H, CCTS, Oceanside, Astronomics, High Point Scientific, Woodland Hills. I've gotten a lot of smaller parts from ScopeStuff and Agena Astro.

A recent issue of *Astronomy Technology Today*, an on-line journal of interest to us gearheads, featured a short description of Buckeyestargazer.net. It's a combination astrophotography site and parts store. Joel Short is a Mennonite minister in northern Indiana who is an accomplished astrophotographer. He also has a 3D printer and has come up with a variety of useful parts, the kind of things that either you can't get at all or would pay a lot more money for if they were made from aluminum (but don't need to be). For years I wanted a bracket to hold the hand control on my iOptron Minitower. iOptron didn't make one (the hand control hangs off the mount on a tether, which means it flops around during slews). Joel has a whole range of HC brackets for different scope manufacturers' hand controls and even sizes them for different size tripod legs. His products are spun from durable, temperature tolerant PETG filament. The bracket he made for me cost just $19, including shipping. There are many mounting solutions for various components like the ASIAir, USB hubs and polar alignment cameras. He makes other parts like desiccant caps to keep scope insides dry, Bahtinov masks for focusing, dust caps for nearly every size and thread and

other hard-to-find accessories. He'll even custom-make parts. Check out his site.

Sometimes, though, you have to be on your own. I've written in prior newsletters about adapting parts to make a laser finder and to build a dew heater controller. Tripod extensions help when long refractors, since they may not clear the tripod legs in certain positions, a problem especially common with alt-az mounts when trying to reach the zenith. Several manufacturers have recognized this problem. iOptron sells pier extensions specifically designed for their various mounts. The Sky-Watcher AZ-GTI, a small but clever alt-az mount, comes with an easily-attached riser.

A few years ago I upgraded my iOptron MiniTower alt-az mount from the original 1.5"-leg diameter tripod to a 2" tripod, on which I installed an iOptron riser. But what to do with the old tripod, a reasonably solid device? I could use it for some other small mounts I had, particularly the AZ-GTI. The MiniTower tripod uses three adjustable screw assemblies to level the mount head. The threaded holes for these screws would be perfect to hold a riser. I had a machine shop make a 6-inch diameter, ½-inch thick aluminum plate, bored with a center hole and three holes at just the right locations to sit over the threaded holes on the tripod. McMaster-Carr provided metric threaded couplings (to use as the riser posts) and threaded rods and flat-head screws to fasten everything together. I countersunk the holes so that the top would be completely flat. It's just a little rough-looking (I needed two couplers for each strut; they are hexagonal on the outside but they don't exactly line up when tightened), but it's 100% functional and stable as a rock.

Sky-Watcher, iOptron and home-made risers

WAA member Steve Bellavia went one step further. Steve has had a number of parts made via 3D printing, but for a tripod riser plastic isn't rigid enough.

Although the vendor made a riser for his tripod, it wasn't a simple process to attach it. Steve wrote

I originally purchased the Sky-Watcher Pier Extension for my EQ6-R Pro. It was inexpensive, and did work, but every time I needed to use it, the toolbox had to come out. You need to remove the azimuth stop-pin, and then you need to disassemble the tube so that you can get to the knob that attaches to the head, reassemble it, and then move the azimuth stop-pin to the new location.

So I designed my own no-tools-needed "rapid" extension." It goes on and off in seconds, and everything stays as it was, including the azimuth stop pin. It is an all-aluminum welded assembly. (The SkyWatcher version uses a heavy steel tube). I had it fabricated overseas, and had it powder-coated. The dedicated azimuth stop-pin that remains in place after installing is stainless steel (why not?).


Steve Bellavia's custom-made riser

The process Steve went through to do this wasn't terribly complex, and it shows you something about how the world works these days.

