SkyWAAtch

The Newsletter of Westchester Amateur Astronomers

November 2024

The Heart Nebula by David Parmet

Details on page 28.

Our club meetings are held at the David Pecker Conference Room, Willcox Hall, Pace University, Pleasantville, NY, or on-line via Zoom (the link is on our web site, www.westchesterastronomers.org).

WAA November Meeting

Friday, November 8 at 7:30 pm

Evaporating Exoplanet Atmospheres

W. Garrett Levine
Department of Astronomy, Yale University

Among the most surprising discoveries in the exoplanet era is the number of short-period planets with orbits smaller than that of Mercury. Because these planets are so close to their host stars, theoretical models hypothesize that their atmospheres are at-risk of evaporating due to intense stellar ultraviolet and X-Ray irradiation. Some of those predictions have recently been confirmed with data from telescopes including Hubble and JWST. This talk will describe how this new branch of research places longstanding results from solar system geoscience in an exoplanet context and will conclude with a discussion of how amateur astronomers are supporting these ongoing observational campaigns.

Garret will be speaking live at Pace. WAA members and guests are encouraged to come to the meeting to meet the speaker and fellow club members. Join us for some food and drink after the lecture.

Also In This Issue

WAA December Meeting

Friday, December 13 at 7:30 pm

Seeing the Invisible: What does a Black Hole look like?

Eliot Quataert, PhD
Charles A. Young Professor of Astronomy
Princeton University

Starway to Heaven

Ward Pound Ridge Reservation, Cross River, NY

Saturday, November 2 at 5:45 p.m. EDT
Saturday, November 23 at 4:30 p.m. EST
Saturday, November 30 at 4:30 p.m. EST
Weather permitting.

New Members

Jason Antolik	Mt. Kisco
Orrin Beissinger	Warren
Dennis Covert	New City
Peter Knipp	Norwalk
Thomas LaBella	New Rochelle
Derrick McCall	White Plains
Angela Michaels	Cortlandt Manor
Nina Nadelman	Katonah
Robert Peck	Greenwich
Paul Schwendener	Larchmont
Yuxin Zou	Irvington

Renewing Members

Bill Caspe	Scarsdale
Edgar S Edelmann	Ossining
William Meurer	Greenwich
Ciaran O'Sullivan	Montrose
Daniel Platt	Putnam Valley
Robert Rehrey	Yonkers
Kevin Shea	Carmel
Rita Walton	Yonkers

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

ALMANAC For November 2024
Bob Kelly, WAA VP of Field Events


Bob Kelly


New 11/1


1Q 11/9


Full 11/15


3Q 11/22

Planets Pop Up!

We've had Saturn in the evening sky for months now. It's time for other bright planets to join the gang. Jupiter been taking forever to rise at a time when people aren't normally asleep. Mars' motion makes it actively working to stay in the morning sky. This month the motion of the planets across the constellations, plus the movement of the constellations themselves, finally nudge the planets to the evening sky. And they get a boost towards pre-bedtime viewing as the change to Standard Time brings darkness an hour earlier.

Darkness comes for the evening hours

Daylight time ends at 2 a.m. on Sunday the 3rd. Remember to 'fall back' an hour. It'll be unexciting driving home in the new-found, all-encompassing evening darkness. The darkness lets us start the late November star parties earlier on the clock, observe in a dark sky and still get to sleep at a reasonable hour. Jupiter and Mars become evening objects.

Jupiter-rise moves from 8 p.m. at the beginning of the month to 5 p.m. at month's end. Jupiter rides the horns of Taurus the Bull as it makes a retrograde motion in our skies, approaching opposition on December 7th. Due to its being quite far north on the ecliptic, Jupiter gets high in our skies quickly.

Mars scoots away from the Bull, as if afraid to get hung up in the horns of the Bull like Jupiter. It appears to line dance with the Gemini, the Twins, before they spin Mars off toward Cancer, where it will dance with the bees in their hive (M44). Mars starts rising earlier, by 8:30 p.m. EST by the end of the month, on its way to the January opposition.

Low in the southwestern sky

Venus is still slow to gain altitude in November, despite being about as far away from the Sun as it can get. The blazing star on the horizon, often mistaken for an aircraft, sets just after the end of astronomical twilight. Mercury tries to join Venus, but it's even lower and never gets as far out from the Sun as Venus does.

Ice Giants

Neptune (2.5" diameter, mag. 7.8) is near the meridian 3½ after sunset this month, while Uranus, 60° to the east on the ecliptic, culminates four hours later, around midnight mid-month.

November meteors

The Leonids peak on the night of the 17th/18th. While this shower can produce a dozen swiftly moving meteors an hour, the early morning peak is overwhelmed by the nearly full moon. The northern Taurids peak earlier in the month. They can add a few fireballs to the meteor mix.

Comets

Comet C/2023 A3 Tsuchinshan-ATLAS will be an evening telescopic object in Ophiuchus and Serpens through the month. See page 17 for more about this Great Comet. Comet C/2024 S1 ATLAS, a Kreutz sungrazer touted as a "Halloween Comet," was predicted to be extremely bright around its October 28th perihelion passage just 0.7 solar radii above the Sun's photosphere. However, it evaporated in the intense coronal heat and radiation.

Satellites

China's Tiangong space station is visible evenings from the 8th through the 23rd. The International Space Station is available for viewing in the mornings until the 12th and in the evenings for the rest of the month.

WAA Members: Contribute to the Newsletter!
Send articles, photos, or observations to
waa-newsletter@westchesterastronomers.org

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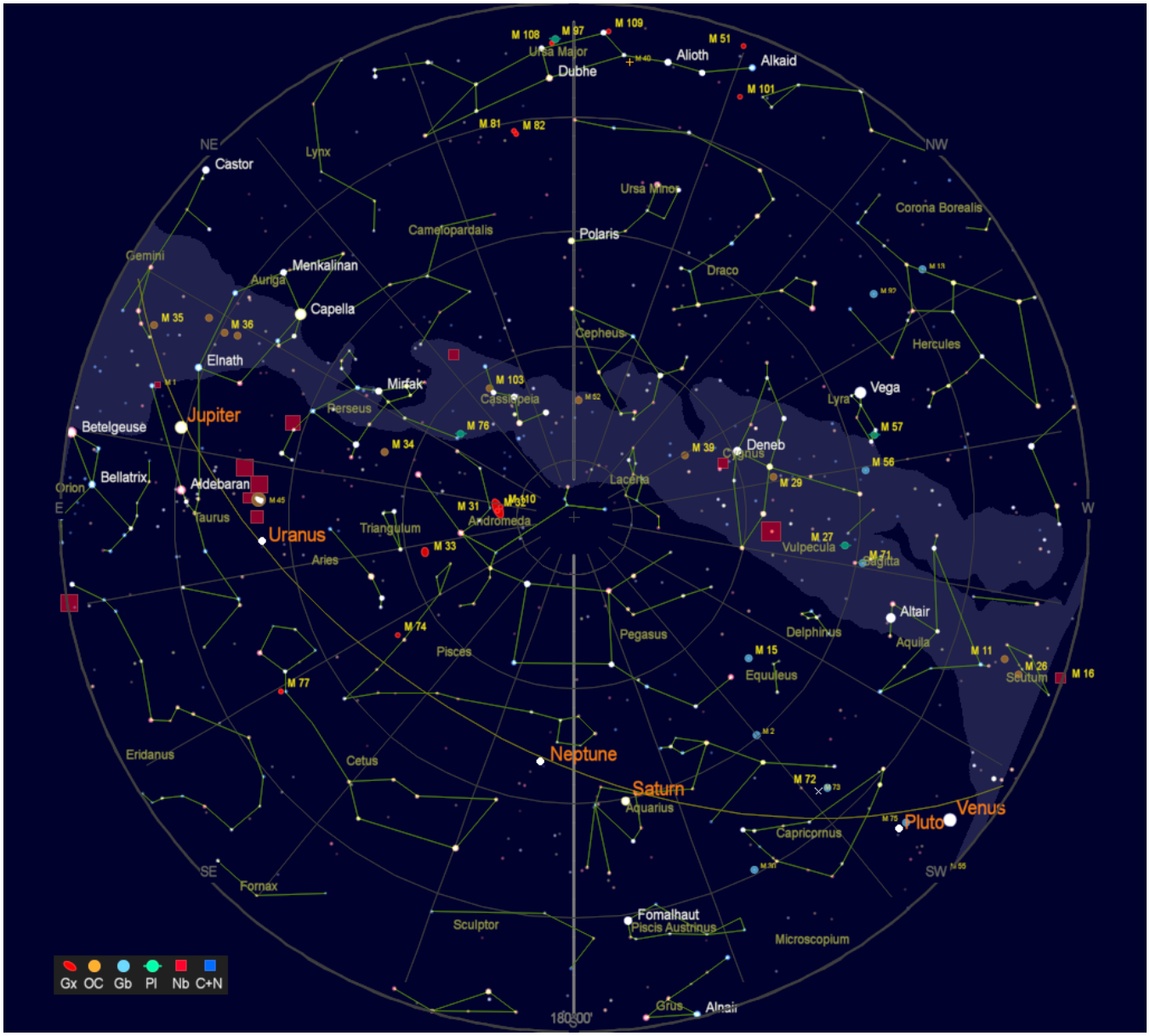


This month's **night sky from Westchester**. Except for the position of the Moon, this is how the sky will appear at 9:45 p.m. EDT on November 1st, 8:00 p.m. EST on November 15th and 6:45 p.m. EST on November 30th.

SAVE THE DATE

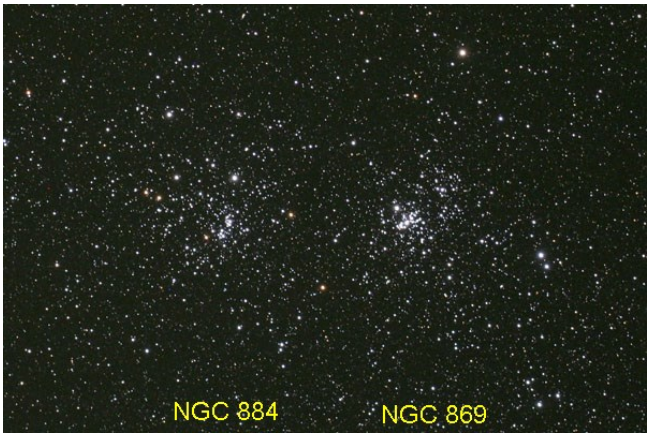
Westchester Amateur Astronomers 40th Anniversary Celebration

Mark your calendars for **Friday April 11, 2025 at 6PM** in Willcox Hall at Pace University in Pleasantville, NY to help us celebrate our 40th anniversary! More information to follow.

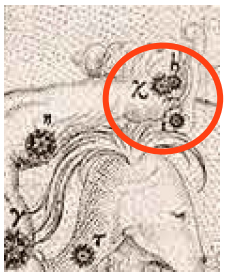
If you are interested in joining the planning committee for this event, please contact Eva Andersen at waa-membership@westchesterastronomers.org or text her at 845-803-4949.

Deep Sky Object of the Month: The Double Cluster

Constellation	Perseus
Object type	Open Clusters
Right Ascension J2000	02h 19.1m (884)
Declination J2000	+57° 09’ (884)
Magnitude	3.7 & 3.8
Size	1 degree
Distance	7,460 & 7,640 LY
NGC designation	884 & 869
Other designation	Caldwell 14
Discovery	Hipparchus, 130 BCE



Although the Double Cluster was first catalogued (as a star) by Hipparchus and was well-known to Arab astronomers, it apparently was seen as two separate objects by Bayer, who drew two stars at the location (h Persei and χ Persei). It was shown to be two clusters of many stars by William Herschel, who labeled them as VI-33 and -34 when he saw them on November 1, 1786, describing them as “beautiful and brilliant.”

