SkyWAAtch

The Newsletter of Westchester Amateur Astronomers

January 2023

Messier 81 by Arthur Miller

The giant spiral galaxy Messier 81 in Ursa Major was discovered by Johann Elert Bode in 1774, five years before Charles Messier and Pierre Méchain first saw it. It's known in astronomy vernacular as Bode's Nebula. It's 12 million light years distant. Appearing almost as wide as a full Moon, it shines at a magnitude of 6.94 and its core, at least, is easily seen by small telescopes. Arthur made this image in Arizona. See the December 2022 SkyWAAtch, page 17 for more information on his imaging setup, and page 17 of this issue for more of his work.

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

WAA January Meeting

Friday, January 13 at 7:30 pm

Cosmic Eras in the Infant Universe: What Was Happening During the First Billion Years?

Paul O'Connor
Instrumentation Scientist, Brookhaven National Laboratory

The more scientists discover about the ingredients that make up our Universe and the ways in which they evolved from a featureless gas to the systems of stars and galaxies that we see today, the more we recognize the need for new observations -- ones which can extend our reach across time and space to resolve questions at the foundations of fundamental physics. This has led to an effort within the High Energy Physics community, formerly concerned with particle accelerators to study the subatomic world, to build large facilities and instruments designed to tackle the big open questions of cosmology. This lecture will review progress on Large Synoptic Survey Telescope (Vera Rubin Observatory) construction, and will present several new instrument concepts for studying the physics of the early universe using the highly-redshifted radiation from atomic hydrogen which we observe in the radio frequency wavelength range.

Starway to Heaven

Ward Pound Ridge Reservation, Cross River, NY

Star parties resume in March 2023.

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

Editor: Larry Faltz
Almanac Editor: Bob Kelly
Copy Editor: Elyse Faltz
Editorial Consultant: Scott Levine
Editor Emeritus: Tom Boustead

WAA February Meeting

Friday, February 10 at 7:30 pm

How are Orbits Determined?

Dan Platt
Westchester Amateur Astronomers

New Members

Dina Carreras	Mahopac
Ellen Grogan	Pound Ridge
Drexel Harris	Jamaica, NY
Kingsley Krivonozka	Greenwich, CT
Mark Lane	Larchmont
Milagros Lecuona	White Plains
Steve Lin	Goldens Bridge

Renewing Members

Harry S. Butcher, Jr.	Mahopac
Giuseppe Colombo	Mamaroneck
Edgar S Edelmann	Tarrytown
Eileen Fanfarillo	Irvington
Peter Germann	Katonah
Jonathan Gold	Newcastle
Sharon and Steve Gould	White Plains
John Higbee	Ophelia, VA
Jeffrey Jacobs	Rye
Penny Kelly	Wappingers Falls
William Newell	Mt. Vernon
John Pasquale	Bedford
Robert Peake	Pleasantville
Srikanth Srinivasan	Mount Kisco
Trudy Swan	Yorktown Heightrs
Oliver E. Wayne and Elizabeth Scott	Cliffside Park, NJ
Lori Wood	Yonkers

Also In This Issue

ALMANAC For January 2023

Bob Kelly, WAA VP of Field Events


Bob Kelly

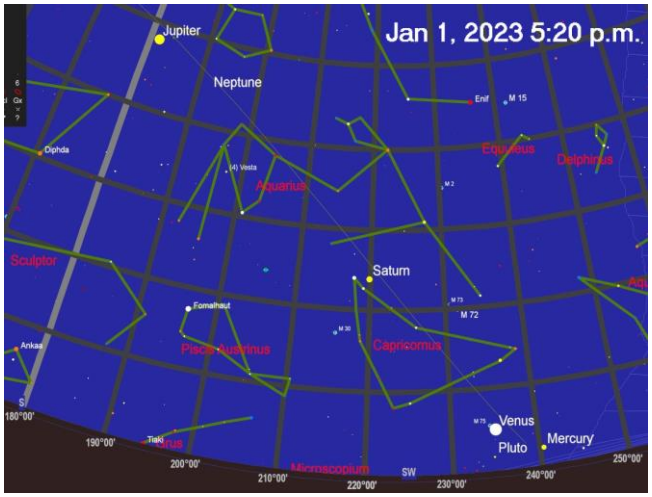

Full Jan 6


3Q Jan 14


New Jan 21


1Q Jan 28

To start the new year we get a chance to see all five planets in the early evening sky. Mercury's fall into the solar glare makes short work of this lineup. Saturn follows in early February, so see it while you can.



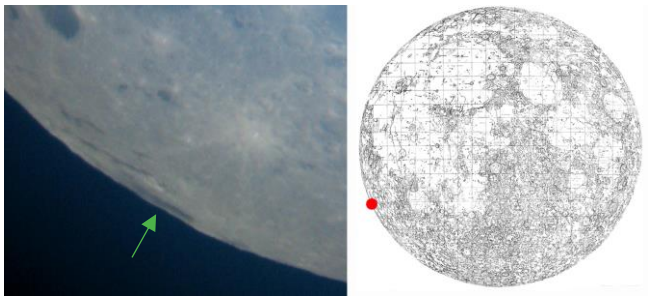
Mercury will celebrate the first evening of the new year only two degrees above the horizon 45 minutes after sunset. Mercury is heading for solar conjunction on the 7th. Mercury makes a second showing towards the end of the month, creeping into the morning sky and reaching greatest elongation on the 30th. That gives us two chances to see the fleet innermost planet this month. See page 27 for more information about Mercury.

Venus is five degrees up at that time. As the month goes on, Venus will stretch its separation from the Sun and get a bit higher in the twilight sky. Venus on the other side of the Sun from us and will have a slightly gibbous phase.

As **Saturn** heads off-stage toward its conjunction with the Sun in mid-February, it will pass up-and-coming Venus on the evening of the 22nd. You may need binoculars to pick out Saturn in twilight, less than a Moon-width from Venus. A telescope should show Saturn's moons **Titan** and **Iapetus**, now that Iapetus has its bright side facing us for the whole month of January. On the 22nd, Iapetus will be with Titan on the east side of Saturn, about twice as far from Saturn as Titan.

Jupiter is high and bright in the south-southwestern sky after sunset. There will be an opportunity to view some shadow transits. See page 26 for details.

We'll see the bull's eye of the **Moon's** Mare Orientale edge on in the lunar southwest as libration tips it toward us from the 13th through the 16th. It looks nothing like a bull's eye because of foreshortening.



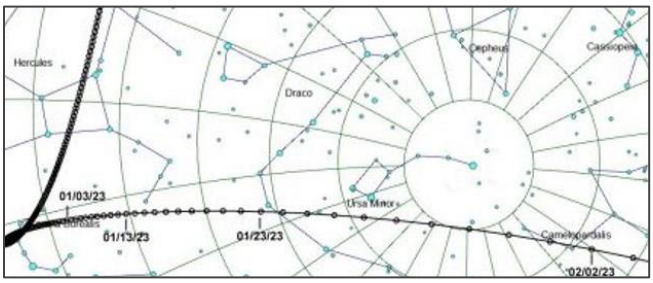
Bob Kelly's 2009 afocal image of the Mare Orientale (green arrow) and its location on the Moon's disc (red dot).

The **Quadrantid** meteor shower peaks for our area on the morning of the 4th. The just-past-full-Moon will reduce the number of meteors we can see. A few fireballs can happen, making this a shower worth a look before morning twilight begins. Keeping the Moon and other bright lights out of your view, if you can, will increase your chances of seeing a dozen or so meteors an hour. The Moon's brightness will keep the number down from the 60 or so an hour that could have been seen in a dark sky at the peak.

Mars is small, but bright at magnitude -0.3, rising in the evening sky. The Moon makes a close pass on the 3rd. But wait, there's more! Mars actually gets covered up by the Moon, again, but in the middle of the night on the 30th/31st for the southern United States, from Miami to Los Angeles. In our area, we'll see a close pass with Mars above and a bit further from the Moon than the December 2022 event.

Comet C/2022 E3 (ZTF) will be well placed in the northern sky this month, as it reaches peak brightness, perhaps 5th magnitude, near the end of January. At that time, it will be moving swiftly across the sky from night to night, passing through the gap between the Big and Little Big Dippers. Use the finder chart to locate C/2022 E3 in binoculars, and then, see

if you can spot it with the unaided eye.



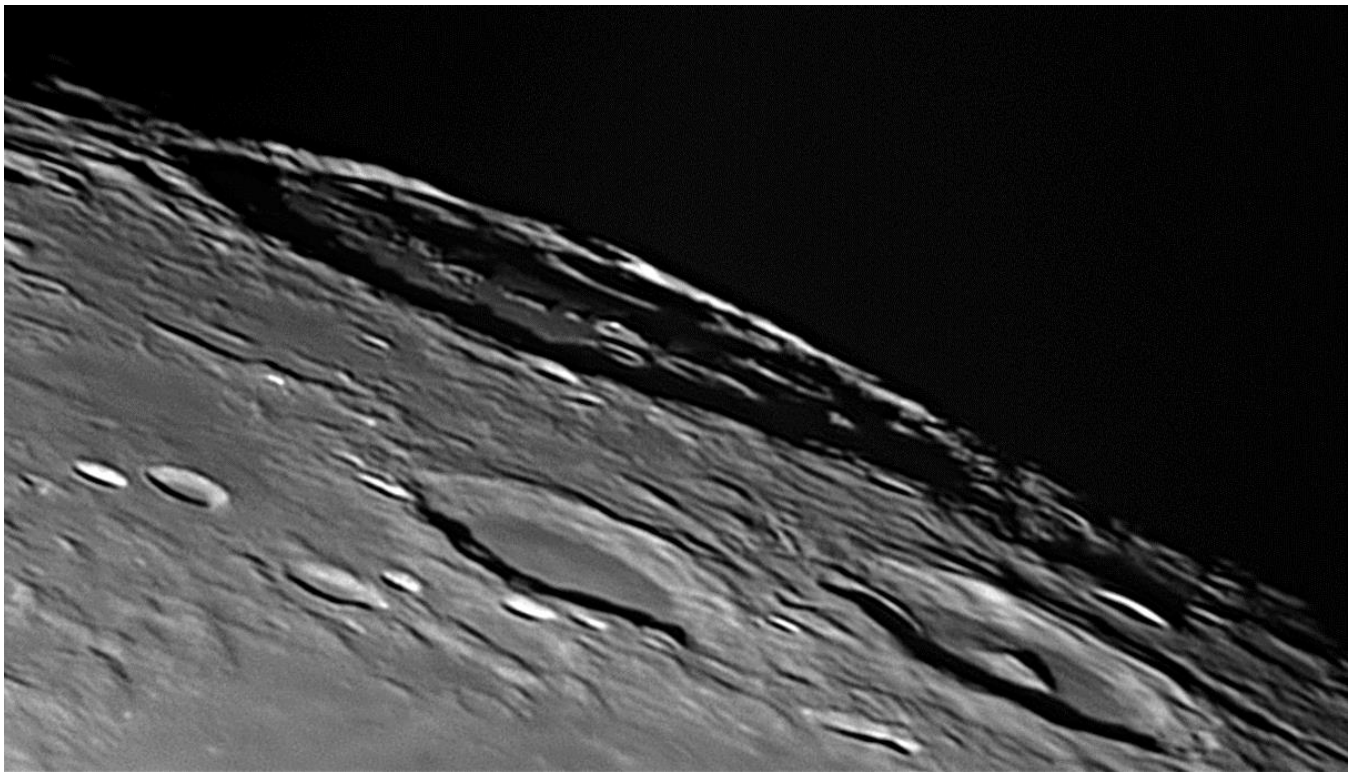
Path of Comet C/2022 E3 (ZTF)