Steve made 3-D models and 2-D drawings and submitted them through mfg.com, a site that connects people and manufacturers worldwide. Within 48 hours he had about 50 quotes, ranging from $60 to $1100. They came from all over the world, including China, Pakistan and the United States. He chose a company that offered a 10-day turn-around and had a good customer rating. With shipping, materials, the welding and the stainless steel azimuth stop-pin, the cost was $200. This is about twice what the Skywatcher product costs, but the $100 difference goes away quickly after a few nights of not struggling with assembly and disassembly of the original pier extension. Plus, there's the satisfaction of having solved a problem by yourself and making a unique and elegant mount accessory. ∎

Images by Members

Ramadan Moon by Steve Bellavia
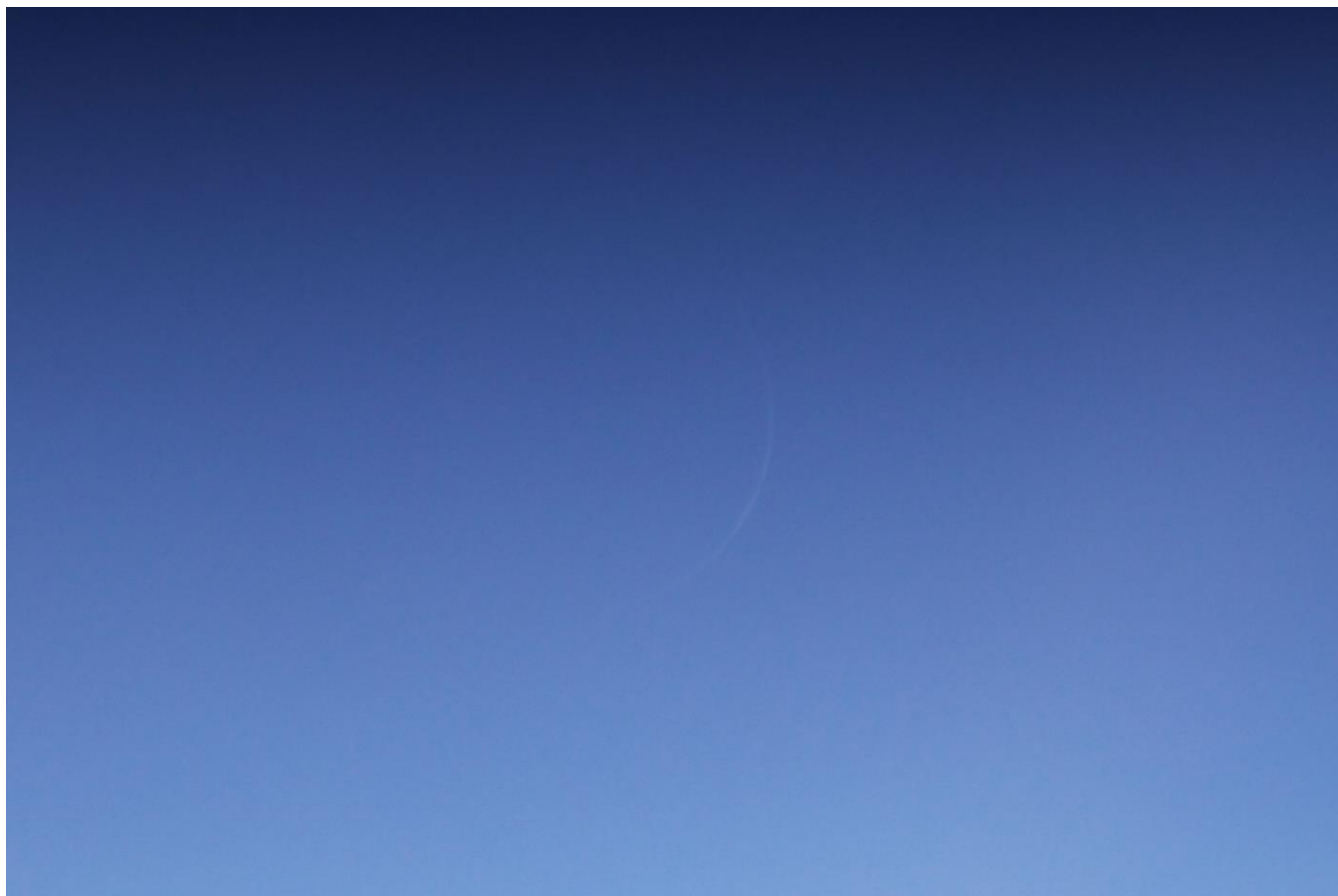
An Islamic month officially begins when the first waxing crescent Moon is sighted. This particular Moon has extra significance in 2022 since it inaugurated the month of Ramadan, the holiest in the Islamic calendar. While imams all over the world were searching for it visualy, Steve managed to catch the 2.4%-illuminated crescent Moon in the afternoon of April 2nd using a DSLR and a TS-Optics Photoline 72mm f/6 doublet refractor. A single exposure at ISO 100, 1/2000 sec.

