NIGHTFALL

A PUBLICATION OF THE HUACHUCA ASTRONOMY CLUB

DECEMBER 2024

December Club Meeting

We won't have a regular meeting this month but instead we will have a club holiday party. For more information, please refer to the "Holiday Party Payment" item below, or click here for more information on our club forum. Hope to see you there!

Welcome our new members

Santiago Colon of Fort Huachuca joined the club in November. Welcome, we are glad you joined.

HAC Dues Reminder

Thank you to everyone who has paid their 2025 dues. There are still several memberships that expire in December. If you are unclear about your due's status, please contact the treasurer, Ted Forte at tedforte511@gmail.com Dues are $35 Family and $25 Regular ($25 and $20 for active-duty military). Full time students pay $10. Here are the options to pay your dues:

1. You can pay your dues in person by cash or check made out to Huachuca Astronomy Club. See the treasurer, Ted Forte, at a meeting or event.
2. You can mail your dues check to the Huachuca Astronomy Club PO Box 922, Sierra Vista AZ 85636
3. You can pay online by visiting www.hacastronomy.org and pulling down the membership menu. You'll be directed to Pay Pal where you can use your Pay Pal account OR your credit card.
4. If you have a Pay Pal account, you can use PayPal Direct to send your payment to paypal@hacastronomy.org
5. If you have a Zelle account with your bank, you can make a dues payment by transferring funds to twforte@powerc.net

Holiday Party Payment

A few days remain to still sign up for the HAC holiday party on December 13th. You can pay for the party by using the "Donate" button the HAC homepage or use Zell or Pay Pal Direct as described in the "HAC Dues Reminder" section above. The fee is $18 for adults and $9 for children under 12.

Club Elections for 2025

by Penny Brondum

Huachuca Astronomy Club Elections for 2025 were held at the November General Member meeting. The following slate of officers, presented by the Nominating Committee. were elected by acclamation. Their term of office is from Dec 1, 2024, through Nov 30, 2025.

Officers:

- President Penny Brondum
- VP/Programs Mark Orvek
- Secretary Del Gordon
- Treasurer Ted Forte

Members-At-large:

- Gary Grue
- Richard Lighthill
- Mike Morrison
- Vince Sempronio

Thank you to Jim Reese and Katerine Zellerbach for your service to the club in 2024. Your energy and commitment will be missed. Congratulations to Mark Orvek and Del Gordon, for stepping up to fill vital roles. We look forward to your enthusiasm, fresh ideas, and contributions in the new year. And thank you to the returning members of the board for your continued support. It takes everyone working together to keep the club functioning and meeting our members' needs.

President's Constellation Exploration – Perseus

by Penny Brondum

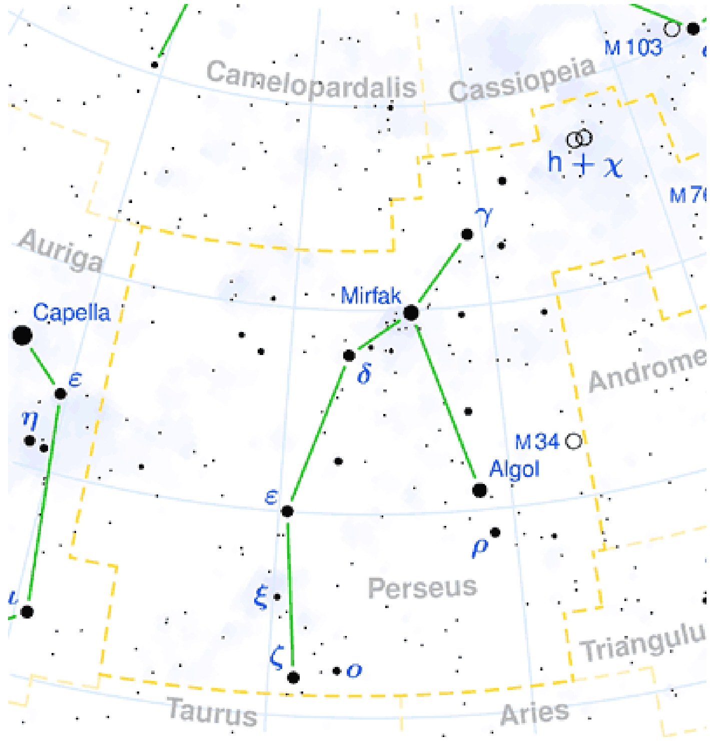
Perseus is a constellation in the northern sky, named after the Greek mythological hero Perseus. It is one of the 48 ancient constellations listed by the 2nd-century astronomer Ptolemy. It is located near several other constellations named after ancient Greek legends including Andromeda to the west and Cassiopeia to the north. The constellation Perseus, the hero, can be seen in late summer and autumn in the northern hemisphere. Perseus is a mid-sized constellation with a total area of 615 square degrees. This makes it the 24th largest constellation in the night sky.