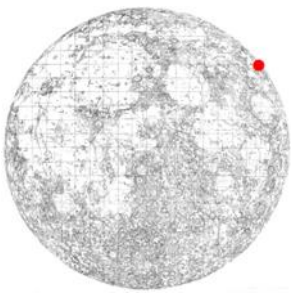
The **International Space Station** is visible in the morning dawn sky through the 8th and in the evening dusk starting on the 14th through the end of the month. It can be as bright as magnitude -3.7. China's space station **Tiangong** added laboratory modules in November. Now, the larger station reflects more light, making it as bright as magnitude -2.3. It will be visible for our area in the morning skies in early January and the evening in the second half of January.

Earth is **closest** to the Sun at 11:47 a.m. EST on the 4th, three percent closer than at aphelion in July. Morning sunrises will start moving earlier on the 4th.

The Moon's closest approach to the Earth for 2023 occurs January 21st, only one minute from the time of new Moon. Watch out for extreme high and low tides on and following that date. ■

Another Example of Foreshortening on the Moon's Edge, by Larry Faltz





The 177-km circular walled plain (impact crater) Gauss lies on northeastern edge of the Moon's face. Foreshortening distorts it into an ellipse. The crater is named for the German physicist and mathematician Karl Friedrich Gauss (1777-1855), who invented the magnetometer and whose name is used as the unit strength of the magnetic field. There are several small craters inside of Gauss. Their obliquely illuminated walls are easily seen in the image. Berosus and Hahn are the two foreground craters.

Celestron CPC800, 2X Barlow, ASI290MM camera. The 99% illuminated Moon was less than one day after full. Larchmont, NY December 8, 2022.

The WAA Hot Line: Call 1-877-456-5778 (toll free) for announcements, weather cancellations or questions.

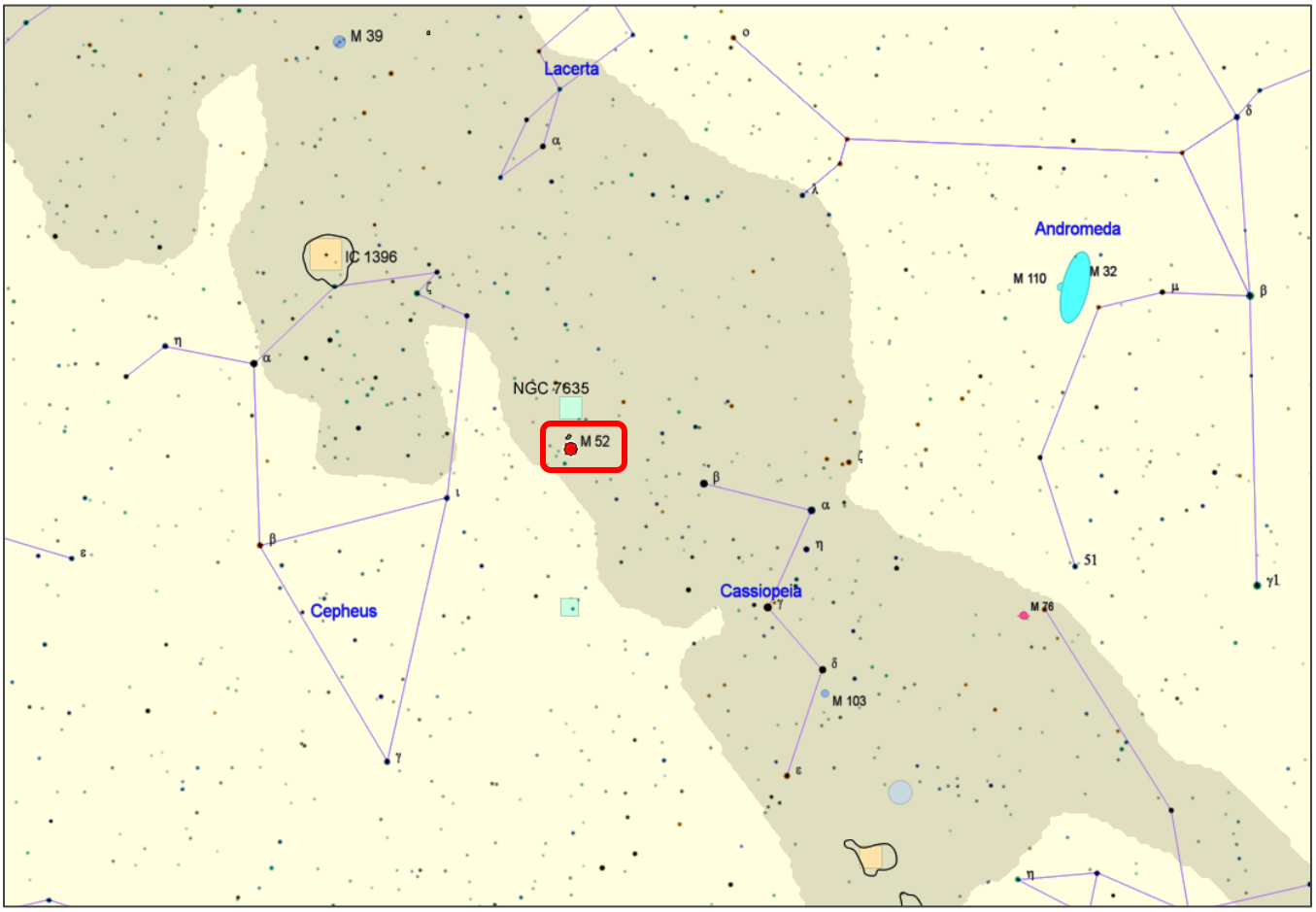
Deep Sky Object of the Month: Messier 52

Messier 52	
Constellation	Cassiopeia
Object type	Open Cluster
Right Ascension J2000	23h 24m 48.0s
Declination J2000	+61°
Magnitude	7.3
Size	13.0 arcminutes
Distance	4,600 LY
NGC	7654
Discovery	Messier, 1774

This cluster, in cluster-rich Cassiopeia, is not far from the often-imaged Bubble Nebula, NGC 7635. Its stars are not very concentrated centrally, and because it is in a fairly dense part of the Milky Way, it can be overlooked with a telescope. It does well with binoculars.

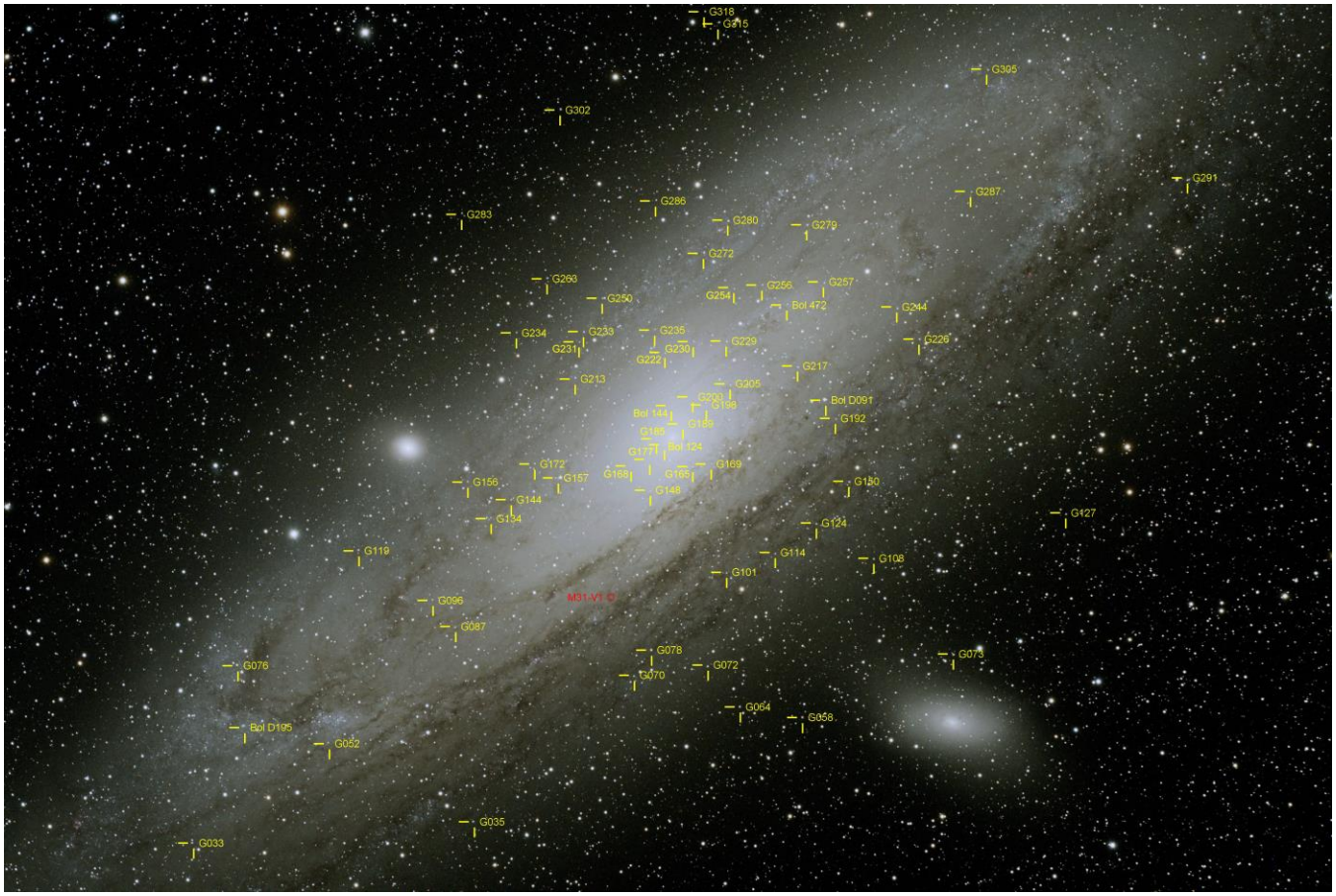
The bright F8 star BD +60°2532, magnitude 8.3, is a member of the cluster, whose age is estimated at 158.5 million years.