Steve also sent this DSLR shot of the moon rising behind the trees in Long Island on April 11th.

Plato, the Alpine Valley and the Eastern Mare Imbrium by Larry Faltz

April 12, 2022, 9:26 p.m. Larchmont NY (my driveway). Seeing 4/10 (good for the suburbs, imaging over rooftops), transparency 8/10. Moon age 11.79 days, illumination 84.1%, Moon altitude 62 degrees. Orion Apex 127-mm Maksutov (1540-mm focal length) on iOptron MiniTower alt-az mount, ASI290MM camera, best 750 of 3000 frames, each 758 μsec, gain 279. Stacked with Autostakkaert!3, wavelets with Registax 6.1, tone curves with Photoshop Elements 2.0. Slightly cropped from original 1936x1096 pixels (full frame for 290MM).

The lava-filled crater Plato lies at the western edge of the Montes Alpes, and between the Mare Frigoris to the north and the Mare Imbrium to the south. Cutting through the Montes Alpes is the Alpine Valley, an immense fault 130 km long and 11 km across. Northwest of Plato, close to the terminator, is the crater Philolaus with its western wall illuminated by the rising Sun. The large flat crater on the left edge of the image is J Herschel.

Along the eastern edge of the lava-filled Mare Imbrium (lower right) are, from north to south, the craters Aristillus, Autolycus and Archimedes. The ray pattern from Aristillus is clearly seen. Both Aristillus and Autolycus are relatively young craters (less than 1.1 billion years) while Archimedes is between 3.2 and 3.8 billion years old. In the upper right corner of the image are Aristoteles and Eudoxus.
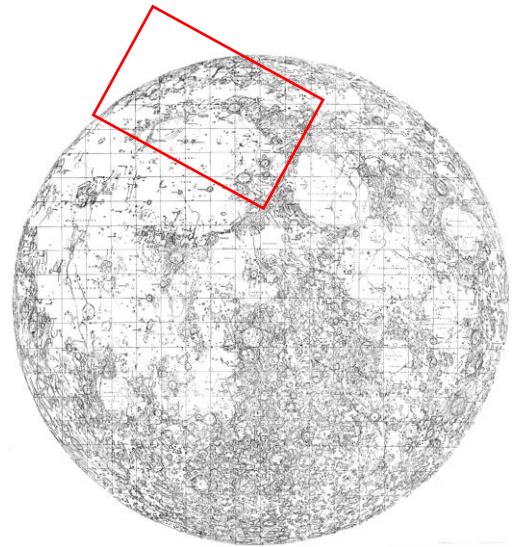
The May 15-16 Lunar Eclipse

As is often the case, the weather was suboptimal for this event. Nevertheless, both Rick Bria and Steve Bellavia sent in images. Rick writes:

> The weather for last night's lunar eclipse was predicted to be completely overcast with a 30% chance of rain. Radar and satellite imagery confirmed almost no chance to see any part of the lunar eclipse. Still, although feeling rather discouraged, I went to the Observatory… just in case.
>
> Miraculously, a hole in the clouds appeared when the moon was about halfway into the earth's shadow and another appeared during totality. During those two short opportunities, I took pictures at a frantic pace. Of the 97 pictures I took only two were free of clouds and properly exposed.
>
> The plan to watch a wonderful lunar eclipse over a tranquil span of two hours was ruined by clouds. However, considering the dismal weather forecast, I am thankful for the result.