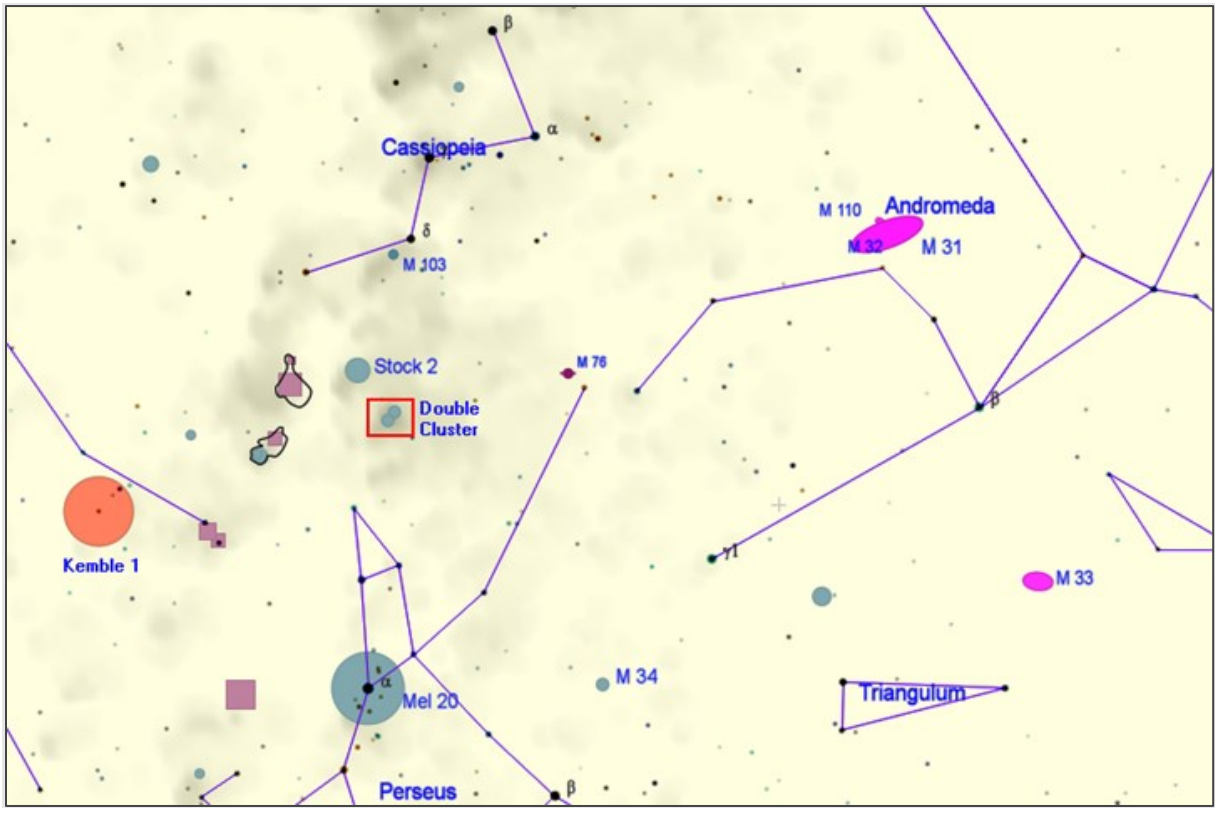


From Bayer’s *Uranometria*

Visibility for Double Cluster (data for NGC 884)			
2200	11/1 (EDT)	11/15 (EST)	11/30 (EST)
Altitude	61° 09’	72° 59’	73° 34’
Azimuth	43° 23’	16° 45’	348° 50’

The Double Cluster is easy to find near Cassiopeia. Low power is needed, and it’s a fine binocular object. Calculate your actual telescopic field of view from this formula:

$$FOV = \frac{Eyeiece\ apparent\ FOV}{Magnification} = \frac{Eyepiece\ \ apparent\ FOV}{\left(\frac{Telescope\ FL}{Eyepiece\ FL}\right)}$$



Another Movie Telescope: *Star Trek: First Contact*

A Meade LX-200, probably a 10-inch model, is seen in *Star Trek: First Contact* (1996). James Cromwell plays Zephram Cochrane, inventor of the warp drive. In this time-travel story, the Enterprise (NGC-1701-D, commanded by Jean-Luc Picard) follows a Borg ship to Earth through a temporal vortex to try to prevent the assimilation of the human race. They meet Cochrane the day before he is to make the first warp flight. Rather than the heroic genius the Enterprise officers expect, Cochrane is a hard-drinking, cowardly yahoo who has to be forced to make the flight. After the usual battles and mayhem, Earth wins, as it always does in Star Trek.

Cochrane doesn't believe it when Riker, Troi and Geordi claim they come from a spaceship, so they show it to him in this telescope, which just happens to be on hand. Still skeptical, he glances at the corrector plate as if to see if they've put a little picture on the on it, like many people claim after they've seen Saturn for the first time. The optical tube has a rather silly extension on the front, which we think serves no other purpose than making the scope look longer, like a "real" telescope. Not being solid, it's certainly useless for dew control or to prevent light trespass on the corrector plate. But it would allow you to place a picture of Saturn (or the Enterprise) there.

The October 5th Star Party

We were fortunate, after many clouded-out events this year, to have a perfect night: cloudless skies, crisp fall weather, no wind, not much humidity and an attractive sliver Moon that set just after sunset. The fine conditions brought out about fifteen telescopes and many members of the public. For the first time in several years, the club's 20" Obsession Dobsonian reflector, now sporting encoders and an AstroDevices Nexus DSC, made an appearance, set up by Jordan Webber and Paul Alimena. Besides wonderful views of M13, M27, M57, M81 and M82, the view of Saturn at 250X was astonishing. The shadow of the narrowly angled rings was projected on the planet's surface as a thin, sharp, black line. The ringed planet appeared almost three-dimensional.

Your editor made photos after dark of some of the attendees, painting subjects after dark with a red light.






Just after sunset, Bob Kelly, WAA's Vice President for Field Events, pointed out the 3-day old crescent Moon just above the trees, and to its upper right, about eight lunar diameters away, -4.0 magnitude Venus (just to the left of the large tree). All images were made with a Sony DSC-RX100 camera.

Saturn in November

This is the month to check out Saturn. The ringed planet passed opposition on September 8th, when it rose at sunset and culminated (transited the meridian) at midnight. In November it will be well-placed for viewing in the evening, culminating at 40° elevation throughout the month. Its distance from Earth will increase, making the disk a bit smaller than its maximum of 19.6 arcseconds at opposition in September. With distance increasing and the ring plane closing, the planet loses brightness, but at magnitude +0.8 to +1.0 it's still plenty bright for viewing and imaging.

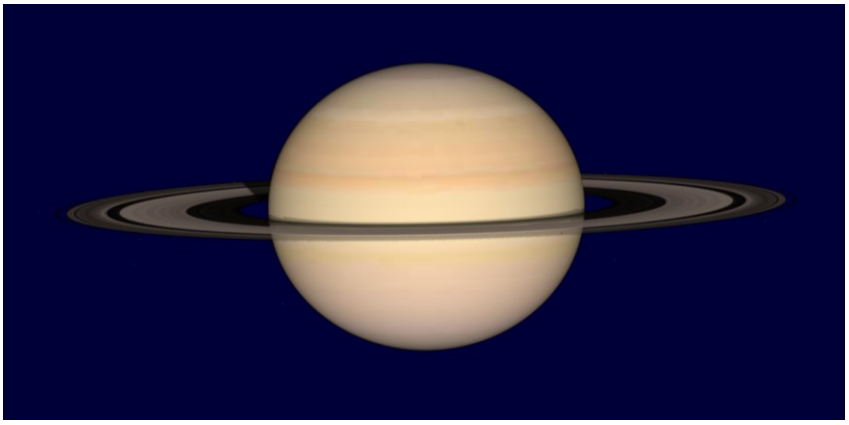
Date	Sunset	Elevation at sunset	Meridian transit (Culmination)			
			Time	Elevation	Magnitude	Disk diameter
11/1/2024	17:49 EDT	37° 26'	21:07	40° 03'	+0.8	18.4"
11/15/2024	16:34 EST	39° 54'	19:11	40° 01'	+0.9	18.0"
11/30/2024	16:26 EST	39° 07'	18:13	40° 08'	+1.0	17.5"

Saturn's brighter moons should be visible in moderate-aperture scopes. The brightest moons are

Moon	Magnitude (at planetary opposition)
Titan	8
Rhea	9
Tethys	10
Dione	10
Iapetus	10.5
Enceladus	11.5
Mimas	12.5

Use the on-line tool from Sky & Telescope (https://skyandtelescope.org/wp-content/plugins/observing-tools/saturn_moons/saturn.html) or their app for iOS or Android to identify the satellites. The phone apps are more attractive and informative than the on-line page, and of course you will want to be at the scope when trying to identify the moons.

There will be a conjunction of the Moon and Saturn on November 10, 2024. At 23:13 (11:13 p.m.) the planet will be just 7 arcminutes from the limb of the 70% illuminated waxing gibbous Moon. It will be a challenge for photographers because of the differential brightness of the two bodies.



Saturn in November, as simulated in Cartes du Ciel

Show Saturn to your friends and neighbors. They will be amazed! And send us any images. Use the technique of "lucky imaging" with a telescope of long focal length to capture a video file that you can stack and sharpen with software such as Autosatkkaert!3 and Registax. ■

From the Editor — Larry Faltz

If you look at the news feed on your phone, you might get, as I do, a large number of astronomy and physics related news items. It's one way to keep up with astronomy progress without going to sites like SkyandTelescope.org or universetoday.com.

Many of the science stories that appear are timely and interesting, but I've noticed that interspersed among credible astronomy news stories are a few designed more to titillate than educate. Some of the headlines are shills to get you to make an investment in Apple News or some pay-for web site by enticing you to find out how "your consciousness is connected to the entire universe" or how scientists "just spotted evidence of negative time." The Great Web Brain is trying to pick your pocket as much as it wants to inform or entertain you. Some of the oddest items come from sources one would think have little to do with astronomy: *Business Insider* and *Popular Mechanics* foremost among them, at least on my phone. I always thought *Popular Mechanics* was about lathes. The science in these stories is often reasonable, but editorial extrapolations can be rather fantastic. Anyway, I already had a negative time experience, called my first marriage (during which time my consciousness was disconnected from the universe).

Quantum mechanics may be indeed fantastic, in the formal definition of the word, but it still follows very precise mathematical rules. The math is everything. As the great Richard Feynman was wont to say about QM, "Just shut up and calculate." At a minimum, to appreciate it you need to know matrix algebra and complex numbers. You can learn that stuff with a bit of effort, more successfully if your brain is young enough to develop the neural connections needed to grasp abstract concepts. A good introduction to the mathematical language of quantum mechanics is the series of lectures by Stamford professor (and Bronx Science graduate) Leonard Susskind on YouTube. But basic scientific concepts depend on basic mathematics, which ought not to be difficult. This brings me to an item from the astronomy/physics feed on my phone that piqued my interest, something that involves quantum physics but at a much simpler mathematical level than, say, the Schrödinger equation.

A headline from web site InterestingEngineering.com, which seems to have both informative and titillating articles, appeared on my phone one day in September. It dramatically announced:

Oxford Ionics sets new world record, slashes quantum errors by 1,300%.

The story describes how a quantum computing company associated with the physics department of Oxford University in the UK had developed a new protocol that could detect and reject faulty qubits. The protocol improved on previous efforts by showing a "13-fold reduction" in something called quantum state preparation and measurement, which goes by the unfortunate acronym SPAM.