Visibility for Messier 52			
9:00 pm EST	1/1/23	1/15/23	1/31/23
Altitude	46° 56’	40° 31’	33° 35’
Azimuth	320° 34’	322° 08’	325° 32’



Exploring the Great Nebula in Andromeda

Robin Stuart



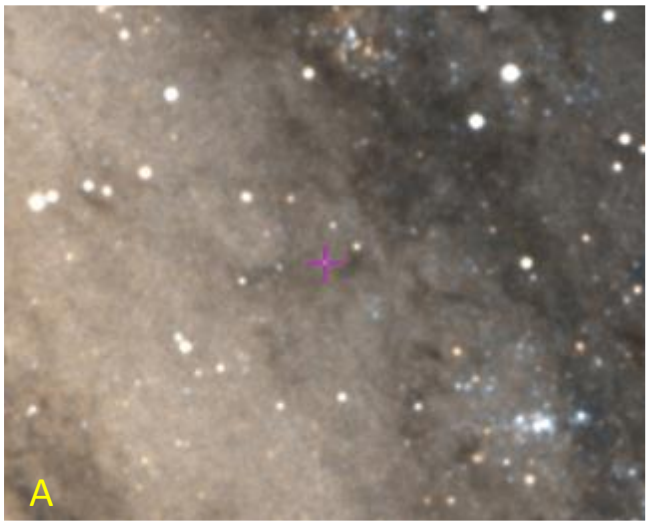
This image of M31, with its globular clusters labeled, was taken from Eustis, Maine with a ZWO2600MC cooled OSC camera through a TeleVue NP127. PixInsight's Photometric Color Calibration was applied which shows the galaxy in its natural tones and not in over-saturated psychedelic colors as galaxies are often depicted in the pages of *Sky & Telescope* and elsewhere. The default settings of the EZ HDR Script from the EZ Processing Suite in PixInsight were applied to reduce the brightness the galaxy's central bulge. Note the small bright region of the nucleus that remains above the label "Bol 124". Note also the nucleus and dust lanes visible in the satellite galaxy M110 at lower right.

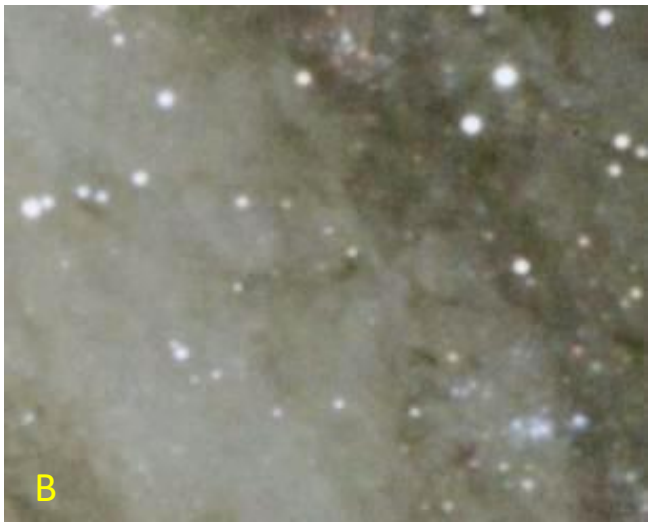
We see M31 tilted at an angle of 12.5° from edge on but it lies at a galactic latitude of -21.6°. As the Milky Way is now believed to be quite similar in size and mass to M31, an amateur astronomer in M31 looking at our galaxy would be presented with a broader view that might look something like the image to the right. Here the original M31 image has been stretched by a factor 1.7 in the direction perpendicular to M31's galactic plane to reflect the Milky Way's greater tilt angle to an M31 observer.

The Milky Way from M31?

The Milky Way is host to roughly 150 globular clusters while M31 is estimated to have between 390 and 530. The largest, Mayall II, is 36″ across and shines at magnitude 13.8. Physically it is more than twice the

mass of our own Omega Centauri. Lying 2.5° from the galaxy's core, Mayall II falls outside the field-of-view of this image but the positions of 67 others, with diameters ranging from 2.2″ to 4.9″ and magnitudes 14.2 to 16.1 have been plotted and labelled in yellow. To do this, the image was plate solved at https://nova.astrometry.net which returns the precise right ascension (R.A.) and declination of the image's center along with the plate scale and orientation. This information allows pixel positions in the image to be converted to R.A. and declination and vice-versa. A list of the 75 brightest globular clusters in M31 was downloaded from https://www.astronomy-mall.com/Adventures.In.Deep.Space/gcm31.htm and Mathematica code was used to plot and label the positions on the image. Some labels needed to be adjusted manually to prevent overlap. The cluster G073 at lower right is actually associated with M101 and not M31.



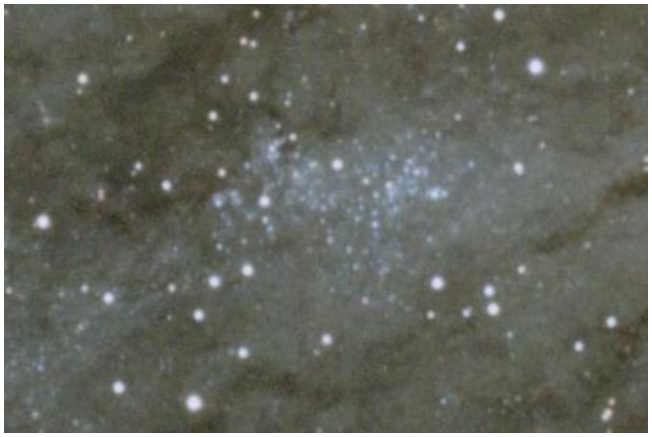


Circled in red on the annotated galaxy image on page 6 is a Cepheid variable star designated, M31-V1, with a median magnitude of 18.5 and a period of 31.415 days. In order to confirm its identification, shown above (image A) is a Digitized Sky Survey (DSS) image taken from http://simbad.u-strasbg.fr/simbad/sim-id?Ident=M31+V0619 indicating the variable with a small purple cross. Image B below it is an enlarged view of the area centered on the red circle in my image of M31.

Hubble's plate showing M31-V1 (Var!)

It would be hard to overstate the significance of this star for our understanding of the true nature of galaxies and size of the universe as a whole. In 1923 Edwin Hubble spotted this Cepheid variable in images taken at the 100-inch Hooker Telescope at Mount Wilson. Although initially flagged as a nova and marked with an "N" on the glass photographic plate shown above, its presence and variability in archival images as far back as 1909 clinched its identification. Hubble crossed out the "N" and wrote "Var!" in red marker. The known relationship between luminosity and period of Cepheids placed M31 at a distance of 2.5 million light years, cementing the conclusion that "spiral nebulæ" were galaxies in their own right located at

vast distances outside the Milky Way. Prior to this some had argued that the Milky Way constituted the entire universe and spiral nebulæ lay within its bounds. This finding showed unambiguously that the universe was very much larger than previously believed.



NGC 206

Looking carefully at the edge of the galaxy's disk there appear to be regions where individual stars can be resolved. One such region is just above the cluster labelled G052 at the bottom left of the image. This is NGC 206 and is shown in the enlarged section of my M31 image

Can individual stars really be resolved across a gulf of 2.5 million light years with amateur equipment?!! Some of the stars in the image are foreground stars in the Milky Way but others are clearly associated with the spiral arms of M31. NGC 206 is an *OB association*. This is a grouping of young hot giant stars of spectral classes O and B. Although having formed from a common molecular cloud the constituent stars are gravitationally unbound and form low density groupings that are much larger than typical open clusters. Stars of spectral class O are visually 3,400 to 18,000 times brighter than the Sun. It is this and their relatively wide dispersal that make individual stars observable over vast distances. The familiar Double Cluster forms the core of the Perseus OB1 association within our own galaxy and others can be found strung out along Gould's Belt (see WAA Newsletter June 2020, p. 9) ■

The Astronomer at the Museum: Perugia

All of Italy is a museum. We were in the Umbrian city of Perugia in April 2022. One of the main sights is the *Fontana Maggiore*, built in the 1270's to celebrate the completion of an aqueduct that brought water to the hilltop city. The base of the fountain has tiles that illustrate the months, zodiacal symbols, the elements of the trivium (grammar, logic and rhetoric) and quadrivium (arithmetic, geometry, astronomy, and music), several stories including Aesop's fables, and symbols of city. In medieval times, astronomy and astrology were one subject, and so the tile showing Urania, the muse of Astronomy with a celestial globe, is labeled "Astrology."

Goodbye to Standard Time? Eli Goldfine, with Larry Faltz

The Uniform Time Act of 1966 allows states not to adopt DST at all (like Arizona and Hawaii) but does not permit them to implement permanent DST. Since 2015, over 450 bills, most at the state level, have been introduced proposing year-round daylight-saving time (DST). Nineteen states have passed bills that would implement permanent DST if permitted by the Federal government. In Congress, the Sunshine Protection Act of 2021, proposing year-round DST, was sponsored by two Florida Republicans, Sen. Marco Rubio and Rep. Vern Buchanan. It passed the Senate by unanimous consent (probably no one was paying attention), but it did not reach the House in time for a vote. It is likely that a new Sunshine Protection Act of 2023 will be introduced in the 118th Congress that convenes on January 3, 2023.

There is public support for a single annual time. Many people find changing clocks twice a year annoying, but opinions on whether we should have permanent savings time or permanent standard time are split. A CBS News poll in March 2022 found that 46% of U.S. residents preferred daylight saving time all year round, 33% preferred standard time year-round and 21% were okay continuing to change clocks twice a year. The reaction among astronomers was consistently negative. The astronomy headlines read “Too Much Ado About Daylight-Savings Time,” “Daylight Saving Time? Bah, Humbug!” “Why astronomers HATE Daylight-Saving time,” and others in a similar vein.

There is historical precent that demonstrates the impact of this change. On December 15, 1973, President Richard Nixon signed the Emergency Daylight Saving Time Energy Conservation Act. The Act was a response to the Saudi Arabian oil boycott on October 20, 1973, implemented as punishment for the United States’ support of Israel in the Yom Kippur War. Long lines at filling stations inconvenienced many Americans and threatened winter heating oil supplies until the boycott was lifted in March 1974. The Act made daylight savings time permanent for two years. A section of the bill read, “The Congress hereby finds and declares (1) that the United States faces severe energy shortages, especially in the winter of 1973-1974 and in the next several winters thereafter; (2) that various studies of governmental and nongovernmental agencies indicate that year-round daylight-saving time would produce an energy saving in electrical power consumption….” We are not sure that the “various studies” were accurate, or whether year-round daylight savings time can actually reduce electrical power consumption, but we do know one thing: the Act was a disaster. Children were getting hit by cars while walking to school that winter because of decreased visibility in the morning darkness. Some people, overwhelmed by the sudden change, simply went back to bed according to the Washington Post. Congress repealed the Act in October 1974, before a second DST winter, citing the impact on safety.