This is a 4-second exposure with a Televue TV-85 and a DSLR, from the Mary Aloysia Hardey observatory.
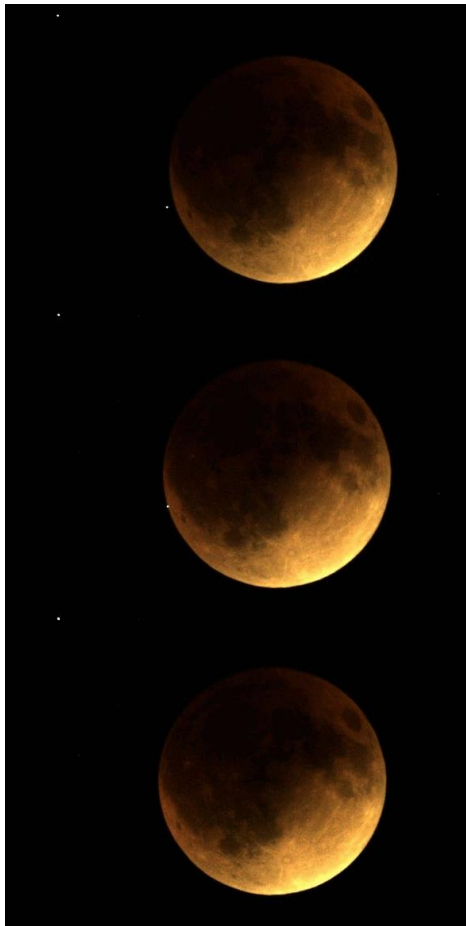
On eastern Long Island, Steve had a better sky. He recorded the occultation of the double star HD 138268 (also catalogued as HIP 76033, TYC 6192-1596-1, and BD-19 4128) producing a 3-frame animated GIF. Pdf files (the format for *SkyWAAtch*) can't show the animation, so your editor used an on-line program to separate the gif into its three frames. The frames are aligned on the star to the upper left of the Moon (HD 138413), so the Moon's movement is evident.

Steve also produced an image that reproduced his view in binoculars, showing more stars than can usually be seen on a single photographic image. It looks even better on Steve's on-line Astrobin site: https://www.astrobin.com/s611af/