However, it should be obvious that the headline is absurd. You can't reduce something by 1,300%. Once you've reduced it by 100%, there's nothing left! You can have a 13-fold reduction from some prior value, but that means you have one-thirteenth of the original number or amount, a 92.4% reduction. If there were 1000 errors to begin with, there are now 1000/13, or 76.9 (let's round to 77 since you can't have 0.1 errors, although in quantum mechanics maybe you can.)

Oxford Ionics achieved SPAM fidelity of 99.9993%. That means there were only 7 errors out of a million. A 13-fold reduction would mean there had previously been just over 100 errors per million, or an accuracy of 99.9900%. The story is fine, but headlines are usually written by someone other than the story writer, in this case a guy who needs some help understanding percentages. It surely would be "interesting engineering" to achieve a 1,300% reduction in anything.

InterestingEngineering.com offers news items, podcasts, courses and other features. Some stories about scientific or engineering advances predict fantastic and maybe unbelievable outcomes. The story "*Catalyzed fusion system produces electricity, can run indefinitely, claims UK firm*" seems to be utterly credulous and reminded me of the perpetual bread machine that the Devil, Nick Shadow, sells to Tom Rakewell in Igor Stravinsky's opera *The Rake's Progress*. The site tries to appeal to our inner nerd. They sell a cap with the message "Never trust an atom…they make up everything" and you can buy a T-shirt imprinted with "May the F=ma be with you." Wear one of these and you'll never get a date. ■

Aurora over Westchester, October 10

A coronal mass ejection (CME) from Active Region 3848 on October 8th arrived at Earth at 11:15 a.m. EDT on October 10th with a velocity of nearly 2.9 million miles per hour. The Space Weather Prediction Center, a division of the National Oceanic and Atmospheric Administration predicted auroras extending as far south as Alabama and California. The Editor's niece saw an aurora in Knoxville, Tennessee.

Here are some of the many images made by WAA members. We're showing one per member, and choosing from among the fine photos wasn't easy. Photos tend to enhance the saturation of the red wavelengths of the aurora, but there was plenty of visible red color in the sky, and some green, waxing and waning as the evening progressed. What a show!

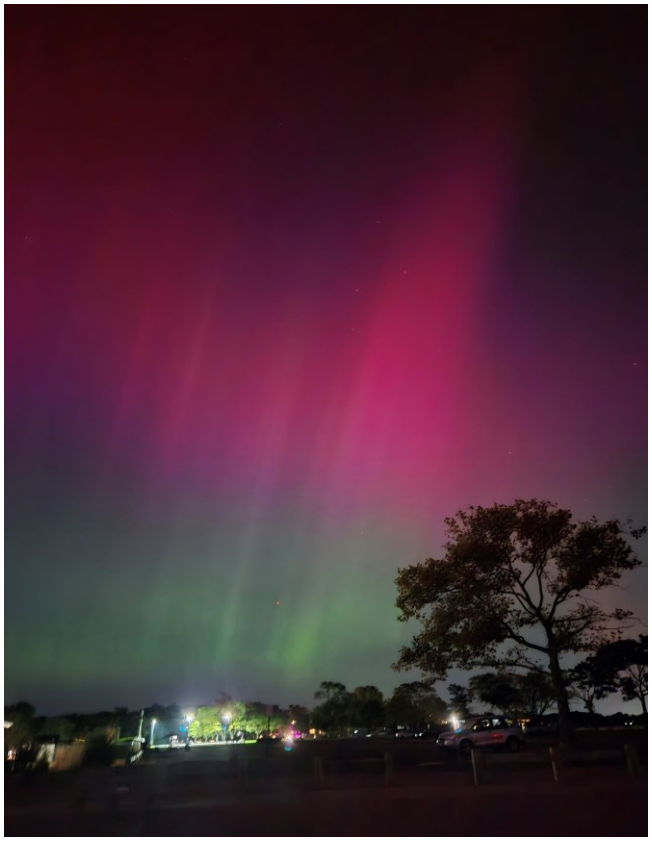
↑ Bob Kelly, Ardsley

↑ Jordan Webber, Rye Brook

↑ Ireneo Fante, Brookfield, CT

↑ Mike Lomsky, Wilton, CT

↑ Mary-Ann Feller, Ward Pound Ridge Reservation



↑ Eva Andersen, at Westport, CT

↑ Steve Bellavia, Mattituck LI

Steve posted a YouTube video with multiple images.
https://www.youtube.com/watch?v=TPt_5Y1Bgz8

↑ Marc Favreau, Greenwich

↑ Melinda Battle & Peter Castleton, Pound Ridge

↑ Rick Bria, Salisbury, CT

↑ Mitch Feller, Ward Pound Ridge Reservation, looking east. Jupiter is just rising above the trees, with Capella above and to the left, the V-shaped Hyades to the right and the Pleiades above it.

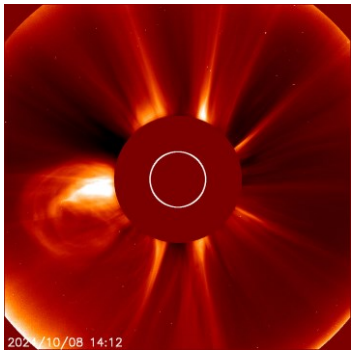
↑ John Paladini, Lake Mahopac

↑ Larry Faltz, Ward Pound Ridge Reservation

↑ Srikanth Srinivasan managed to see an aurora at WPRR on Sunday, October 6^{h}, triggered by two CMEs from Active Region 3842 that occurred on October 3rd.

About the aurora

Solar Cycle 25 is nearing its peak, with sunspot numbers substantially higher than predicted. Increased solar magnetic activity resulted in a class X1.8 solar flare on the east limb of the Sun on October 8th. This was the largest flare to date in SC 25, even larger than the one that brought auroras to our area in May.

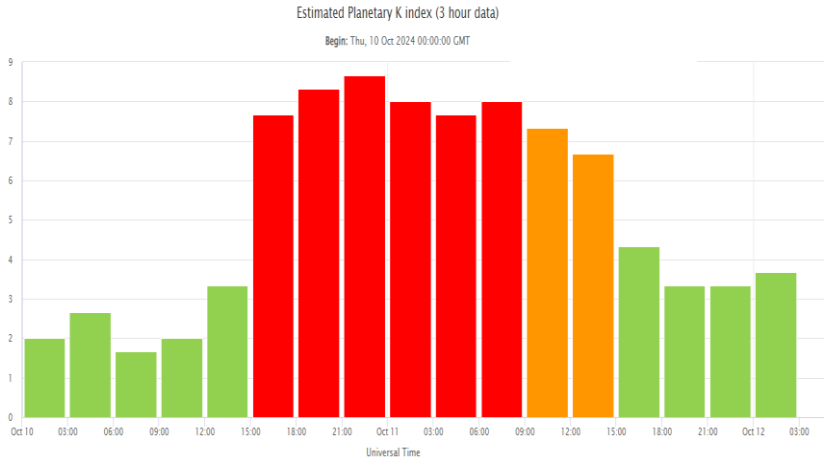


Solar and Heliospheric Observatory LASCO C2 image showing the October 8th solar flare (9 o'clock).

Solar flares affect all the layers of the solar atmosphere: photosphere, chromosphere and corona. Intense magnetic recombination events in sunspot areas ("active regions") heat the solar plasma to temperatures above 10 million K, and its contents (protons, electrons and other ions in the solar atmosphere) are accelerated to nearly the speed of light. Electromagnetic radiation across the entire spectrum, from gamma rays to radio waves, is also emitted. Flares are often, but not always, associated with coronal mass ejections, in which an average of 1.6×10^{12} kg of matter in the corona is flung into space. When these charged particles reach the Earth, the magnetosphere directs them into the upper layers of the atmosphere, where the oxygen and nitrogen atoms are ionized and fluoresce in the auroral colors and patterns. Since the magnetosphere is essentially a bar magnet, the solar particles are directed towards the Earth's polar regions.

At higher altitudes, the oxygen line at 630 nm dominates the auroral emission. Lower down, a green emission from a different ionized oxygen state at 557.7 nm is seen. The human eye is more sensitive at this lower wavelength, and many auroras are distinctly green. The October 10th aurora was decidedly red, and so most of the ionization occurred in the upper atmosphere, at least in our area. If the solar particles reach even lower parts of the atmosphere, ionization of nitrogen produces a blue light at 428 nm.

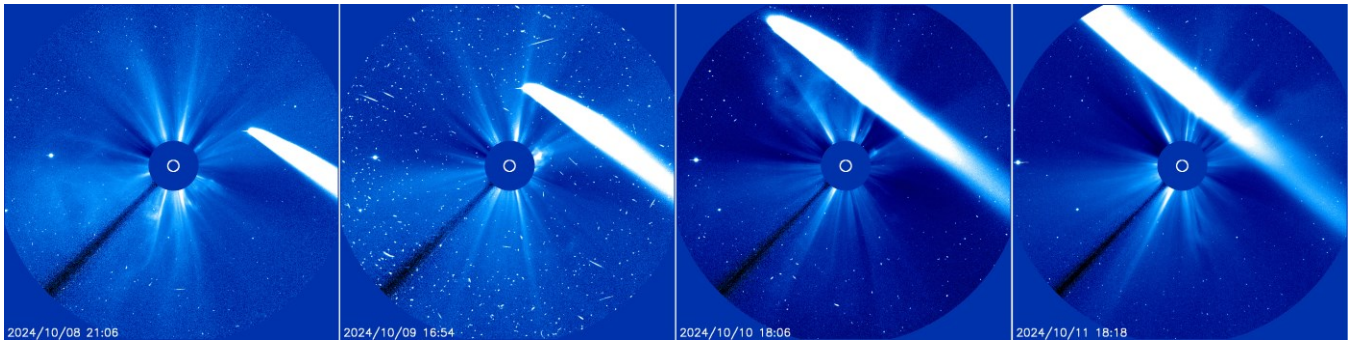
Moving electric particles generate their own magnetic field, which interacts with the Earth's field. Magnetometers detect alterations in the Earth's field, the strength of which is quantified as the K (or Kp) index. The index runs from zero to nine. A higher K index means the aurora will be stronger and more likely to be seen farther away from the poles. The October 10th aurora reached a K index of 8.5. Thes graph below was downloaded from NOAA's Space Weather Prediction Center in the evening of October 11th.



There are also rating systems for the strength and disruptive effects of geomagnetic storms, solar radiation storms and radio blackouts. See https://www.swpc.noaa.gov/noaa-scales for an explanation. This storm was rated G4. For a deep dive into science of the aurora, go to https://www.swpc.noaa.gov/content/aurora-tutorial.

-LF

Comet C/2023 A3 Tsuchinshan-ATLAS



Comet C/2023 A3 Tsuchinshan-ATLAS, a visitor from the Oort Cloud, was in the morning sky when it passed perihelion on September 27th (see Steve Bellavia's 9/30 image the September 2024 SkyWAAtch, page 5). It was then visible for a few days in the LASCO C3 camera of the Solar and Heliospheric Observatory (above). By October 11th it emerged into the western sky at dusk and by the 12th it was high and bright enough (magnitude possibly 0 on 10/12) for WAAers to photograph it. It rose higher each night for the next couple of weeks but lost brightness as it moved away from the Sun. In very dark, non-light polluted skies it was visible for another couple of weeks.

Here is a selection of the many images made by WAA members.

↑ Steve Bellavia (10/12)

↑ Mitch Feller (10/12)

↑ Larry Faltz, from Rockwood State Park Preserve in Sleepy Hollow. (10/12)

↑ Jordan Webber (10/12)

↑ Pierre-Yves Sonke (10/14) Mario Cuomo (Tappan Zee) Bridge.