Conversion to year-round daylight savings time will have negative effects for individuals who want to observe the night sky. For example, if you have to wake up very early as Eli does to take a bus to a school far away from his house, you’ll be waking up in the dark for much more of the year. This can make you tired for observing in the evening, which will have to happen “later” than at present. Overall, the bill is bad news for America's amateur astronomers.

Studies show that after we “spring forward,” fatal traffic accidents, workplace injuries, medical errors, and risk of heart attacks rise 6% in the following week. Lack of sleep increases 10%. These data suggest that the Sunshine Protection Act will be bad for the health of the general public. For these reasons, permanent DST is strongly opposed by many neuroscientists, sleep medicine physicians and psychologists. They favor permanent standard time, as do most astronomers.

If the next iteration of the Sunshine Protection Act passes, the 19 states that already passed bills will implement permanent DST. States that do not implement savings time can continue to opt out, but there will certainly be pressure to adopt permanent DST. A Missouri law creates permanent DST in the state if two contiguous states adopt it. That’s a form of responding to pressure even before the pressure is applied!

If you want year-round standard time, move to Arizona or Hawaii. They never have and may never in the future observe the monstrous Daylight Saving Time. ■

A Visit with WAA Member John Higbee — Larry Faltz

Elyse and I were invited by John Higbee and his wife Carol to visit them at their new home in the Northern Neck of Virginia, and we accepted their hospitality for three days during the week before Thanksgiving. The Northern Neck is the area east of Fredericksburg bounded by the Potomac to the north and the Rappahannock to the south (see map, page 11).

John is a 1974 graduate of the US Naval Academy and was a career submariner, rising to the command of the USS Von Steuben, a James Madison-class fleet ballistic missile submarine which was commissioned in 1964 and was active for 30 years. Nuclear-powered, the Von Steuben first carried Poseidon missiles and then the more advanced three-stage Tridents. After his retirement from active duty, John had a number of government positions, finishing his career at the Defense Acquisition University, an organization that provides technology and logistics training to military and Federal civilian staff and Federal contractors. Military equipment is complex. The DAU curriculum focuses on a range of management, engineering, financial and project planning subjects needed to coordinate and evaluate projects such as building and deploying warships, aircraft and the vast range of systems needed for modern defense. John was Dean of DAU's Executive College. He formally retired in 2021, but he continues in an advisory capacity on a part-time basis.

A life-long amateur astronomer (his enthusiasm undimmed by lengthy active duty assignments underwater) John likes old-time telescopes and has the skills to restore them. He is the manager of the historic (1858) observatory on the campus of the Naval Academy in Annapolis, which houses its original 7¾-inch Clark refractor. A newer 12½-inch reflector donated by WAA's Rick Bria will be mounted atop the Naval Academy's new science and engineering building (Grace Hopper Hall) in the near future. You can read John's profile in the November 2020 SkyWAAtch, p. 7.

John and Carol decided to build a house on rural riverside property they had purchased some years before, moving permanently from Alexandria last year. The spacious house (and a soon to be completed garage/guest house) frequently hosts members of their large extended family.

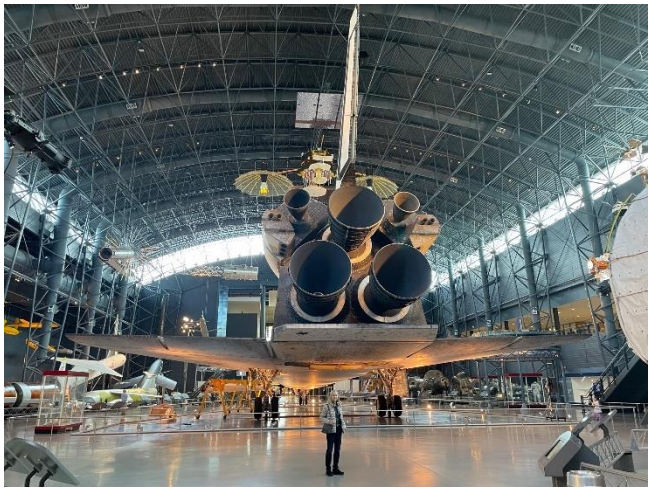
With the promise of dark, rural skies, we planned the trip for a week when the Moon would be below the horizon during observing hours. Forecasts the week prior to our trip were worrisome but two of our three nights turned out to be clear.

On the way down, we overnighted in Gaithersburg, Maryland, just north of the Washington, DC beltway, to have dinner with an old friend and her family. Since we were planning to arrive at the Higbees in the late afternoon, we had a couple of hours to kill the next morning, so we drove to the Udvar-Hazy Center, the branch of the National Air and Space Museum adjacent to Dulles Airport. Although we'd heard much about it (and had been to Air and Space on the Washington Mall many times), we were not fully prepared for the massive display of airplanes, rockets, helicopters, satellites and space and aviation memorabilia, capped off by the space shuttle Discovery. The collection includes the B-29 Superfortress "Enola Gay" (the airplane that dropped the first atomic bomb), a Lockheed Continental, a Concorde, a Boeing 367-80 (the precursor to the Boeing 707 passenger plane that revolutionized commercial aviation), a vast number of fighter planes from all the 20th century's conflicts (even a Cold War SR-71 spy plane) and even experimental aircraft. I was fascinated by the Messerschmitt Me 163B-1a Komet, the first jet-powered combat aircraft.

Part of the Udvar-Hazy Center. The large silver airplane with the R on the tail is the Enola Gay.

Of course, the highlight for us was the shuttle. We had seen the Enterprise at the Intrepid Museum on the Hudson River in Manhattan earlier in November, but Enterprise was only a test craft designed to be

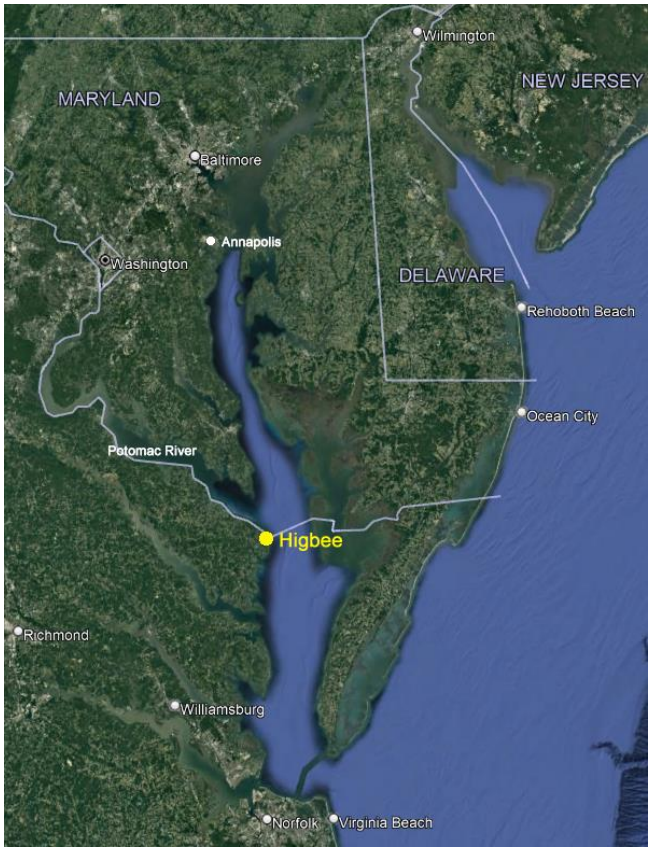
dropped from a Boeing 747 to evaluate the shuttle's gliding and landing capabilities. Enterprise flew (glided, really) only five times, and never went to space. It has a cowling over where the engines would have been and lacks most of the internal components of a space-going vehicle. The Discovery, on the other hand, flew in space 39 times, logging 5,830 orbits. The huge hangar-like wing of the Udvar-Hazy center in which it sits is dedicated to rocketry, missiles, spacecraft, satellites, astronomy, and solar observation. The large collection of artifacts includes a "Miss Astronaut Barbie" doll from 1965. Barbie anticipated the first female astronaut by 13 years.



Top: Discovery, front view. Middle: Back view. Bottom left: Miss Astronaut Barbie. Bottom right: some of the satellites on display.

We could have spent a lot more time at the museum, and we'll definitely plan a return visit. But after two hours, it was time to drive to the Higbees.

The so-called Northern Neck of Virginia runs along the southern shore of the Potomac River until it empties into the Chesapeake at Smith Point, named for the English explorer John Smith who helped found the first English colony at Jamestown, and was (most likely apocryphally) saved from death by Pocahontas. John told us there are only two traffic lights in the entirety of rural Northumberland County, and both were on our route. With a good bit of shoreline, one of the Northern Neck's main industries is fishing, with emphasis on crabs and oysters, both of which have returned to the Chesapeake after some years of ecological challenge.



We arrived at the Higbees and were shortly treated to a spectacular sunset down the Little Wicomico River. It was going to be a cloudy night, but the next two were forecast to be clear. So we took advantage of the overcast to drive 15 miles to the northern shore of the Great Wicomico River for a fresh seafood

dinner at the unpretentious Horn Harbor Restaurant (everything in that part of the world is unpretentious!).

Looking west on the Little Wicomico River at sunset

The next day was clear and cloudless, and the evening promised a dark and transparent sky. We spent the day around the house. A few years ago, we gave John the club's venerable, rare 6-inch f/15 Tinsley Saturn refractor for a restoration. The tube had been dented and denuded of paint, the objective had some debris between the two elements (which turned out to be a dead bug) and various other parts were in sad shape. John has been patiently working on it. Many of the tube's defects have been repaired or patched, and the tube has been painted green, apparently its original color. The optics were taken apart, cleaned and reseated. The finder was replaced, the mounting parts polished and the heavy ash tripod legs refinished. The mount, which is a simple steel saddle on a telescoping riser, still needs attention. Hopefully John will be able to finish it soon. He is shooting to display this telescope at NEAF 2023!

The Saturn in 2018 and now

After lunch we set up our telescopes. John's 14-inch orange tube Celestron once belonged to the late WAA club president Bob Davidson. When John purchased the scope from the club, he decided to become a member. He is also a long-standing member of NOVAC, the Northern Virginia Astronomy Club.