Spectroheliograph Images of the Solar Chromosphere by John Paladini

CaK
393.4 nm

Hα
656.28 nm
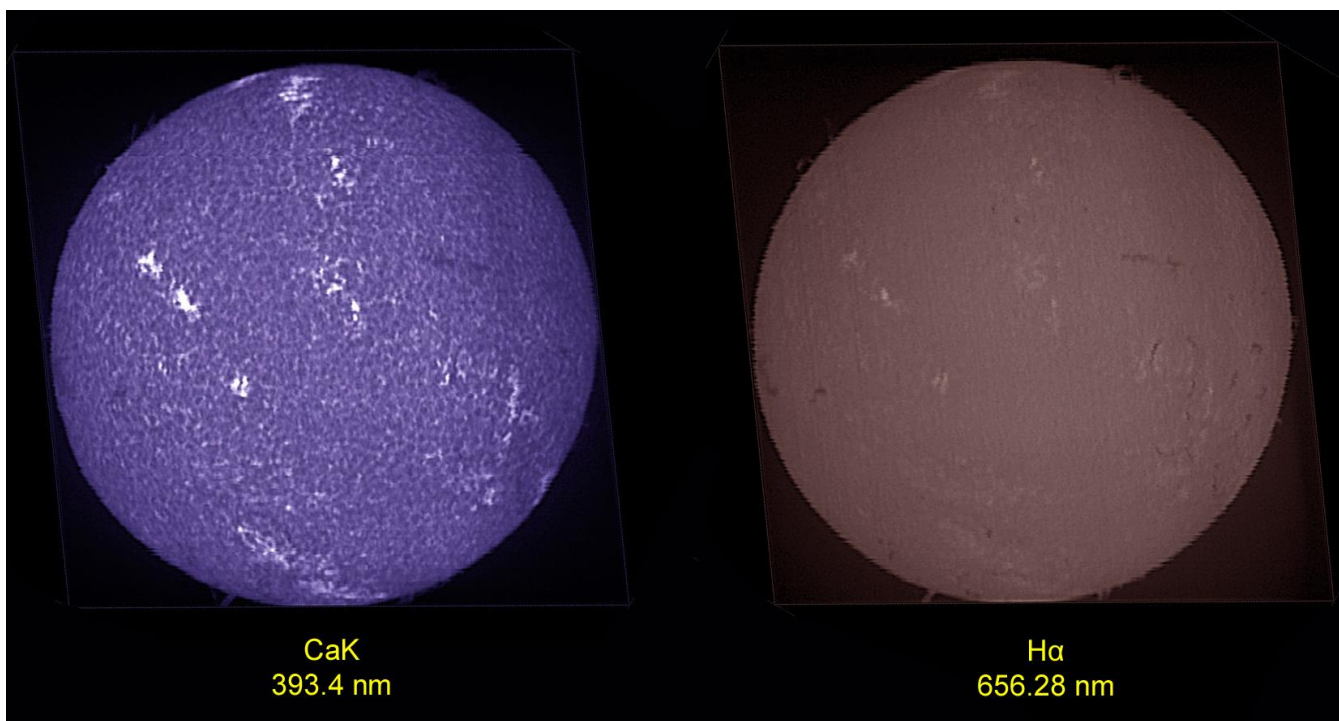
We see the Sun's photosphere, the "surface" with a temperature of around 5,800 K. Above the photosphere is the slightly hotter chromosphere, whose temperature rises with increasing height. Above the chromosphere the temperature quickly rises to a million Kelvin in the solar corona. The CaK line at 393.4 nm detects the cooler parts of the chromosphere, closer to the photosphere than the hydrogen-alpha line at 656.28 nm. The CaK images reveal super granulation cells that form in areas of high magnetic activity. Imaging in CaK requires a camera, since the human eye can't detect wavelengths below 400 nm. The best commercial CaK filters, such as the Lunt Calcium K Module, have bandpasses of around 2.4 Å (compared to Hα bandpasses of 1 Å or less). Because the wavelength is shorter than Hα, CaK bandpasses need to be less than 0.6 Å in order to see solar filaments (face-on prominences). John made these images with his home-made spectroheliograph, which is capable of imaging at any wavelength.[1] The filaments are visible on the CaK image, a detail of which is shown. This means the bandpass of John's spectroheliograph at 393.4 nm is less than 0.6 Å. (1 Å = 0.1 nm)

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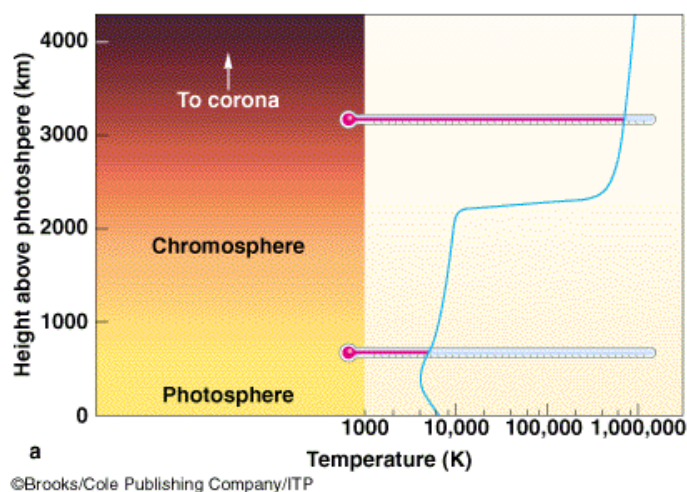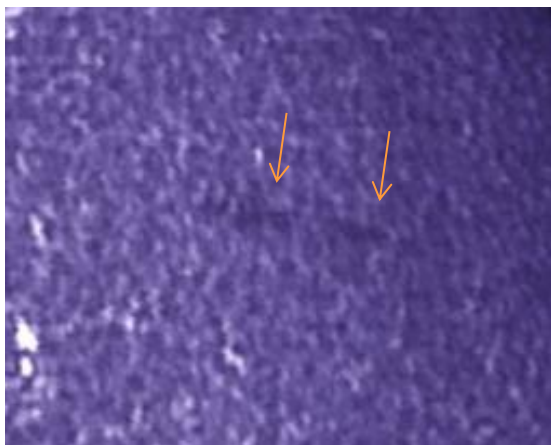
[1] See John's article in the April 2017 SkyWAAtch