Mike Cefola (10/14) Jones Beach

↑ Steve Bellavia (10/14).

↑ Eli Goldfine (10/14) Larchmont, made with binoculars and cell phone

↑ Eva Andersen (10/14). From Croton looking across the Hudson towards Haverstraw

↑ Karen Seiter (10/15)

↑ Rick Bria (10/15)

↑ Katherine Baumgartner (10/15)

↑ Joe Geller (10/15)

↑Steve Bellavia (10/15)

↑ Larry Faltz (10/15)

↑ Eric Baumgartner (10/15)

↑ John Paladini (10/16) SeeStar S50

↑ Olivier Prache (10/16) SeeStar S50

↑ David Parmet (10/16)

↑ Steve Bellavia (10/16) Custer Institute, LI

↑ Eva Andersen (10/16) Main St., Manning Iowa. Eva's husband Erik and their friend Terri Johnson.

Steve Bellavia made a short video on the 14th. See it at https://is.gd/bellC2023A4. Also, see Robin Stuart's technical discussion of the geometry of comet tails and anti-tails in the May 2023 SkyWAAtch, p 11

About Comet C/2023 A3 Tsuchinshan-ATLAS

Discovery: 9 January 2023 at Purple Mountain Observatory (China); independently by ATLAS (South Africa) 22 February 2023, confirming the Chinese finding that had been considered "lost" for 6 weeks after the initial report. This is why the comet bears two names. Magnitude at discovery 18.7 (China), 18.1 (ATLAS). It was subsequently found to be present on Zwicky Transient Facility images from 22 December 2022 when it was magnitude 19.2-19.6.

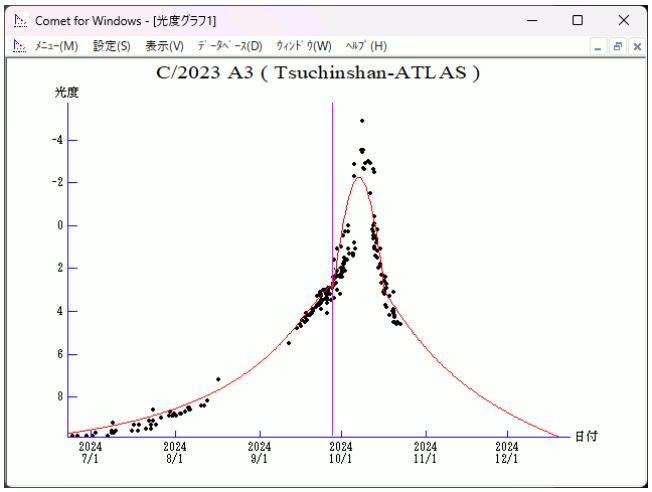
Origin: Oort Cloud, estimated aphelion 270,000 AU.

Perihelion: 0.3914 AU (36.4 million km), 27 September 2024 18:00 UT.

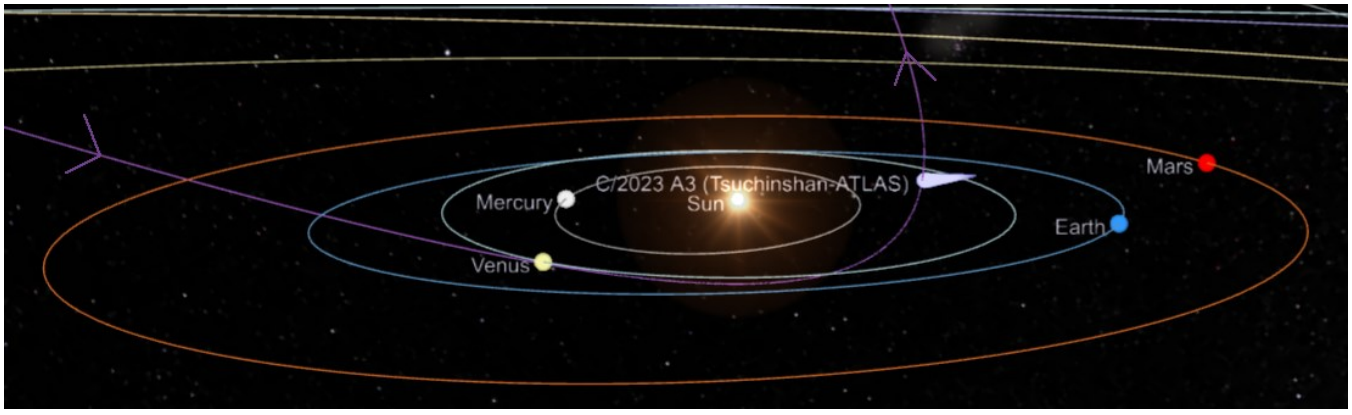
Closest distance from Earth: 71 million km, 12 October 2024 15:18 UT.

At peak magnitude -4.9 on October 9th, it was one of the brightest comets of the last hundred years, but it was only 3° from the Sun and so visible only in the SOHO Lasco C3 camera as shown on page 17. By 10/11 it was sufficiently far from the Sun to be viewable. It crossed Earth's orbital plane on 10/14, which gave rise to the visible anti-tail as seen in the images by Steve Bellavia, Eric Baumgartner and John Paladini.

It will be a telescopic object low in the western sky through the end of December, perhaps 10th magnitude by Christmas.



Magntiude data from(aerith.net, as of 10/24/24. Black dots are observations; red curve, post-discovery estimates.



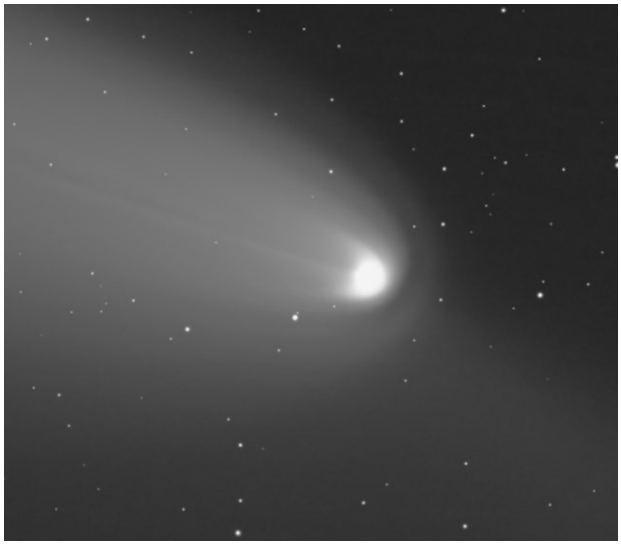
Position of the comet on October 12, 2024 at 7:30 p.m. EDT

Steve Bellavia's Hi-Res image of the comet

Steve writes:

I had been patiently waiting for Comet C/2023 A3 Tsuchinshan-ATLAS to get into a dark part of the sky, with no Moon, to perform longer integration imaging. October 20th was the first opportunity to do that, and the first time I used a "real" telescope, with more aperture and focal length than my smaller camera lenses. I deliberately over-sampled (a little) as I did not want to miss any details, and the comet is plenty bright for that.

I also got an opportunity to show friends the comet with 15 x 70 binoculars, and it was also still naked-eye visible. We were able to see that incredibly long tail, even as it got very low in the sky.



The original image file is a 7800 x 5200 pixel image (40 Megapixels), where you can see the "hood" (or hoods) in front of the nucleus, as well as some fine details in the tail. Here is an enlargement of the coma, showing the detail.

Equipment & technique: William Optics FLT-91 Triplet refractor, William Optics Flat 6A-III 0.8X reducer-flattener, bringing scope to f/4.7, 432mm focal length, ZWO ASI 294MM camera, Baader UV-IR luminance filter, 120 x 30 seconds. October 20, 2024, 7:02 PM to 8:08 PM EDT, Southold, NY. Sky: Bortle 4, Transparency 7/10, Seeing 3/5, 12 °C, no wind, moderate dew.

Is C/2023 A3 Tsuchinshan-ATLAS the Comet of the Century?

It seems these days like every comet, at least upon discovery, is touted as the "Comet of the Century." A true Comet of the Century ought to have most, if not all, of these characteristics: very bright and ideally bright enough to be seen in daylight (probably -5 magnitude); good separation from the Sun near its maximum brightness so it can be seen in a dark sky at night; a substantial tail; good visibility for the populated centers of the Northern Hemisphere (where the majority of Earthlings are located…yes, this is chauvinistic, sorry); viewability in the evening hours (since that's when most people are awake to see it); and more than passing interest by the general public. C/2023 A3, was too near the Sun at maximum brightness for visual observation. It was perhaps magnitude 0 when it reached the evening sky on the 10th and was above magnitude 3 through the 16th. The ubiquity of light pollution poses a huge obvious problem for comets.

The honorific "Great Comet" is often applied to particularly bright comets but has no formal definition. Among the Great Comets of the second half of the 20th century, Ikeya–Seki (1965), West (1976), Hyakutake (1996) and Hale-Bopp (1997) might vie for the Comet of the Century title. McNaught in 2007 would surely have had the appellation had it been visible in the Northern Hemisphere, but it only made its great show south of the equator and was always rather close to the Sun. NEOWISE in 2020 was very good, but not the intensity of West, Hyakutake or Hale-Bopp. Of the comets of the past that qualified as the best of their centuries, we can propose the Great Comet of 1680; the Great Comet of 1744 (with multiple tail striae, like McNaught), Donati's Comet (1858) and the 1910 appearance of Halley's Comet, during which Earth passed through its tail, generating a peculiar and fascinating reaction among segments of the public. There are, of course, other contenders.

Comets today are discovered by large survey telescopes when they are dimmer than magnitude 18, and predictions of their visibility can be overly optimistic, with enthusiasm magnified for commercial purposes: Halleyscopes anyone? It didn't help that Kohoutek in 1973 and Halley's pass in 1986 were overhyped. We also have the recent example of C/2012 S1 ISON, an Oort Cloud comet that, after being touted for months as the "Comet of the Century," broke up when rounding the Sun on November 28, 2013, shown live on-line with SOHO's LASCO C3 camera to a huge audience. See "Some Thoughts on Comet ISON" in the January 2014 SkyWAAtch, page 11.

Here's a gallery of a few Great Comets.

↑ Halley's Comet in the Bayeux Tapestry. The text "ISTI MIRANT STELLA" means "They wonder [at the] Star." The comet made its appearance in May 1066. Comets were traditionally considered bad omens.The English were defeated by the Normans at the Battle of Hastings on October 14, 1066. The tapestry, 210 feet long, was probably made in 1077. Worth a trip!

↑ Halley's Comet as the Star of Bethlehem in the Scrovegni Chapel, Padua. Giotto saw it in 1301.

↑ Great Comet of 1618. This was the comet (one of three that year) that Galileo and Grassi fought over.

↑ Great Comet of 1680 (painting by Lieve Verschuier, Rotterdam Museum)

↑ Great Comet of 1744 (1877 engraving)

↑ Great Comet of 1811 (engraving by H.R. Cook)

↑ Donati's Comet 1858 (William Turner painting). See the February 2022 SkyWAAtch page 13 for more on this important comet.