Setting up the C14 is a two-person job; it would probably have helped if the two persons were younger than us. After locking the legs of the large fixed-height tripod, we bolted the massive wedge and polar drive base to it, and then bolted on the two heavy and awkward fork arms. Finally, the 50-pound telescope was precariously lifted above the fork, gently dropped into place, and bolted securely. It's a major effort, but rather satisfying once done.

I brought my new ZWO AM5 harmonic drive mount with its lightweight carbon fiber tripod, and a Stellarvue SVR-105 carbon-fiber tube triplet, an irresistible NEAF extravagance from a few years ago. I was going to do primarily EAA (electronic-assisted astronomy) using a 20-megapixel ASI183MC camera borrowed from WAA's Charlie Gibson as the main camera, my 2.4-megapixel ASI290MM serving as the guide camera on a tiny 30-mm svBony guidescope.

We had an early dinner and watched just after sunset as a magnificent Belt of Venus stretched across the eastern sky. The wide vista across the Chesapeake showed the Belt's full arc, a reminder of the point

made in last month's SkyWAAtch that the shape of the Earth's shadow under the belt of Venus is visual proof that our planet is a sphere.

The AM5 has a simple hand controller with a wi-fi hub, but it performs best with an ASIAir Plus wi-fi controller. The ASIAir Plus links mount and cameras (and dew controllers, focuser and filter wheel if needed) for totally wireless control and image acquisition. The ASIAir control software is designed for iOS or Android (ZWO does not officially support Windows operation) so you can do everything with a hand-held device if you wish. One downside is that only ZWO astro cameras interface with the ASIAir Plus, although it supports DSLR's and mirrorless consumer cameras. If you want to use non-ZWO imaging devices, connect them by cable to a laptop running SharpCap or other software, but control the mount through the HC wi-fi hub either with a ZWO app or via ASCOM.

As the stars came out, I aligned the AM5. The initial step is to get the mount pointed fairly near Polaris, which is easy with a laser. For accurate polar alignment, the mount starts out in "home" position, collects an image, automatically slews about 60 degrees, makes another image, plate solves, and then the software tells you how much to manually move the base of the mount in altitude and azimuth, continually updating by plate-solving and generating new error calculations. As you get closer to a true north alignment, a little happy face on the screen begins to smile. If you can get the error low enough, within an arcsecond or so, the screen displays fireworks when you end the alignment routine. At that point you lock down the mount and you're ready to go.

The C14's alignment is a completely manual proposition, and for the first night we didn't get it quite right. The C14's collimation was excellent, and the scope gave impressive views of the three planets. Tracking wasn't a significant problem for visual observing but it did affect the images we tried to make with my high-speed 0.3-megapixel (720x540) Mallincam DS287. See the December 2022 SkyWAAtch, page 22, for an example of what this camera can do under excellent conditions. It also didn't help that there was a substantial wind, varying between 12 and 20 miles per hour with higher gusts, shaking both telescopes. The chaotic guiding graphs in the ASIAir software was tangible proof of what wind can do to tracking.

The sky was transparent and quite dark, the Unihedron Sky Quality Meter reading 21.05. The Milky Way was fairly bright, M31 very easy to pick out, and the Pleiades were impressive. Orion was blazing. Many of the fainter constellations (Lepus, Cetus, Eridanus) were easy to pick out. The few lights along the river and in local houses had little impact.

I got some nice views of M31, some Summer Triangle objects and later the Orion Nebula. The images are much nicer than those from the Mallincam CCD video camera I was using before. Even with an equatorial mount instead of an alt-az the setup is much faster and easier, with many fewer wires.

M42, single 30-second exposure. SVR105.

We stayed out until around midnight, but the wind was sufficiently strong and temperatures low enough eventually to sap our stamina. Nevertheless, it was a lovely evening of observing and gearheading.

The Sunnybank Ferry

The next day we toured the area, passing through several small towns, lunching at a different

unpretentious riverside seafood restaurant, visiting a local winery (there are seven in the Northern Neck) and coming back by way of the Sunnybank Ferry. This cable barge crosses the Little Wicomico River, connecting two segments of the little-travelled Virginia state route 644. It cuts about 12 miles off the land route around the river. The ferry, merely a flat lighter, holds just two cars and six people. It operates from 8:30 a.m. to 4:30 p.m. weekdays, 8:30 to noon on Saturdays and is closed Sundays, holidays and from noon to 12:30, when the operator takes his lunch. It also doesn't operate in rough weather. If you drive up to it and the barge is on the other side of the river (a span of about 1,650 feet), you simply wave and the operator, a jolly fellow with a great sense of humor brings it over to load you on. It just seemed so improbable and quaint to us, but it typified the low-key hospitality of the area. And, it's free!

After dinner we again went out to observe and try to image in spite of the continued blustery wind. We were able to move the C14's tripod into more accurate polar alignment. We made a not-bad image of Jupiter at the C14's native f/10, picking up the Red Spot and two moons.

Callisto is just off the planet's limb at 11 o'clock; Europa is two planet diameters to the left. Mallincam DS287.

We then popped in a 3X Barlow to try for Mars, whose 16.8 arcsecond disk was about 25 degrees above the horizon. We found focusing very difficult at the enormous focal length, 11,730 mm, the disk shaking a good bit as the wind buffeted the telescope (and us). Autostakkaert!3 wasn't very happy with the image quality, so we were only able to use about 10% of 7,000 frames. I think without any wind, and had we imaged a bit later in the evening when Mars was higher, the results would have been much more impressive.

I pointed the Stellarvue SVR105/AM5/ASI183 combination at the Pleiades. The entire cluster can't fit into the camera's field of view without a focal reducer on the SVR-105. I think the software emulator (BlueStacks) I was using to run the ASIAir app on my laptop isn't fully compatible with the latest version of the app. I've since loaded the Windows Subsystem for Android on my Windows 11 laptop, a complicated process helped by a detailed video on YouTube, and I can now run the app directly in Windows 11.

The trip back to New York took 7 hours and 45 minutes, including a stop for lunch and gas, a couple of traffic jams in Maryland and the usual sclerosis and chaos at the northern merge of the New Jersey Turnpike and the George Washington Bridge.

John and Carol were impeccable hosts. Their new home is spacious and peaceful, and the sky was impressively dark considering there was at least some civilization around. We promised a return visit in the spring, hopefully without wind and perhaps observing from a roll-off roof observatory that John is planning to build for the C14 and a number of other venerable scopes in his collection. ■

Another Movie Telescope

References to astronomy run though the dialogue of the 1956 film *The Swan*. Grace Kelly is a princess of a minor European house, which we are told was displaced by Napoleon a century earlier (the film's action takes place in 1910). Her mother, Jessie Royce Landis (who also played Kelly's mother in Alfred Hitchcock's *To Catch a Thief* a year earlier), insists that she must marry the Prince Royal (Alec Guinness), who is coming for a visit. The marriage would restore the family's status. The family's young, earnest and scholarly tutor (Louis Jourdan) ends up falling in love with the princess. The triangle of princess, prince and tutor has to be resolved, and it is, but in a way you might not have predicted. Guinness' final speech is a marvel. Charles Vidor directed the film, which was based on a 1914 play by the Hungarian playwright and author Ferenc Molnár. He is most familiar to us through his play *Liliom*, which was adapted as the book for the Rodgers and Hammerstein musical *Carousel*.

Early in the film, prior to the Prince Royal's arrival, Jourdan is teaching astronomy to the family's two younger brothers. He points out Arcturus and Vega, mentions their constellations, and reminds the boys that the stars appear small because they are so far away. Kelly comes out and takes a look, but by then Vega has moved out of the telescope's field, as any amateur astronomer would expect. Jourdan repositions the instrument. As she is looking, the star again moves out of the field. "It's moving so fast," she comments, at which point Jourdan reminds everyone that it is the Earth that is moving. He says that's its speed is "68 miles per hour" but is immediately corrected by the boys to 68,000. But that too is a mistake: 68,000 mph (actually 66,616) is Earth's speed in its orbit around the Sun, but the star is moving out of the telescope's field because of the Earth's rotation around its axis, a meager 700 miles an hour or so at the unspecified middle-European latitude of the action. That minor error does not detract from the imaginative astronomical metaphors subsequently used at critical moments in the script.

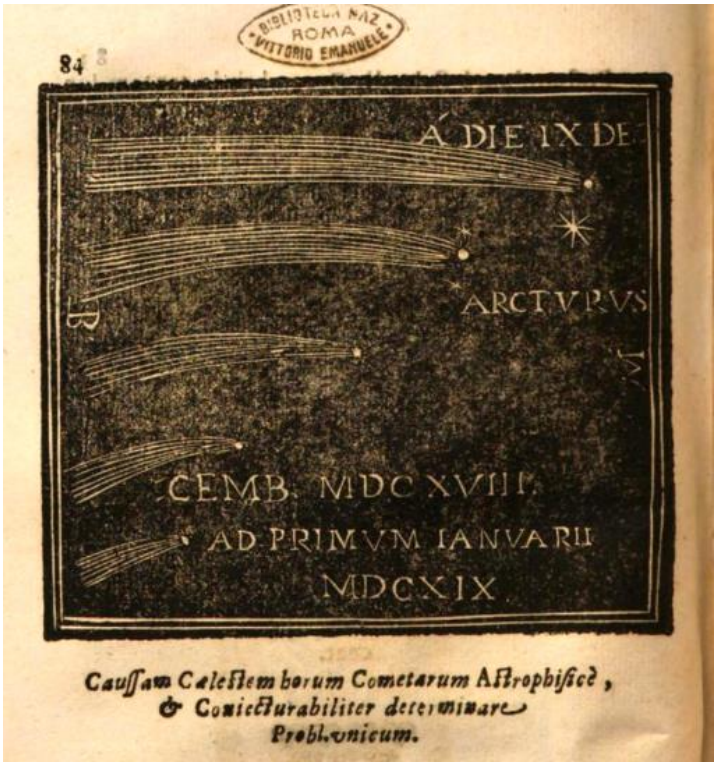
Although listed as a comedy, and much of it is light, this fine film's mood is far more complex, with moments of drama, passion and even wisdom as the characters confront and resolve their situations.