"White Light" Sunspots by John Paladini
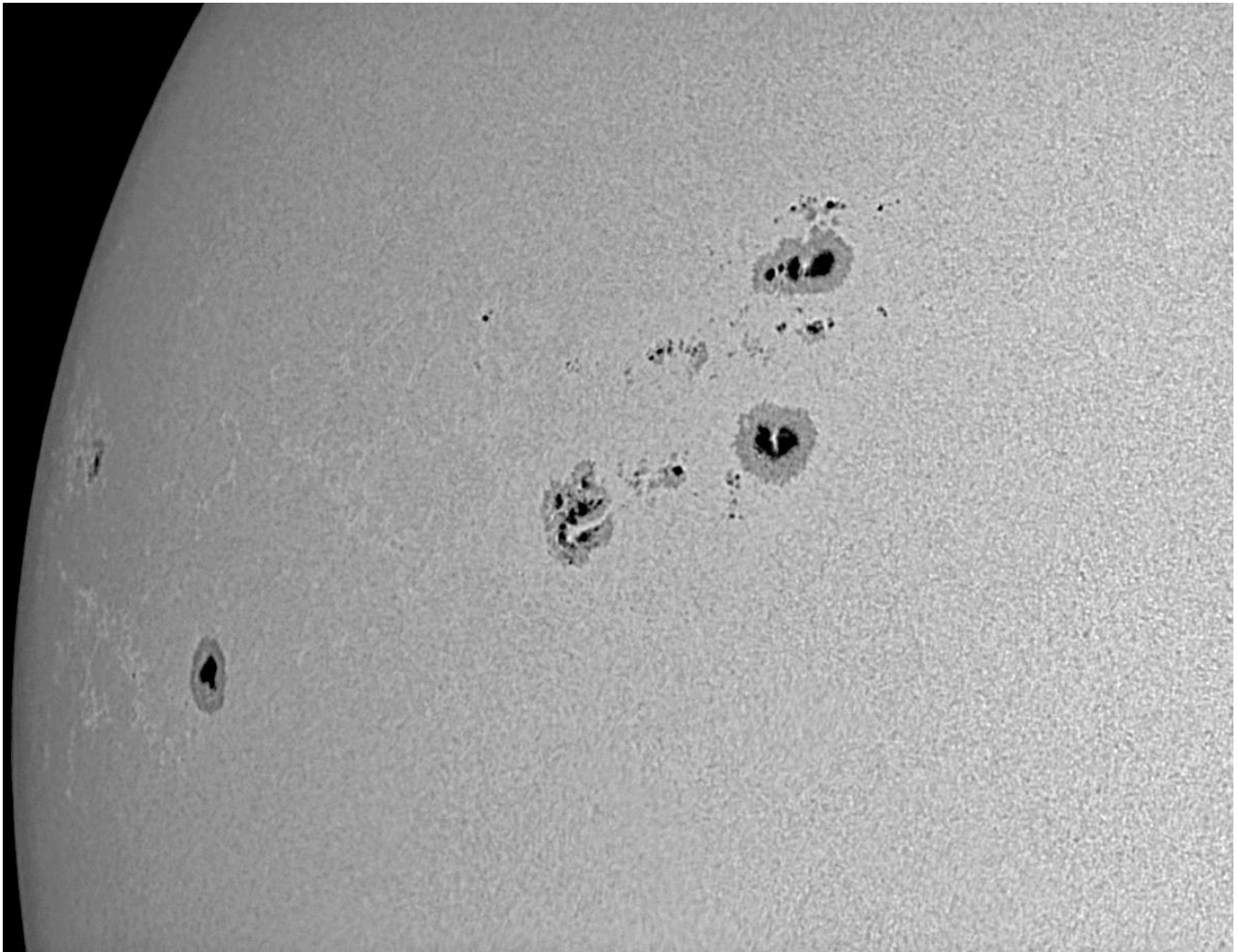
The sunspots count of solar cycle 25 appears to be more numerous than originally predicted. Sunspots can easily and safely be viewed or imaged with a good "white light" solar filter, like a Baader my-lar, on the front of your telescope, or through a Herschel wedge on a small refractor. Using a 66 mm refractor on April 20, John added a narrowband 532-nm, 3-nm bandpass (37% transmission) Andover Corporation filter in front of the camera. Details in the sunspot group and substantial surface granulation are clearly seen. When viewing or imaging the Sun, either put a mylar filter on your finder or take it off the scope altogether. Televue (and others) make easy-to-use lens-less solar finders.