↑ Halley's Comet 1910 (Giuseppe Cali painting)

↑ Comet Ikeya–Seki 1965 (NASA)

↑ Comet Hale-Bopp 1997 (Michael Stecker)

↑ Comet West 1976 (Richard West)

↑ Comet McNaught 2007 (ESO)

↑ Comet Hyakutake 1996 (Fred Espinak)

↑ Comet Neowise 2020 (Lowell Observatory)

Whether or not Tsuchinshan-ATLAS is the “Comet of the Century” it qualifies as a Great Comet and was an impressive sight for quite a few evenings. —LF

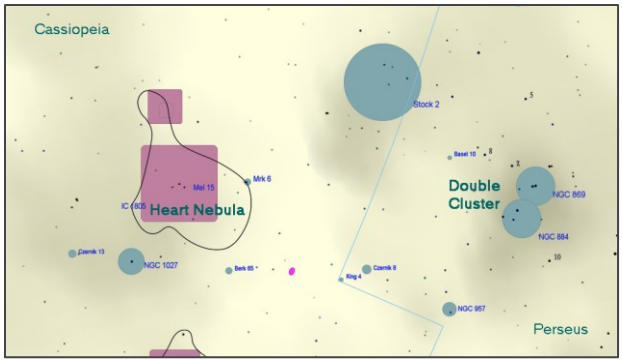
Images by Members

Cover Image: The Heart Nebula by David Parmet

David made the cover image of IC 1805 on September 3rd at the Mid-Hudson Astronomy Club's observing site in Lake Taghkanic State Park, just east of the Taconic State Parkway. The park is 83 miles north of White Plains.

The image is composed of 60 three minute light frames, and 20 each darks, flats and biases. He used a William Optics Redcat 51 f/4.9 4-element refractor, ZWO ASI533 MC Pro camera and UV/IR filter. The image, covering 2.57 x 2.56 degrees was processed with PixInsight.

The Heart is an emission nebula in the Perseus arm of the Milky Way, some 7,500 light years from the Sun. It is powered by a cluster of hot O stars at its center, which are catalogued as Melotte 15 and Collinder 26. The cluster was first listed in the 2nd Index Catalog (1908) where it is described as a "nebulous cluster," discovery credited to E. E. Barnard. The 2nd Index Catalog describes IC 1805 as "Cl, co, eL neby extends f" which means "Cluster, coarse, extremely large nebulosity extends following" (i.e. east). It's not far from the Double Cluster, this month's Deep Sky Object of the Month (page 5).



The bright knot of nebulosity in the lower right corner of the image is the Fish Head Nebula, which is catalogued as NGC 896. It was first seen on November 3, 1787 by William Herschel, who listed it as catalogue number III 695 (class III for "very faint nebulae") and located it in the constellation Camelopardalis (the Giraffe), but it now lies within Cassiopeia. Recall that the constellation borders were not fixed until 1930. The nebula is six degrees from the closest edge of the Giraffe's northern border. Herchel described it as "eF. pL. iF." which means "extremely Faint, pretty Large, irregularly Faint."

The Heart Nebula is an enormous object, nearly 2 degrees across. It was completely ignored by Stephen James O'Meara in his *Deep Sky Com*panion series of observing guides, and by Phil Harrington in *Cosmic Challenge*, and of course it doesn't appear in Burnham's *Celestial Handbook*, which is a guide to the visual sky. Sue French, in *Deep Sky Wonders*, notes that IC 1805 contains about 40 stars 13 arcminutes across, with the brightest member about 8th magnitude. At 17x with a 3.6° field of view in a 105-mm refractor under very dark skies, she is able to see "extensive nebulosity in and around the cluster," which is enhanced with an OIII filter. Given that the magnitude of the Heart is listed as 18.3, this would seem impossible, even for one of the most experienced and talented observers of all time, but we suspect the magnitude is simply not correct, although it is a very faint object. French's article describes the two loops of IC 1805 without giving it its "Heart" nickname or its other rarely-used appellations, the Valentine {obvious} and Running Dog (huh?). Her column was first published in *Sky & Telescope* in January 2003, but an image of the "Heart Nebula" using that name was published in S&T in July 2001. The origin of nicknames for astronomical objects are sometimes hard to pin down. When there is more than one name, over time one usually wins out. The main exception is Messier 17, which still is referred to as either the Swan or the Omega nebula, with both names persisting in common usage.

Messier 33 by Bill Caspe

Bill made this image under Bortle 2 skies at the Medomak Astronomy Retreat and Seminar (MARS) in Washington, ME during the first week of September. William Optics Redcat 61 f/4.9 Petzval telescope, ASI2600MM camera, Antlia 3nm LRGB filters. 10x300 second subs on each RGB channel. The field of view is 2.19 x 1.49 degrees.

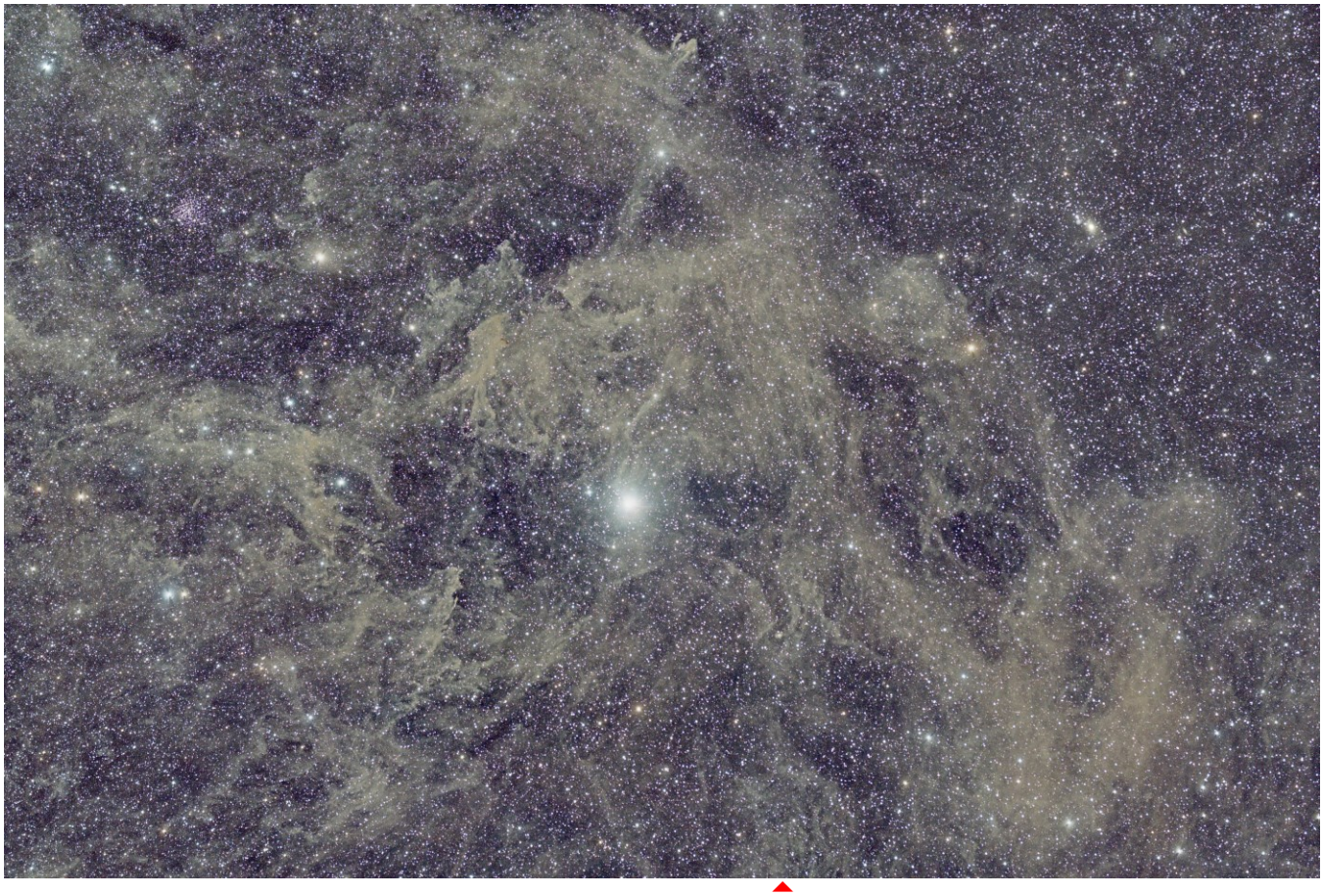
Messier 33 (NGC 598) in Triangulum, also called the "Triangulum Galaxy" and once known as the "Pinwheel" (now reserved for M81), with a mass of 5×10^{10} $M_\odot$ is the is the smallest of the three spiral galaxies in the Local Group, after the Andromeda Galaxy (M31, mass $1.5\pm0.5\times10^{12}$ $M_\odot$) and the Milky Way galaxy (mass 8.9×10^{11} to 1.54×10^{12} $M_\odot$). All the other members of the group are dwarf galaxies, including the Large Magellanic Cloud, which is classified as a "Magellanic Spiral" and is almost massive enough to be considered an ordinary galaxy.

M33 is about 2.7 million light years from us, approaching at a velocity of 179.28 kilometers/second (calculated from the redshift of -0.0005980). This is slower than the approaching velocity of M31 (297.1 km/s, redshift -0.000991). M33 is 750,000 light years from M31 and interacted with it some 2-4 billion years ago. A simulation of the Andromeda-Milky Way interaction doesn't show M33 participating in the collision that will take place in about 5 billion years. See it at https://svs.gsfc.nasa.gov/30955.

There are many areas of active star formation within M33, evidenced by the large number of red HII regions in Bill's image. Some of these have individual NGC and IC catalog identifiers. The most prominent of them is NGC 604, the bright knot in the lower spiral arm at 7 o'clock. In 2018, M33's star formation rate was calculated to be 0.45 ± 0.10 $M_\odot$/year, at least during the last 100 million years. This is substantially higher than M31.

The core of M33 does not contain a supermassive black hole even though the center of the galaxy is ultraluminous in the X-ray band. At most there is an intermediate-mass object with a mass of 1,500 $M_\odot$.

Milky Way Shine by Robin Stuart



This image shows the Integrated Flux Nebula (IFN) near the north celestial pole. The field of view is 10¼° x 6¾°. The IFN is illuminated by the combined glow of the Milky Way's approximately 100 billion stars falling on clouds of dust and gas lying above the plane of the galaxy. It is the galactic analog of Earthshine on the Moon. An image showing the IFN in the region around M81 and M82 can be found in the September 2023 SkyWAAtch, page 26.

The bright star near the upper center of this image is Polaris, which currently sits 38 arcminutes from the pole. Near the upper left corner of the frame is NGC 188 (Caldwell 1), the *Polarissima Cluster*. It lies at a distance of 5,400 light years from Earth and sufficiently far above the plane of the Milky Way that it is largely unaffected by galactic gravitational interactions that cause open clusters to drift apart after a few million years. With an estimated age of around 6.8 billion years, it is one of the most ancient open clusters known. Also present in the image but visible only as a 15th magnitude point of light is the galaxy NGC 3172. At declination 88° 57.5' it is the most northerly object in the New General Catalog, earning it the title of *Polarissima Borealis*. Triangulate the red markers to find it.

The image was made on the night of September 30th at Eustis, Maine with a ZWO ASI2600MC camera attached to a Rokinon 135-mm f/2 telephoto lens. It might be expected that guiding would be easy near the pole as things don't move very much. However, as shown in the September 2023 SkyWAAtch, page 13, field rotation rate is inversely proportional to the sine of the polar distance, which can lead to elongated star images even for relatively short exposures and a well polar-aligned mount. Individual subframes were limited to 3 minutes each. Away from the pole, 5-minute subframes produce acceptable star images with the 135-mm lens for tracked but unguided exposures. The camera was centered on right ascension (R.A.) 3h 39m and declination 89°. The R.A. was chosen to be the local sidereal time (LST) at the start of the imaging session plus 7 hours to ensure that the German equatorial mount would not need to perform a meridian flip. The session started about half an hour after astronomical twilight and the camera was allowed to soak over the hours of darkness. The final image is a stack of 144 3-minute subframes for a total of 7 hours, 12 minutes.