The Swan was Grace Kelly's penultimate screen appearance. After *The Swan* she made *High Society*, the musical version of the 1940 Cary Grant-Katherine Hepburn film *The Philadelphia Story*. In 1955, at the Cannes Film Festival, she met Prince Rainier of Monaco and shortly thereafter they became engaged. *The Swan* was released (not by accident) on April 18, 1956, the day of their wedding. Although she only played a movie princess in *The Swan*, Kelly that day became an actual princess, showing that life *can* follow art. ■

The Astronomer in the Library: Giovanni Battista Hodierna

***Giovanni Battista Hodierna: De systemate orbis cometici; deque admirandis coeli characteribus* (*On the System of Cometary Orbits, and on Wonderful Things in the Heavens*) (1654)**

Hodierna (1597-1660) was born in Ragusa, on the south coast of Sicily. His earliest astronomy experience appears to have been in 1618-19, when he observed three comets with a 20x Galilean telescope (convex objective lens, concave eye lens). These were the same comets that Galileo and the Jesuit astronomer and architect Orazio Grassi were fighting about (September 2022 SkyWAAtch, p. 13). Hodierna joined the priesthood in 1622. He taught mathematics and astronomy in Ragusa. He was an enthusiastic Galilean, even publishing an analysis of the *Sidereus Nuncius*. He was also a botanist and microscopist, building his own microscope and becoming one of the first people to study the anatomy of a fly's eye with the device. In 1636 he moved to Palma di Montechiaro, a newly founded town further west on the south shore of Sicily, where he was attached to the court of the Dukes of Montechiaro. He became court astronomer and mathematician as well as chaplain.



Comets of 1618-1619

His astronomy studies included observing the rings of Saturn (he corresponded with Huygens) and publishing the first ephemeris of the satellites of Jupiter.

His 1654 *De systemate* is a catalog and discussion of diffuse celestial objects. Hodierna accepted Galileo's view of comets, which wrongly held them to be sublunar. He correctly thought that diffuse nebulas were collections of stars. He catalogued 40 "deep sky" objects; 25 appear to be unique discoveries while 15 are just asterisms or clusters known since antiquity like the Beehive, the Pleiades and the Hyades. His book has woodcut images of the objects, including the first image of the Orion Nebula.

The Orion Nebula

The book was published in Palermo but it seems to have gone unread by any practicing astronomers of the time, or for that matter over the next 300 years. It was only rediscovered in 1985. Messier gets the credit for the "first" catalog of nebulas, but we now acknowledge the priority of Hodierna's observations.

Hodierna independently re-discovered the Andromeda nebula (M31, credited to al-Sufi in 905), M42 (Orion nebula, first seen by Peiresc in 1610) and Collinder 399 (the "Coathanger," also first seen by al-Sufi). Among the new deep sky objects listed in *De systemate* are M6, M36, M37, M38, M41, M47, NGC 2362, NGC 6231, M8 (Lagoon Nebula), Melotte 20 (Alpha Persei cluster), probably M33, M34 and NGC 752, and possibly NGC 2451.

Sources: Google Scholar, Linda Hall Library, SEDS. LF

Images by Members

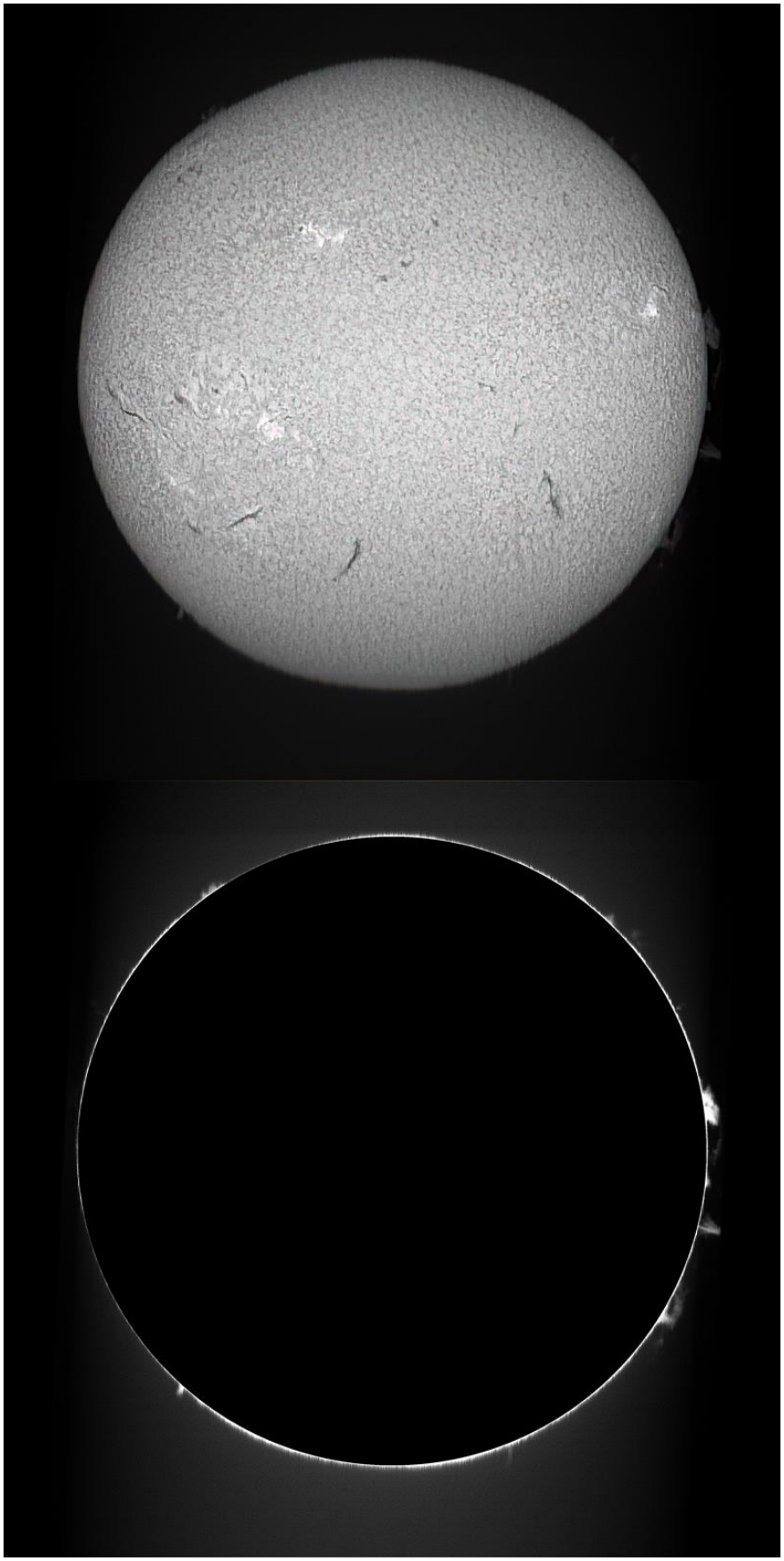
Here are some more images from southern Arizona by WAA member **Arthur Miller**. See the December 2022 SkyWAAtch for information in his imaging set-up and technique.

Messier 27

Messier 64

Messier 33

Messier 51



Thanksgiving Sun

John Paladini sent in these images, taken on November 24.

John used his home-made spectrohelioscope and an ASI 178MM camera. He used solar disc reconstruction software written by Doug Smith, which can be found at

https://solarchat-forum.com/viewtopic.php?t=38726

John found a bug in V3.6 of the software, an error in the polynomial best fit curve on center of emission line, and he communicated that to Smith, who revised the Python code.

The software creates the coronagraph image to highlight prominences by making an automatic increase in the gain and then blacking out the Sun's face.

If you have a 3-D printer, you can make a Sol'Ex spectrohelioscope by following the instructions at

http://www.astrosurf.com/solex/.

The site is in both French and English.

With the coming solar maximum (probably 2025) more amateur astronomers are interested in observing the Sun. But don't do it unless you know exactly what you are doing and taking proper precautions with equipment and filters.

The "Baby Eagle," LBN 777 by Steve Bellavia

Steve writes:

The last time I was at the Cold Spring Lodge, in Oliverea/Big Indian Valley NY, was over 10 months ago.

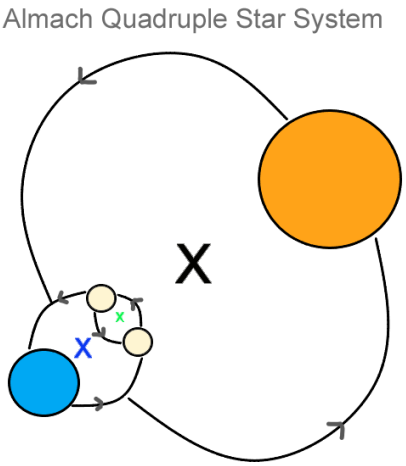
On that trip I captured a widefield image of the Taurus Molecular Cloud (see the cover of the February 2022 SkyWAAtch.) On the very right-hand side of that image you can see the baby eagle (upside down). So on this most recent trip, I wanted to zoom-in on that little bird, LBN 777, the Baby Eagle, or Vulture nebula.

This was a tough capture because there was snow on the ground, low temperatures, and wind too.

I tried to make it easy for myself by using a small telescope and a one-shot-color (OSC) camera, and that helped, as I had it running in a semi-automated mode, only venturing outside once an hour to check on things. At the very end of the second night, my laptop literally froze, and stopped taking data around 3:20 a.m. The battery seems to be permanently damaged, even though it was connected to a 19-volt power supply.

Detailed technical information is at https://www.astrobin.com/16ak9t/.

Almach (Gamma Andromedae) by Rick Bria



Rick Bria writes:

Almach is a giant gold/orange star, 80 times bigger and 2,000 times brighter than our Sun. It is located 350 light years away in the constellation Andromeda.

To the unaided eye Almach is a single star. In a telescope it resolves into a beautiful blue and gold double star. We should remember that although stars are huge, they appear as pinpoints as viewed from Earth because of their great distances. The different disc sizes in the image are the result of optical and atmospheric effects. The star colors are real and reveal their different temperatures. The blue star is hotter.

Unlike our Sun, about half the stars in the sky have at least one companion star. Many are multiple star systems. Almach is a quadruple star system. The two large gold and blue stars take about 4,800 years to orbit each other. They orbit around a common barycenter (center of mass) represented by the large black X in the orbit diagram.

The blue star also orbits a barycenter with two small yellow/white stars every 64 years. The barycenter of this part of the Almach system is represented by the blue medium sized X.

The two small yellow/white stars in turn orbit their own barycenter, represented by the small green X, every three days. (Note: The star sizes, distances, orbits and barycenter locations are not to scale.)