In sunspots, loops of the solar magnetic field are packed so tightly that there is no significant amount of unmagnetized gas in that area of the photosphere. The absence of gas inhibits the flow of heat by convection and makes sunspots cooler and darker than their surroundings.

"Active regions" on the Sun, in which sunspots are found, get numbers, and a daily image is posted on the Solar and Heliographic Observatory web site (https://soho.nascom.nasa.gov/). Daily images going back to January 20, 2006 are posted on https://soho.nascom.nasa.gov/data/synoptic/sunspots_earth/.

Research Highlight of the Month

H.E.S.S. Collaboration, Time-resolved hadronic particle acceleration in the recurrent nova RS Ophiuchi, Science 376: 77-80 (2022).

RS Ophiuchi is a recurrent nova. It is a binary system of a white dwarf and a red giant separated by just over 1 astronomical unit. The dense white dwarf draws matter from the red giant onto its surface; when the density of this material is sufficient, a thermonuclear explosion occurs. RS Ophiuchi erupted in 1898, 1933, 1958, 1967, 1985, 2006 and 2021, jumping from magnitude 12 to magnitude 5 and fading over a few weeks.

Emission of energetic particles during the 2021 outburst was analyzed using the H.E.S.S. gamma ray telescope in Namibia and the Fermi-LAT gamma ray space telescope. The explosion creates a shock wave that accelerates particles in the companion star's stellar wind, allowing them to reach very high energies and generate gamma rays that could reach 100 giga-electron volts. This is a likely mechanism for high-energy cosmic rays.
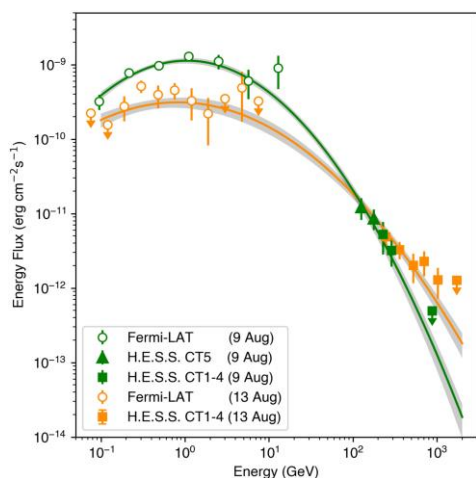

Fig. 3. RS Oph gamma-ray spectra. H.E.S.S. and *Fermi*-LAT spectra for 9 August (green) and 13 August (orange) showing spectral evolution from 9 to 13 August, with a reduction in the *Fermi*-LAT flux and an increase in the maximum energy of the tera–electron volt spectrum.
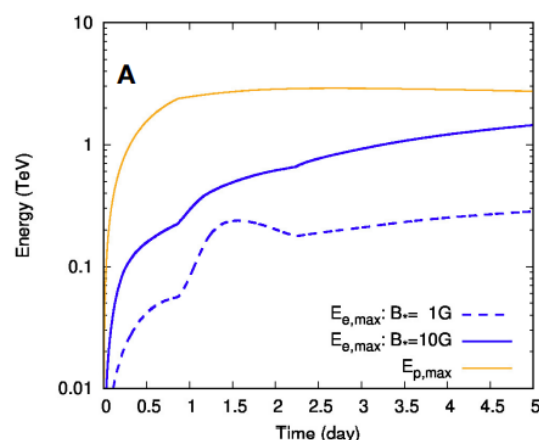