— Robin Stuart

NGC 891 via Seestar by John Paladini

Your Editor took the liberty of fiddling with the image John submitted (see below) as a "Seestar stress test."

The original (left) was made from 51 ten-second subs (the Seestar's usual imaging routine) with a UV/IR cut filter in the light path. It's cropped from 1774 x 1009 pixels to 659 x 560 pixels, just 20% of the original image area (left). This is the equivalent of having the 200 mm focal length Seestar working at 1000 mm. I also jazzed up the tone intensity curve a little.

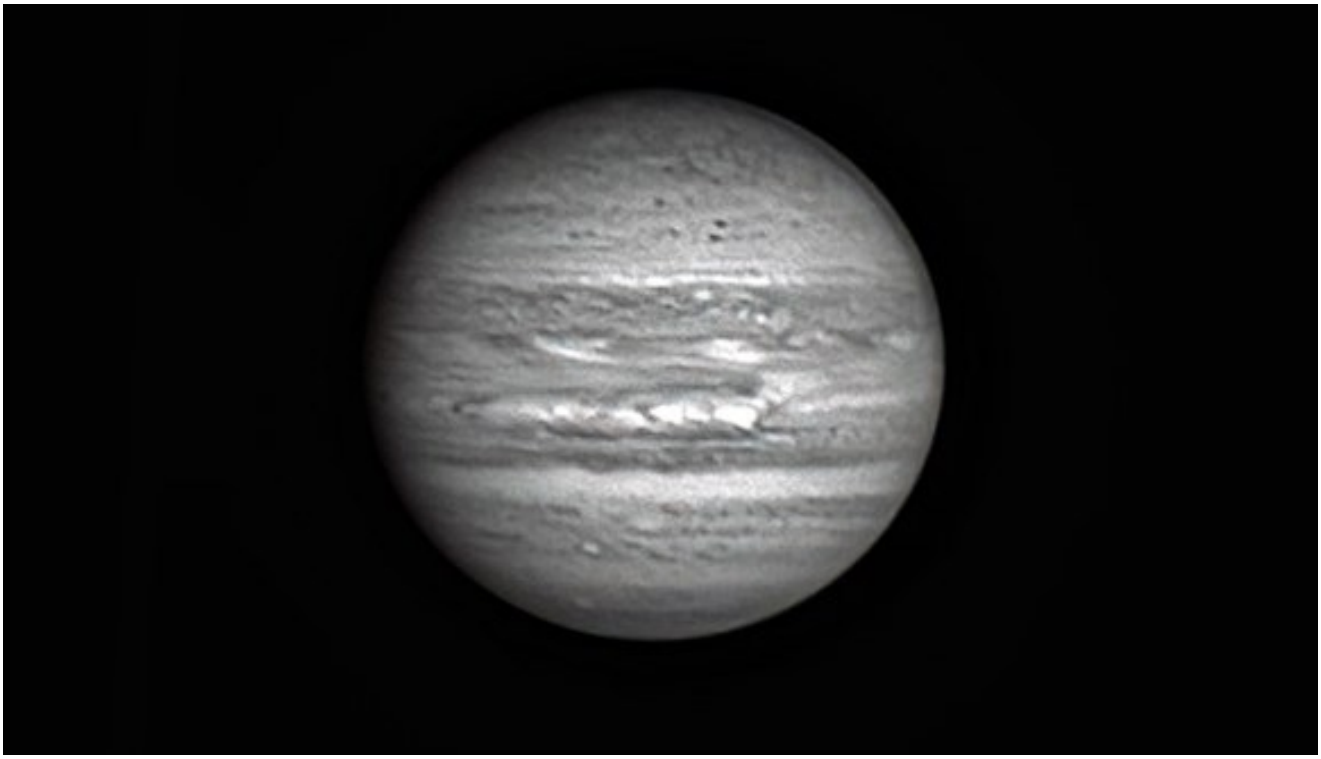
The enlarged image holds up nicely for screen display, which is the *raison d'être* of small "smart" telescopes.

The Dumbbell Nebula by Larry Faltz

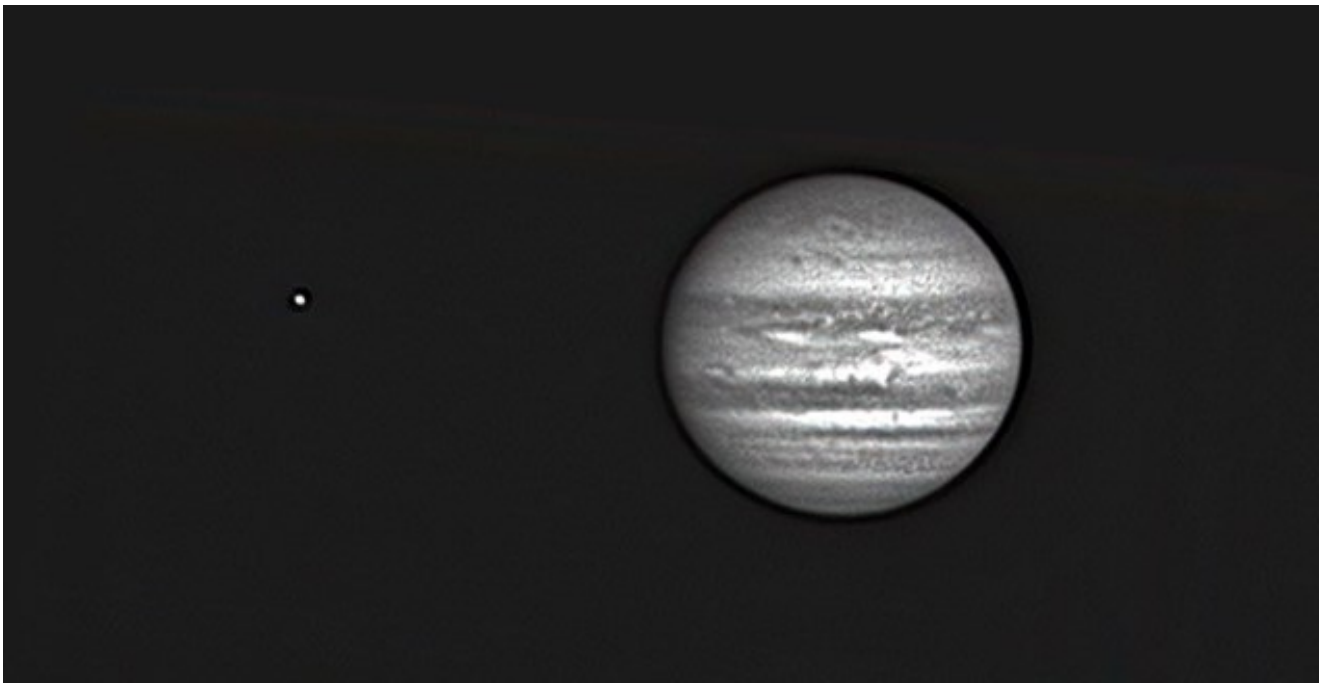
I wanted to get a much larger image scale for the 8.0 x 5.6 arcminute planetary nebula M27 than could be provided by my 105-mm f/7 refractor (FL=735 mm), so I mounted my old Orion Apex 127-mm f/12.1 Maksutov (FL=1540 mm) on the ZWO AM5 mount and ASIAir Plus. The camera was an ASI533MC Pro cooled to -20° C, with a UV/IR cut filter in the optical path. The image, made at Ward Pound in August, is composed of 51 30-second exposures, with 20 flats, 10 darks and 10 bias frames, stacked live with the ASIAir app. The resulting fit file was copied from the ASIAir's memory to a Windows computer, processed and stretched in Siril and the output tif file denoised with Topaz DeNoise AI, with final color adjustment and cropping in Photoshop Elements. The cropped image (58% of the original by area) is 20.6 x 19.6 arcminutes.

I found that obtaining a sharp image is a bit difficult with a telescope that focuses by moving its mirror. These scopes can have a degree of "focuser backlash" that causes tiny turns of the focus knob to make major changes, or no change at all. If I want to use this scope for imaging in the future, I may add a helical focuser to make final focus adjustments. An alternative is to use a refractor and a Barlow to get an equivalent focal length.

Monochrome Jupiter by John Paladini



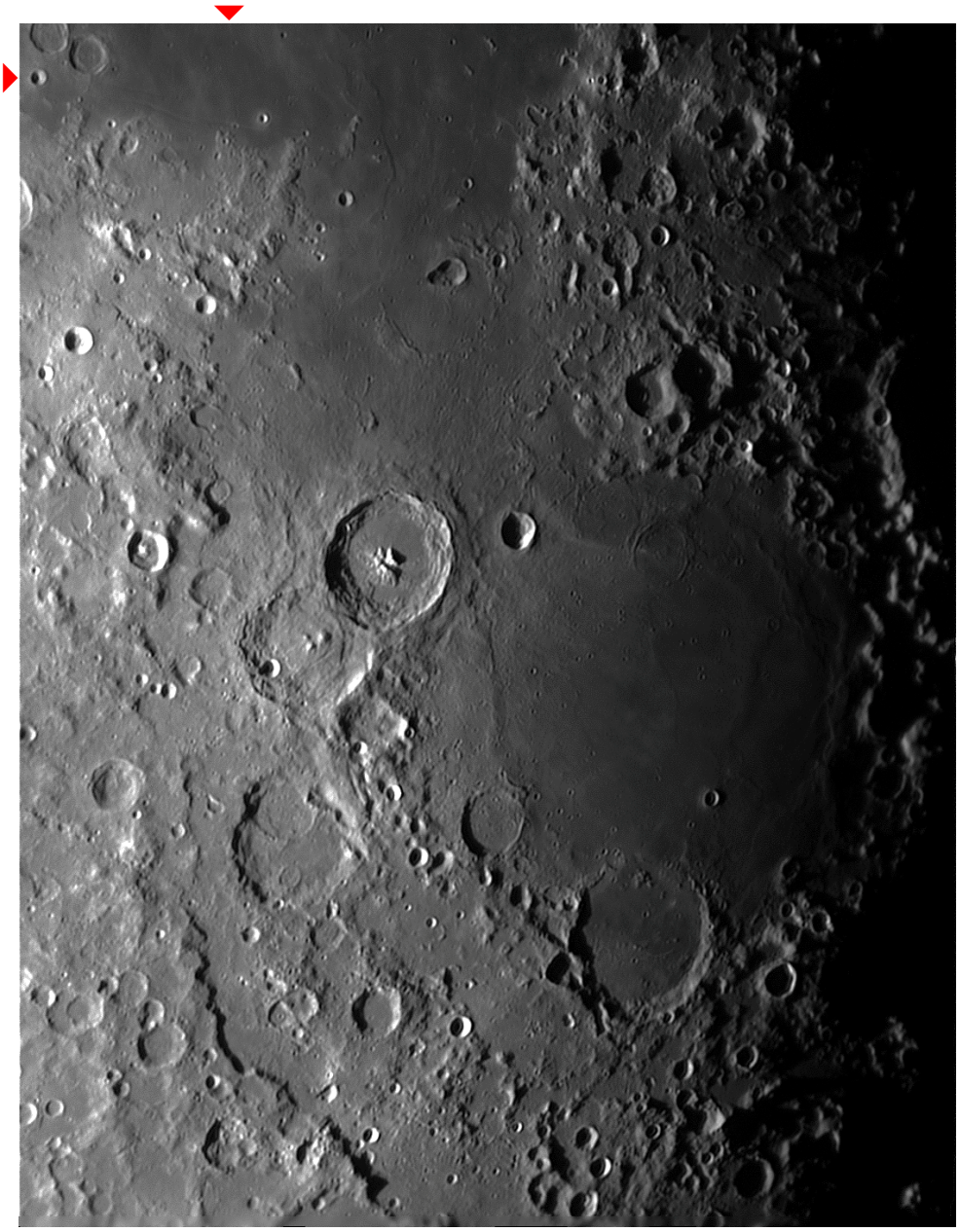
Celestron 9.25” SCT, ASI290MM camera, red filter, September 5, 2024, Mahopac, NY



Criterion Dynascope RV-6 (6” f/8 reflector), ASI290MM, red filter, September 5, 2024. Io is to the left.