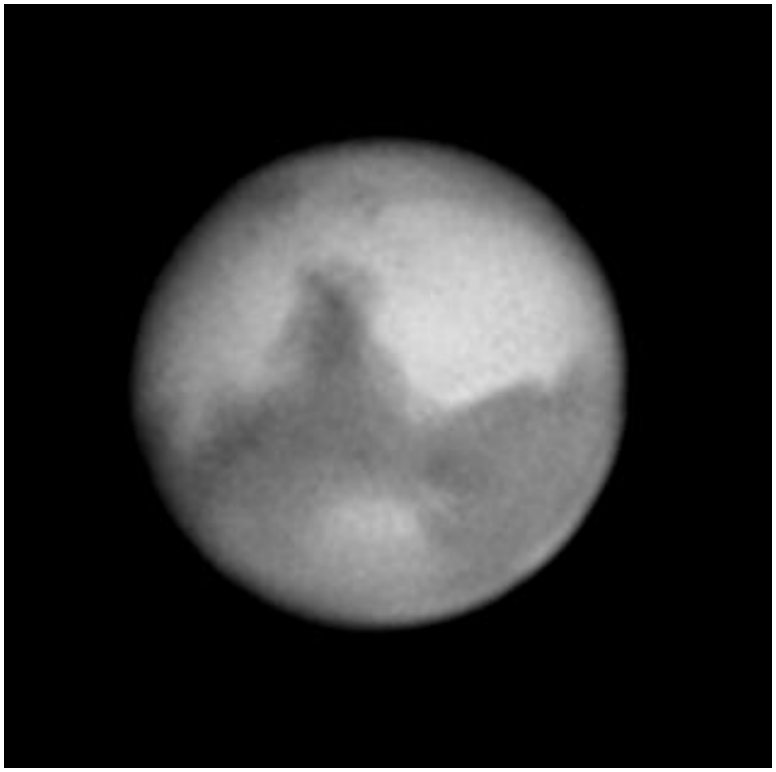
We can only see the bright blue and gold stars of the Almach star system in our observatory telescope. They are separated by ten arcseconds. The two small yellow/white stars are not visible in telescopes and were discovered via spectroscopy.

Almach is one of the most beautiful double stars in the sky and is often included in sky tours on observatory viewing nights. The yellow component shines at magnitude 2.27, while the blue component is magnitude 4.8, so the system is easily in reach of small telescopes.

This image was made with a Canon T2i DSLR on the 14-inch Planewave telescope at Mary Aloysia Hardey Observatory in Greenwich. Seven hundred frames in the camera's 640x480 MOV mode were processed in PIPP, which converts them to AVI, and then the file was stacked in AstroSurface.

Jupiter and Mars by Larry Faltz

Jupiter and the four Galilean satellites at 8:00 p.m. on November 26, 2022. Celestron CPC800, ASI290MM monochrome camera, best 50% of 5,000 frames processed with Autostakkaert!3, Registax and Photoshop Elements.



I put a 3X Barlow on the CPC800 to capture Mars the same evening. This image is also made from the best 50% of 5,000 frames. At this high magnification (f/30, 6,096 mm) the suburban Scarsdale seeing takes a bit of a toll on image quality and focusing accuracy.

Syrtis Major is prominent, with Hellas Basin the light circular feature below it.

I could have pushed the detail further but then the common planetary imaging artifact known as “Mars edge-rind,” an arc just inside the planet’s limb that’s slightly evident at 4-5 o’clock on the disc in this image, would be more prominent. I find the “rind” quite ugly and distracting, so I didn’t push the wavelets or contrast.

Mars was at an elevation of 46° 20’ and shining at magnitude -1.6. North is up.

LF

Mars and the Full Moon, December 7

Scattered clouds in the evening in our area, and much of the northeast, meant some WAAers were unable to see the two bodies at their closest approach around 11 p.m. local time, while others had no problem. There was a full occultation to the north and west.

John Paladini observed in Mahopac. He wrote "lucky clouds moved on. C8, ASI color cam"

Out on Long Island, **Steve Bellavia** reported that "I caught a very lucky break between the clouds. It only lasted a few minutes."

Rick Bria writes:

As the Moon orbits around the Earth, it occasionally moves past distant stars and planets in the sky. The Moon moves roughly its own diameter to the east every hour relative to the background stars and planets.

On December 7th, around 11 p.m., the Moon slowly drifted very near the planet Mars as seen from our area. When two objects in the sky are at their minimal separation it is known as an appulse.

The weather was predicted to be mostly cloudy until about midnight. But the sky cleared around 10:30 p.m., so I grabbed my camera and ran to the Bowman Observatory.

The picture shows bright reddish Mars next to the full Moon. It does not have any scientific value, but the color contrast between the red color of Mars and the Moon was visually impressive.

The Moon has some color. Mineral and chemical differences on the lunar surface create subtle colors of blue and orange. I boosted color saturation in this picture to reveal them. Blue areas contain titanium while orange areas contain iron.

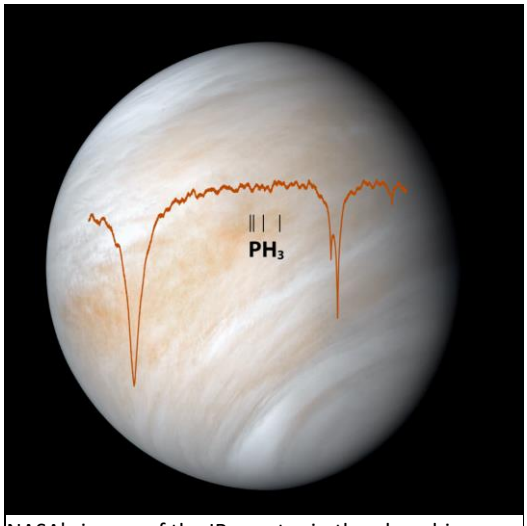
Research Highlight of the Month

M. A. Cordiner,G. L. Villanueva,H. Wiesemeyer,S. N. Milam,I. de Pater,A. Moullet,R. Aladro,C. A. Nixon,A. E. Thelen,S. B. Charnley,J. Stutzki,V. Kofman,S. Faggi,G. Liuzzi,R. Cosentino,B. A. McGuire, Phosphine in the Venusian Atmosphere: A Strict Upper Limit From SOFIA GREAT Observations. *Geophysical Research Letters* Volume 49, Issue 22, 28 November 2022 e2022GL101055

Abstract:

The presence of phosphine (PH_3) in the atmosphere of Venus was reported by Greaves et al. (2021, https://doi.org/10.1038/s41550-020-1174-4), based on observations of the J = 1–0 transition at 267 GHz using ground-based, millimeter-wave spectroscopy. This unexpected discovery presents a challenge for our understanding of Venus's atmosphere, and has led to a reappraisal of the possible sources and sinks of atmospheric phosphorous-bearing gases. Here we present results from a search for PH_3 on Venus using the German REceiver for Astronomy at Terahertz Frequencies instrument aboard the Stratospheric Observatory for Infrared Astronomy aircraft, over three flights conducted in November 2021. Multiple PH_3 transitions were targeted at frequencies centered on 533 and 1,067 GHz, but no evidence for atmospheric PH_3 was detected. Through radiative transfer modeling, we derived a disk-averaged upper limit on the PH_3 abundance of 0.8 ppb in the altitude range 75–110 km, which is more stringent than previous ground-based studies.

The claimed detection of phosphine (PH_3) in the Venusian atmosphere at a level of 20 ppb garnered a lot of press in 2021. Among the authors of the paper was Sara Seager, the MIT professor who was Deputy Science Director of the TESS exoplanet mission. She was already a public figure with strong academic credentials, and she had received a MacArthur "genius grant." The argument that made this finding newsworthy was that the only credible source of phosphine would seem to be biologic. Seager's team developed a complicated scenario for the possibility that simple organisms are floating in dust 45-60 km high in the Venusian atmosphere. The phosphine detection was made by millimeter-wavelength spectroscopy using the ALMA (Chile, 16,500 feet elevation) and James Clerk Maxwell (Mauna Kea, 14,000 feet elevation) millimeter telescopes. The analysis was complex and required a good bit of physical chemistry reasoning and mathematical modeling. But even at those elevations, the Earth's atmosphere can interfere with the accuracy of the spectra. The signals from phosphine are hard to separate from those of other compounds and from noise. Papers in 2021 from other cosmochemists took issue with Seager's conclusions. I heard Prof. Seager lecture in the summer of 2021 at the Medomak Astronomy Retreat. She was quite steadfast and convincing.



NASA's image of the IR spectra in the phosphine region, superimposed on an image of the planet. There are no phosphine peaks.

SOFIA uses a 2.7-meter telescope in a modified Boeing 747 that flies between 38,000 and 45,000 feet, above 99% of the Earth's atmosphere. The GREAT spectrograph on SOFIA was aimed at Venus for short periods after sunset. Even though the duration of the observations was limited, the quality of the signals was deemed sufficient to support the claim that phosphine was not detected, at least not above a trivial upper limit. NASA shut down the SOFIA program this year for budgetary reasons.

Prof. Seager is principal investigator of a privately funded mission that will send a small (45 pound) probe through the Venusian atmosphere. The probe is designed to sample the Venusian atmosphere to detect phosphine and other small molecules of potential biologic origin. The launch vehicle is made by the New Zealand company Rocket Lab. It's scheduled to fly in April 2023 if current timelines are met. ■

Member & Club Equipment for Sale

Item	Description	Asking price	Name/Email
Televue Big Barlow	2” Barlow. 1.25" eyepiece adapter, 48 mm filter threads, captive lock screws, brass compression ring, full multicoating on the high quality optics. Weight 0.75 lb.	Best offer	Peter Rothstein peterrothstein01@gmail.com
Telrad finder	Excellent condition, with removable base.	Best offer	Peter Rothstein peterrothstein01@gmail.com
Celestron 127mm Maksutov-Cas-segrain	f/11.8. Celestron’s version of this compact, high-performing telescope. Great lunar/planetary scope. Excellent optical and cosmetic condition. Well cared for. OTA only. Image here.	$400 or best offer	Manish Jadhav manish.jadhav@gmail.com
Orion Short Tube 80mm re-fractor	2-element achromat f/5.0. Metal tube rings and dovetail for Vixen saddle. A classic travel scope. Excellent optical condition, and very good cos-metic condition. Diagonal and a 25mm Celestron eyepiece included. Image here.	$200 Or best offer	Manish Jadhav manish.jadhav@gmail.com
Celestron Cometron telescope	Small, lightweight 114 mm f/4 reflector. Red dot finder, 25 mm eyepiece. Dovetail bar. A starter scope for a smart, interested child. No tripod: use a camera tripod. Excellent condition.	$50	WAA Ads@westchesterastronomers.org
Meade 8” SCT LX-80	Go-to mount, tripod. Tube wrapped in Reflectix for faster cooling. See https://is.gd/16F0Tv.	$600	Greg Borrelly gregborrelly@gmail.com
Celestron SE mount	No optical tube. Go-to alt-az mount and tripod. Can carry 12 lb payload or tube up to 17”. Up-gradeable hand control.	$300	Greg Borrelly gregborrelly@gmail.com
Celestron Binoviewer	Use both eyes with your telescope. Original case, with two 18-mm eye pieces.	$180	Greg Borrelly gregborrelly@gmail.com

Want to list something for sale in the next issue of the WAA newsletter? Send the description and asking price to waa-newsletter@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.