Figure S6A: Particle energy and luminosity evolution. Maximum energy of accelerated electrons and protons at the forward shock.
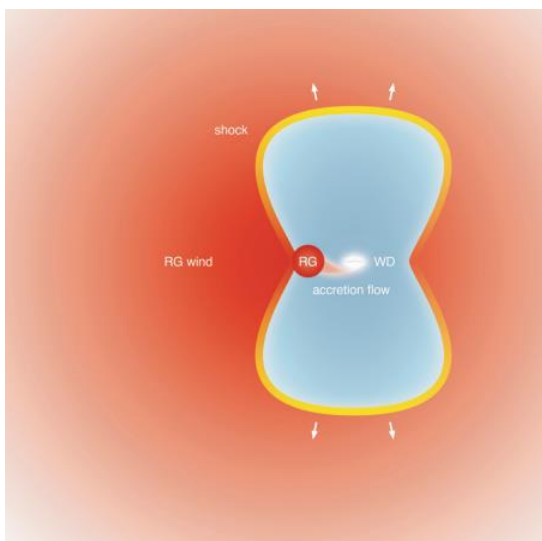

Figure S2: Schematic of external shock model. The explosion originates near the surface of the white dwarf (WD). Within one day, the shock is expanding as a bipolar blast wave moving orthogonal to the accretion disk, into the wind of the red giant (RG). The color gradient of the shock indicates the expansion velocity, whilst the red gradient of the surrounding medium indicates the density of the RG wind. Material internal to the shock is shown in blue. Figure is not to scale.

Member & Club Equipment for Sale

Item	Description	Asking price	Name/Email
Astronomy Books	From classic books on astronomy and astrophotography to bios and science classics. Selling all as one unit. See the titles at https://is.gd/cefbooks	$50	Mike Cefola meteormik@aol.com
Hard Case for 8-inch SCT	Celestron case originally housed a Celestron C8+. Image at https://is.gd/C8case. Excellent condition.	$100	Mike Cefola meteormik@aol.com
NEW LISTING Meade 90-mm refractor	Meade 90-mm f/1000 DS series refractor. Computer controlled. Diagonal, tripod, manuals and batteries included, no eyepieces. Fits perfectly in included Orion case. Great condition. Picture at https://is.gd/Meade90.	$125	Marc Favreau mfavreau@optonline.net
NEW LISTING Meade 8" SCT LX-80	Go-to mount, tripod. Tube wrapped in Reflectix for faster cooling. See https://agenaastro.com/meade-lx80-8-f-10-schmidt-cassegrain-telescope-0810-08-01.html.	$600	Greg Borrelly gregborrelly@gmail.com
NEW LISTING Celestron Astromaster 130	5" f/6 Newtonian on GEM with motorized RA axis (uses 9V battery). Zero-power illuminated finder. Excellent condition. Donated to WAA. Current model lists for $379.	$200	WAA ads@westchesterastronomers.org
NEW LISTING Celestron SE mount	No optical tube. Go-to alt-az mount and tripod. Can carry 12 lb payload or tube up to 17". Upgradeable hand control.	$300	Greg Borrelly gregborrelly@gmail.com
NEW LISTING Celestron binoviewer	Use both eyes with your telescope. Original case, with two 18-mm eye pieces.	$180	Greg Borrelly gregborrelly@gmail.com
NEW LISTING Celestron Eyepiece Set	Like new condition. 4, 6, 9, 10, 15, 32-mm eyepieces, 2X Barlow, 6 colored planetary filters, Moon filter, in padded case. Donated to WAA	$125	WAA ads@westchesterastronomers.org
NEW LISTING APM 100-90 ED APO binocular telescope.	Big astronomy binos! Two APM 18mm UFF eyepieces (30x). Vixen dovetail. Weighs 16 lbs. Soft case with hard foam insert. Four years old. Lightly used, excellent condition. See it here.	$1795	Eugene Lewis genelew1@gmail.com

Want to list something for sale in the next issue of the WAA newsletter? Send the description and asking price to ads@westchesterastronomers.org. Member submissions only. Please offer only serious and useful astronomy equipment. WAA reserves the right not to list items we think are not of value to members.

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