These images were made at John’s home in Mahopac with two of John’s many telescopes.

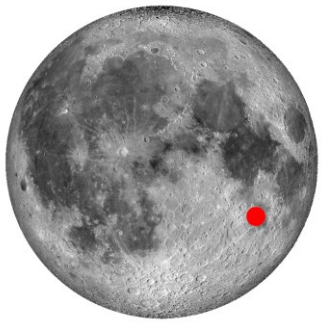
Near the Terminator of the 19-day Moon by Larry Faltz



As the Moon passes into its waning phase, the shadows of familiar objects and locations take on a different perspective.

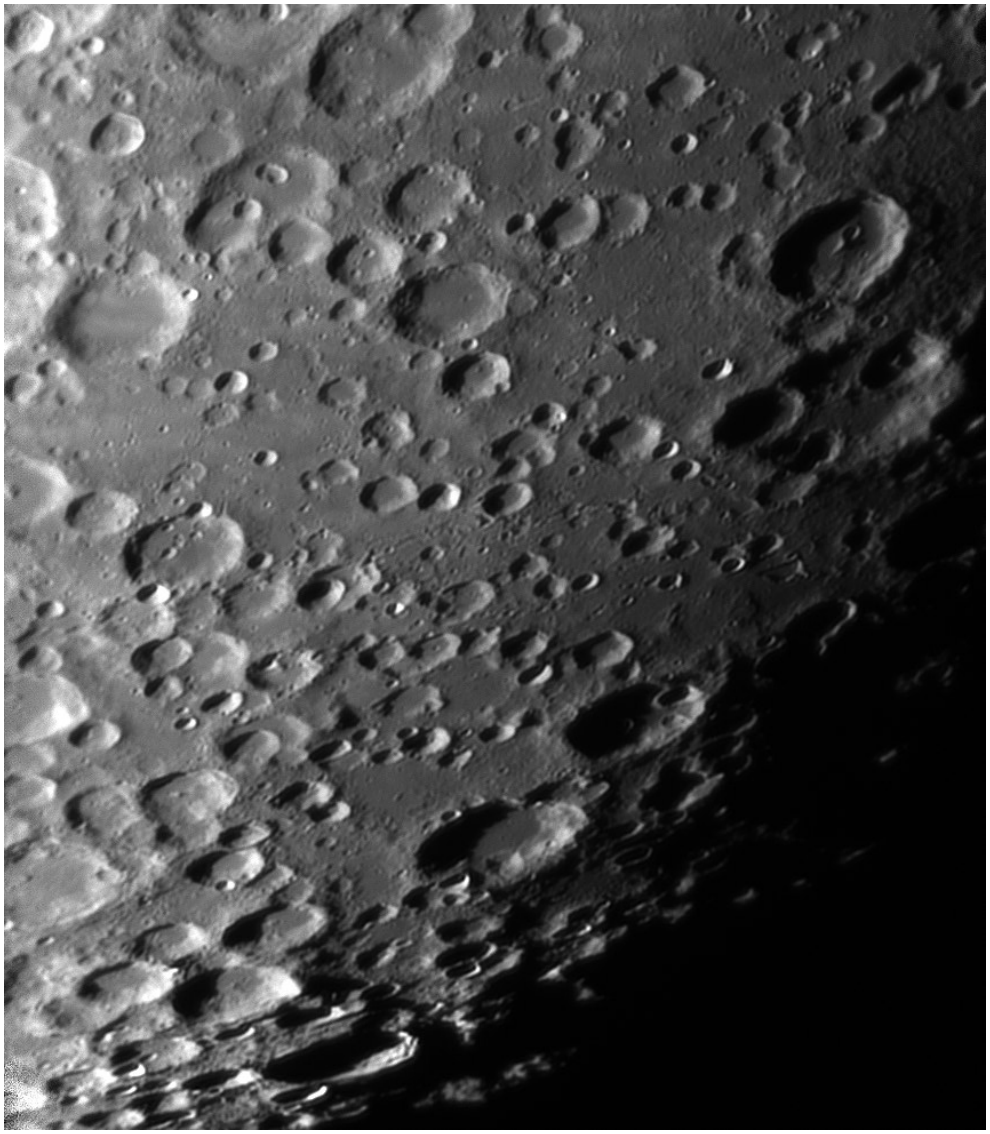
We get a good look at the 212 mile (350 km) wide Mare Nectaris and the prominent crater Theophilus (diameter 100 km) with its distinct central peak complex. The well-defined smaller crater to Theophilus' east is the 17-mile wide Madler. On Theophilus' left edge is the eroded crater Cyrillus.

Cutting diagonally across the lower left corner of the image is the Rupes Altai, which forms the actual rim of the Mare Nectaris. Between it and the large flat crater Fracastorius at the southern edge of the Mare Nectaris is the small, flat crater Polybius. Polybius was not an astronomer but a historian whose *Histories* is the main source for the Second Punic War (218-201 BC), which established Rome's hegemony over the ancient world. That ultimately led, 500 years later, to the adoption and subsequent dominance of Christianity in western culture. Although the Carthaginian general Hannibal famously marched his war elephants across the Alps and secured many victories in Italy, notably at Lake Trasimine and Cannae, his attack stalled and the conflict was only resolved at the Battle of Zama in North Africa, with Scipio Africanus the victorious Roman general. Polybius witnessed the final sack of Carthage in 146 BC at the end of the Third Punic War.



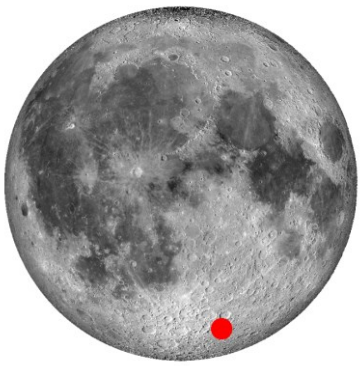
Fracastorius was a 16th-century Venetian physician, mathematician and astronomer who, among other notable things, gave the name to the disease syphilis and published the first description of the disease typhus.

At the top of the image is the southernmost part of the Mare Tranquillitatis. The Apollo 11 landing site, Tranquility Base, is at the intersection of the two red markers.



Along the Moon's southeast rim, a large number of small craters pepper the landscape. The four deepest craters form a line from north to south near the terminator. The most northern is Pitiscus, with the small well-defined Pitiscus A within it. Just below Pitiscus is the crater complex Hommel, the larger main crater holding four smaller craters. After a short gap, Mutus holds a well-defined Mutus V at its northern edge. Below Mutis is Manzinus, with Manzinus E the small sharp crater on its southern edge. At the bottom of the image, the southern edge of Schomberger is still illuminated although shadow has crept across the floor of the crater.

In the upper left corner of the image, the 45-mile wide Cuvier lacks a central peak, but shows a whitish streak across it that is in line with the ejecta radiating from the crater Tycho, which is some 300 miles to the northwest. Just to its northeast is Clairaut, with Clairaut A on its rim and Clairaut C and D inside of it. The larger flat crater to its northeast is Barocius. The lava-filled crater between Cuvier and Pitiscus is Baco, named for the 13th century English scholar and polymath Roger Bacon, known as Doctor Mirabilis. He is credited with inventing the scientific method, although for practical purposes experimental science did not really begin until the beginning of the 17th century.

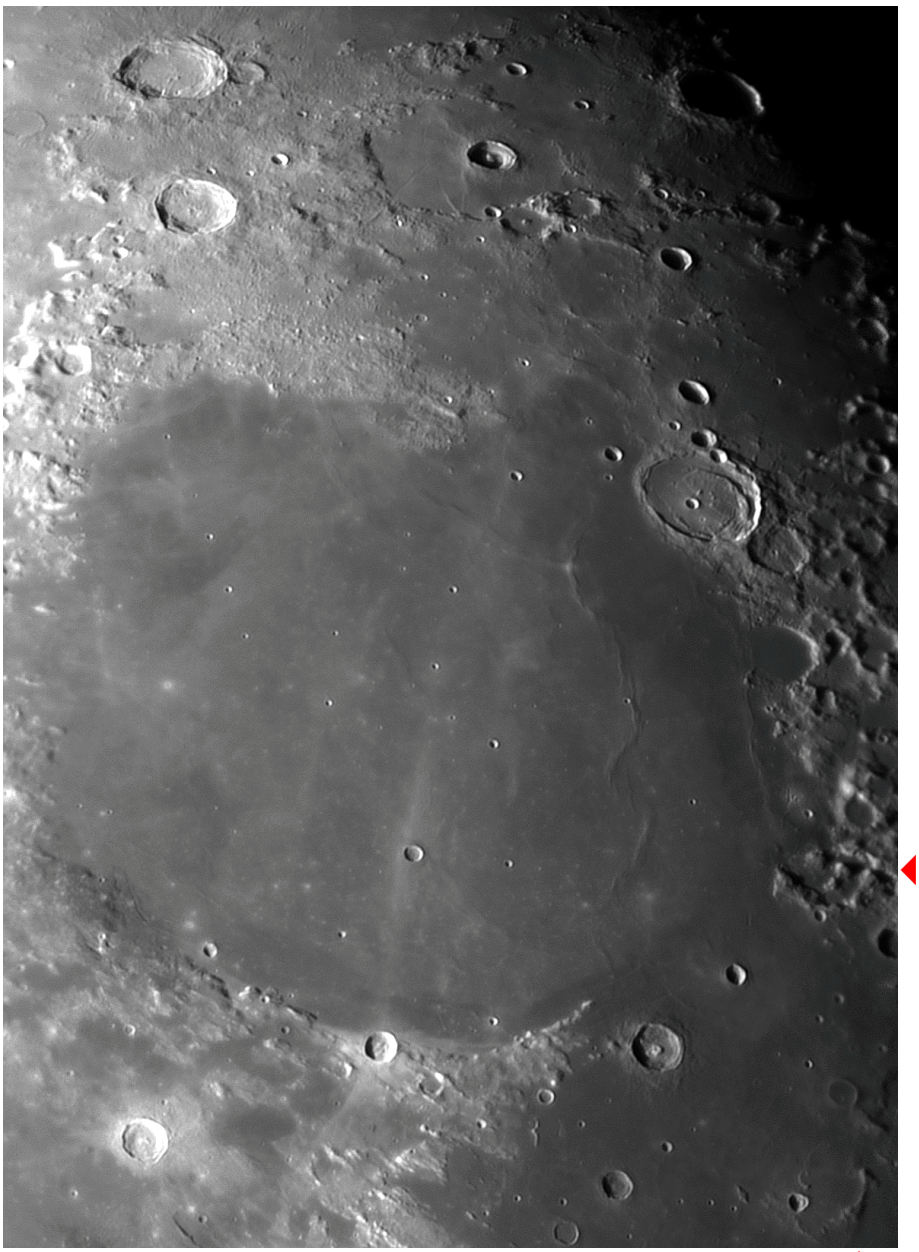


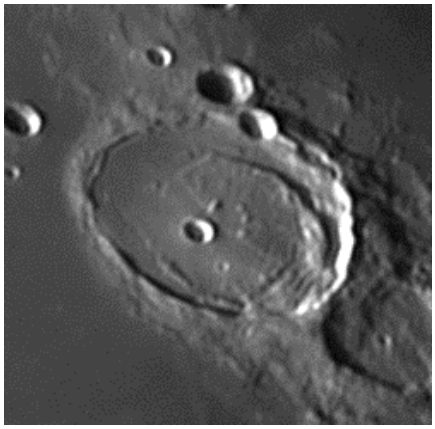
The lunar highlands are higher and older than the maria, and thus more heavily cratered, although some of the flat interiors suggest lava flows within those craters. However, their albedos are higher than the floors of the larger lunar maria.