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). Sales of WAA equipment are final. *Caveat emptor!*

Shadow Transits of Jupiter Visible from Westchester, January 2023

Date	Moon	Ingress		Egress		Sunset	Nautical Twilight ends
		Time	Alt (Deg)	Time	Alt (Deg)		
1/2	Io	18:25	44	20:38	27	16:36	17:41
1/5	Europa	16:52	47	19:25	37	16:38	17:44
1/9	Io	20:21	26	22:33	3	16:42	17:47
1/12	Europa	19:35	32	22:07	7	16:46	17:50
1/18	Io	16:46	48	18:58	35	16:53	17:56
1/20	Ganymede	15:56	48	18:27	38	16:55	17:59
1/25	Io	18:41	34	20:54	12	17:01	18:04

Spot the Messenger: Observe Mercury

David Prosper

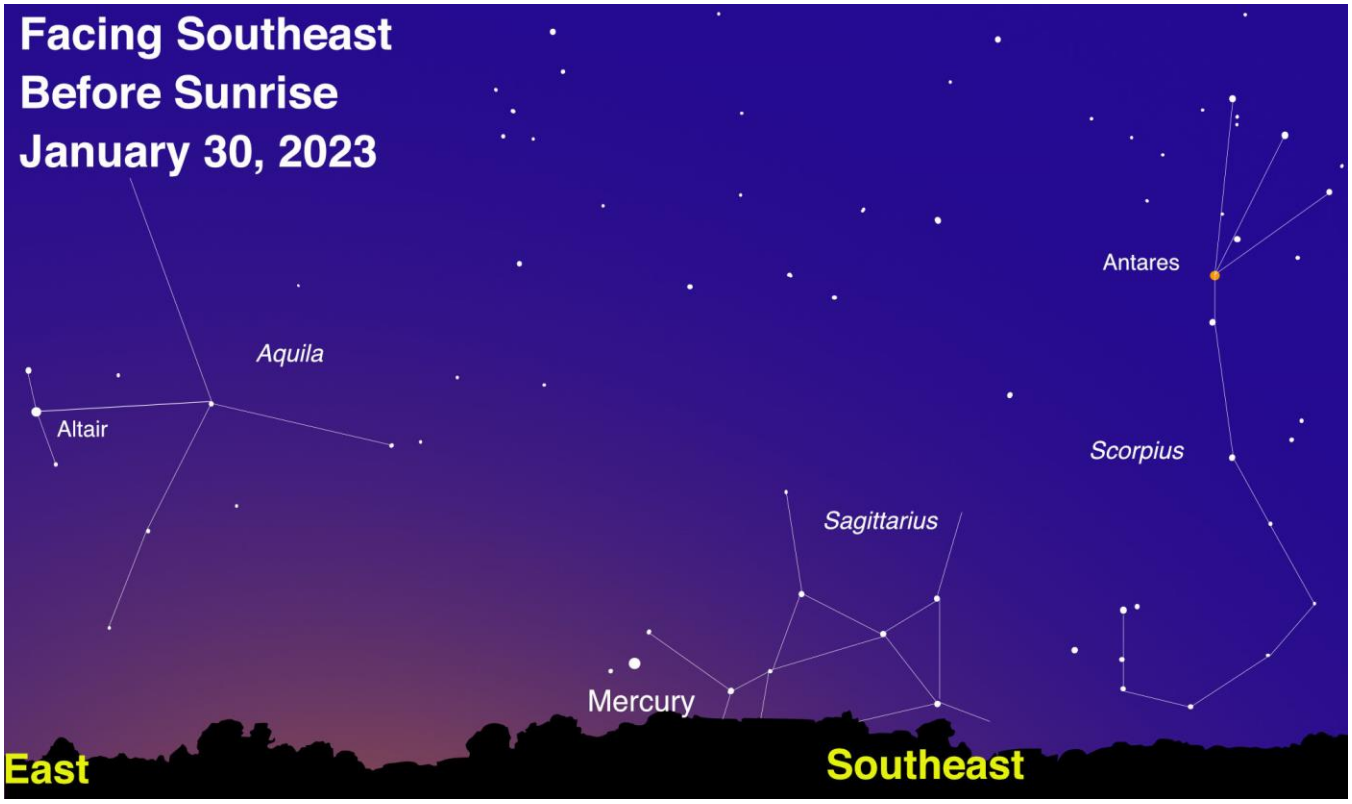
Most planets are easy to spot in the night sky, but have you spotted Mercury? Nicknamed *the Messenger* for its speed across the sky, Mercury is also the closest planet to the Sun. Its swift movements close to our Sun accorded it special importance to ancient observers, while also making detailed study difficult. However, recent missions to Mercury have resulted in amazing discoveries, with more to come.

Mercury can be one of the brightest planets in the sky – but also easy to miss! Why is that? Since it orbits so close to the Sun, observing Mercury is trickier than the rest of the "bright planets" in our solar system: Venus, Mars, Jupiter, and Saturn. Mercury always appears near our Sun from our Earth-bound point of view, making it easy to miss in the glare of the Sun or behind small obstructions along the horizon. That's why prime Mercury viewing happens either right before sunrise or right after sunset. When the Sun is blocked by the horizon, Mercury's shine can then briefly pierce the glow of twilight. Mercury often appears like a "tiny Moon" in a telescope since, like fellow inner planet Venus, it shows distinct phases when viewed from Earth! Mercury's small size means a telescope is needed to observe its phases since they can't be discerned with your unaided eye. Safety warning: If you want to observe Mercury with your telescope during daytime or before sunrise, **be extremely careful**: you don't want the Sun to accidentally enter your telescope's field of view. As you may already well understand, this is extremely dangerous and can not only destroy your equipment, but permanently blind you as well! That risk is why NASA does not allow space telescopes like Hubble or the JWST to view Mercury or other objects close to the Sun, since even the tiniest error could destroy billions of dollars of irreplaceable equipment.

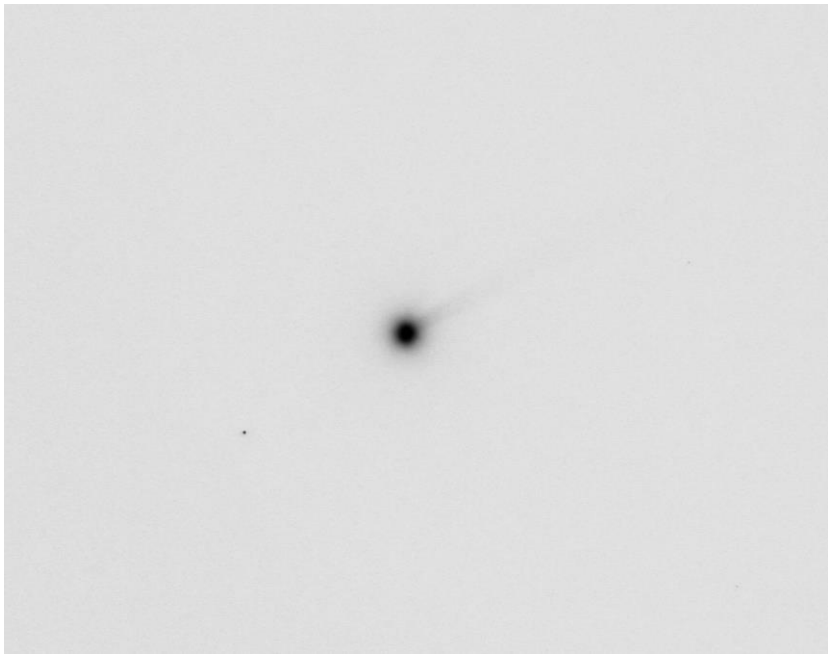
Despite being a small and seemingly barren world, Mercury is full of interesting features. It's one of the four rocky (or terrestrial) planets in our solar system, along with Earth, Venus, and Mars. Mercury is the smallest planet in our solar system and also possesses the most eccentric, or non-circular, orbit of any planet as well: during a Mercurian year of 88 Earth days, the planet orbits between 29 million and 43 million miles from our Sun – a 14-million-mile difference! Surprisingly, Mercury is **not** the hottest planet in our solar system, despite being closest to the Sun; that honor goes to Venus, courtesy its thick greenhouse shroud of carbon dioxide. Since Mercury lacks a substantial atmosphere and the insulating properties a layer of thick air brings to a planet, its temperature swings wildly between a daytime temperature of 800 degrees Fahrenheit (427 degrees Celsius) and -290 degrees Fahrenheit (-179 degrees Celsius) at night. Similar to our Moon, evidence of water ice is present at Mercury's poles, possibly hiding in the frigid permanent shadows cast inside a few craters. Evidence for ice on Mercury was first detected by radar observations from Earth, and follow-up observations from NASA's MESSENGER mission added additional strong evidence for its presence. Mercury sports a comet-like tail made primarily of sodium which has been photographed by skilled astrophotographers (see next page). The tail results from neutral atoms in its thin atmosphere being pushed away from Mercury by pressure from the nearby Sun's radiation.

NASA's Mariner 10 was Mercury's first robotic explorer, flying by three times between 1974-1975. Decades later, NASA's MESSENGER probe first visited Mercury in 2008, flying by three times before settling into an orbit in 2011. MESSENGER thoroughly studied and mapped the planet before smashing into Mercury at mission's end in 2015. Since MESSENGER, Mercury was briefly visited by BepiColombo, a joint ESA/JAXA probe, which first flew by in 2021 and is expected to enter orbit in 2025 - after completing six flybys.

Need more Mercury in your life? Check out NASA's discoveries and science about Mercury at solarsystem.nasa.gov/mercury/, and visit the rest of the universe at nasa.gov.



Mercury reaches maximum western elongation on the morning of January 30, which means that your best chance to spot it is right before sunrise that day! Look for Mercury towards the southeast and find the clearest horizon you can. Observers located in more southern latitudes of the Northern Hemisphere have an advantage when observing Mercury as it will be a bit higher in the sky from their location, but it's worth a try no matter where you live. Binoculars will help pick out Mercury's elusive light from the pre-dawn glow of the Sun. Image created with assistance from Stellarium



Speaking of skilled astrophotographers, WAA member **Steve Bellavia** made this image of Mercury's sodium tail from 5:41 to 6:11 a.m. on October 11, 2022. He used a Borg 90-mm f/4 refractor with a Borg 0.72x focal reducer, ASI294MM camera and Edmund Optics 589 nm filter. Seventeen one-minute guided exposures were captured, stacked and processed. Thirty flat, 30 dark-flat and 30 dark frames were taken for image calibration. Mercury was only 1½ degrees above the horizon at the start of the image sequence.

The Editor has inverted the image to make the tail more visible on a monitor. He thinks the star at the 8 o'clock position lower is HD 104817 (mag 7.68, spectral type AIII).