These images were made on September 21st around 11:30 p.m. with an Orion Apex 127 Maksutov telescope (f/12.1, 1540 mm focal length) and ASI290MM camera. A red filter was used. Stacked in Autostakkaert!3 and slightly wavelet sharpened in Registax 6.1. Final tone adjustments in Photoshop Elements 2.0, a simple program I've had for 20 years, but it still works!

The **Mare Serenitatis** (Sea of Serenity) is 400 miles across. Its lava-filled floor is peppered by just a few small craters, the most prominent being the 10-mile wide Bessel. The white streak that runs from the small, sharp crater Menelaus on the edge of the Mare and across Bessel is a ray of ejecta from Tycho, which is over 2000 km away.

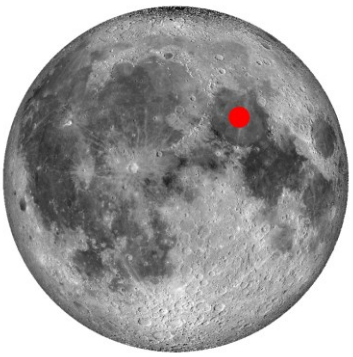
The well-defined crater on the upper right is Posidonius, which is filled with a system of *rimae* (rilles).





Posidonius

Above the Mare Serenitatis is the Lacus Mortis (Lake of Death) with the prominent crater Burg. The crater in the upper right corner of the image, its interior in complete shadow but its eastern rim catching the last rays of the setting Sun, is Hercules.



The two craters on the upper left are Eudoxus and, to its north, Aristoteles (better known to us as Aristotle). Eudoxus conceived of the system of epicycles for planetary motion and organized the original 48 Greek constellations. A contemporary of Aristotle, none of his original works survive but his planetary system is reported in detail in Aristotle's *Περὶ οὐρανοῦ* (in Latin, *De Caelo*, in English *The Heavens)*, one of the seminal works of philosophy and cosmology that influenced (and misled) thinking about the solar system until Copernicus.

At the lower right of the image, the Mare Serenitatis meets the Mare Tranquillitatis. The craters Plinius (left) and Dawes guard the channel between the two maria, with the Promontorium Archerusia on the left and the Mons Argaeus, a mountain massif, on the right. Above Argaeus is the Taurus-Littrow Valley, the landing site of Apollo 17 (triangulate red markers).

Research Highlight of the Month

George, SP, et. al., Space radiation measurements during the Artemis I lunar mission, Nature 634: 48-52 (2024). Open access: https://www.nature.com/articles/s41586-024-07927-7

Abstract:

Space radiation is a notable hazard for long-duration human spaceflight. Associated risks include cancer, cataracts, degenerative diseases and tissue reactions from large, acute exposures. Space radiation originates from diverse sources, including galactic cosmic rays, trapped-particle (Van Allen) belts and solar-particle events. Previous radiation data are from the International Space Station and the Space Shuttle in low-Earth orbit protected by heavy shielding and Earth's magnetic field and lightly shielded interplanetary robotic probes such as Mars Science Laboratory and Lunar Reconnaissance Orbiter. Limited data from the Apollo missions and ground measurements with substantial caveats are also available. Here we report radiation measurements from the heavily shielded Orion spacecraft on the uncrewed Artemis I lunar mission. At differing shielding locations inside the vehicle, a fourfold difference in dose rates was observed during proton-belt passes that are similar to large, reference solar-particle events. Interplanetary cosmic-ray dose equivalent rates in Orion were as much as 60% lower than previous observations. Furthermore, a change in orientation of the spacecraft during the proton-belt transit resulted in a reduction of radiation dose rates of around 50%. These measurements validate the Orion for future crewed exploration and inform future human spaceflight mission design.

NASA limits astronauts to a total radiation dose during their entire career in space to 600 mSv. [One chest X-ray is 0.1 mSv.—Ed.] This limit allows for an increased risk of cancer of 3% above baseline for a 35 year-old woman. So there is an increased cancer risk from spaceflight, but it's small. However, long-term residence during spaceflight, or in residence on the Moon or Mars, will carry substantial risk.

The Artemis I test flight from November 16 to December 11, 2022, made two lunar flybys and spent 6 days in lunar orbit. On board were two female mannikins fitted with radiation detectors. A substantial amount of data was collected, showing that there was effective shielding in certain capsule orientations. One limitation was that there were no solar flares or major cosmic ray fluxes during the mission. Flights to the Moon would not be excessively risky, but the problem of long-term exposure for extended flights or planetary habitation remain.

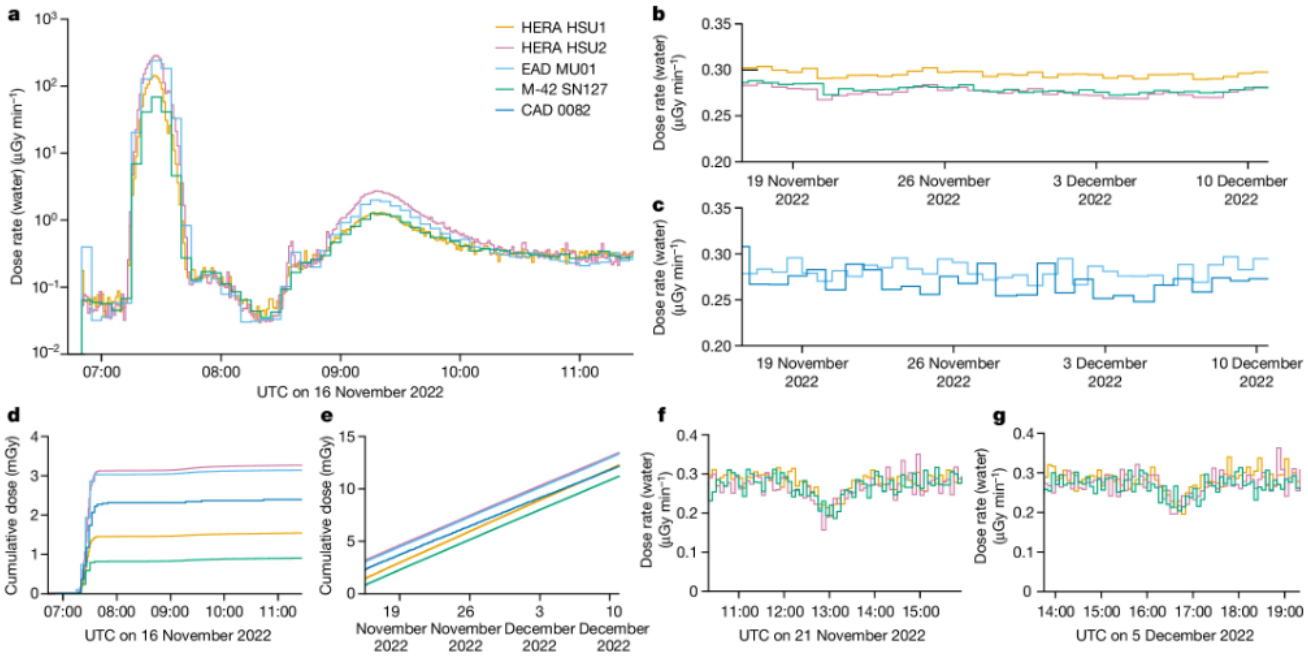


Fig 2 from the paper: Absorbed radiation dose measurements on Artemis 1. Use the link at the top of the page to download the paper and read the caption.

Member & Club Equipment for Sale

Item	Description	Asking Price	Name/Email
Celestron StarSense Explorer DX 102AZ	Brand-new condition 102-mm f/6.5 refractor, uses cell phone to find objects. Slow-motion stalks for movement. The original owner installed a laser finder bracket for easier alignment (laser included). 25-mm and 9-mm eyepieces, red-dot finder, aluminum tripod with tray. Instrument is still in production, see it on Celestron's web site. Lists for $469. Great starter scope. Donated to WAA.	$150	WAA ads@westchesterastronomers.org
iOptron IEQ45Pro equatorial mount head	Traditional German equatorial mount. Includes Go2Nova 8407 hand control (358K objects), counterweight, QHY PoleMaster for easy polar alignment, but no tripod. Pay-load 45 lbs (without counterweight). Mount weighs 25 lbs. This model is also discontinued by iOptron. The current very similar mount (GEM45) lists for $2,598 (plus $269 for the PoleMaster). A 1.75" iOptron "Lite-Roc" steel tripod costs $350; piers and other tripods are available. Specs for the IEQ45 are still on iOptron's web site. Donated to WAA.	$400	WAA ads@westchesterastronomers.org
iOptron CEM25P equatorial go-to mount	A complete IOptron "center-balanced" equatorial mount. Includes Go2Nova 8408 hand control with >50,000 objects, 4.7 kg counterweight, heavy-duty tripod, QHY PoleMaster for easy polar alignment (laptop required). Low periodic er-ror. Payload 27 lbs (without counterweight). The mount weighs 10.4 lbs. Excellent condition. Although this model is discontinued by iOptron, the current very similar mount lists for about $2,097. Details of the CEM25P and an image are still available on iOptron's web site. Donated to WAA.	$350	WAA ads@westchesterastronomers.org
Orion 6-inch f/5 reflector on EQ mount	Little used, if at all. Solid EQ4-type non-go-to equatorial mount with an electric RA drive as well as slow-motion stalks. The setting circles are large and very readable, un-like most EQ mounts for scopes of this size. An image of the mount head is here. 9 and 25 mm Plössl eyepieces, polar alignment scope with reticle, Orion flashlight, finder, coun-terweights, gold-colored aluminum tripod (missing tripod tray, but you can make one easily enough). Good intro scope for a bright young person. A 6" f/5 OTA alone costs at least $300. Donated to WAA.	$125	WAA ads@westchesterastronomers.org
ADM R100 Tube Rings	Pair of 100 mm adjustable rings with large Delrin-tipped thumb screws. Fits tubes 70-90 mm. You supply dovetail bar. Like new condition, no scratches. See them on the ADS site at https://tinyurl.com/ADM-R100. List $89.	$30	Larry Faltz lfaltzmd@gmail.com
1.25" Filters	Thousand Oaks LP-3 Oxygen III (2 available)	$50	Eugene Lewis genelew1@gmail.com
	Astronomic UHC (2 available)	$75	
	High Point Neutral Density (2 available)	$10	

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 re-serves the right not to list items we think are not of value to members. All receipts for items owned by WAA goes to support club activ-ities.

Buying or selling items is at your own risk. WAA is not responsible for the satisfaction of the buyer or seller. Commercial listings are not accepted. Items must be the property of the member or WAA. WAA takes no responsibility for the condition or value of the item, or for the accuracy of any description. We expect but cannot guarantee that descriptions are accurate. Items subject to prior sale. WAA is not a party to any sale unless the equipment belongs to WAA (and will be so identified). Receipts from the sale of WAA-owned equip-ment support club activities. ***Prices are negotiable*** unless otherwise stated. Sales of WAA equipment are final. *Caveat emptor!*

SkyWAAtch is written entirely by human beings.