Perseus rescued Andromeda from the monster by killing it with his sword. This is Perseus carrying the head of Medusa the Gorgon, as depicted in Urania's Mirror, a set of constellation cards published in London c.1825

Perseus was the legendary hero in Greek Mythology that rescued Andromeda from the sea monster, Cetus. Perseus was the son of Danaë, who was the daughter of King Acrisius. His father was the god Zeus. Perseus was sent by King Polydectes to slay the evil gorgon sister Medusa, whose gaze could turn anyone who looked at her into stone. Perseus slew Medusa in her sleep and collected her head in a bag. On his way back home, he spotted the princess Andromeda chained to a rock. She was to be sacrificed to the sea monster Cetus. Perseus used the head of Medusa to turn the monster into stone. Perseus and Andromeda married and had six children.

In Neo-Assyrian Babylonia (911–605 BC), the constellation of Perseus was known as the *Old Man* constellation (SU.GI), then associated with East in the MUL.APIN, an astronomical text from the 7th century.

Perseus appears prominently in the northern sky during the northern hemisphere's spring. Its main asterism consists of 19 stars. Perseus contains a number of stars brighter than magnitude 4. The galactic plane of the Milky Way passes through Perseus, whose brightest star is the yellow-white supergiant Alpha Persei (also called Mirfak), which shines at magnitude 1.79. It and many of the surrounding stars are members of an open cluster known as the Alpha Persei Cluster.



Perseus constellation map © Torsten Bronger CC BY-SA 3.0

The best-known star, however, is Algol (Beta Persei), linked with ominous legends because of its variability, which is noticeable to the naked eye. Rather than being an intrinsically variable star, it is an eclipsing binary. Algol (from the Arabic *Ra's al-Ghul*, which means *The Demon's Head* representing the head of the Gorgon Medusa in Greek mythology, it was called Horus in Egyptian mythology and *Rosh ha Satan* ("Satan's Head") in Hebrew. Located 92.8 light-years from Earth, it varies in apparent magnitude from a minimum of 3.5 to a maximum of 2.3 over a period of 2.867 days.

Seven stars in Perseus have been found to have planetary systems. V718 Persei is a star in the young open cluster IC 348 that appears to be periodically eclipsed by a giant planet every 4.7 years. This has been inferred to be an object with a maximum mass of 6 times that of Jupiter and an orbital radius of 3.3 AU.

Because the plane of the Milky Way passes through Perseus, it is rich in deep-sky objects. but it is much less obvious than elsewhere in the sky as it is mostly obscured by molecular clouds. The Perseus Arm is a spiral arm of the Milky Way galaxy that stretches across the sky from the constellation Cassiopeia through Perseus and Auriga to Gemini and Monoceros. This segment is towards the rim of the galaxy. It contains two Messier objects, M34 and M76. M34 is an open star cluster containing about 400 individual stars. M76, also known as the Little Dumbbell Nebula, is a planetary nebula left over from when a Sun-like star ends its life. Other much fainter objects include several other star clusters and nebulas which can only be seen in large telescopes.

M76, the Little Dumbbell Nebula © Göran Nilsson, Wim van Berlo & The Liverpool Telescope / CC BY 2.0

Within the Perseus Arm lie two open clusters (NGC 869 and NGC 884) known as the Double Cluster. They are easily visible through binoculars and small telescopes. Both lie more than 7,000 light-years from Earth and are several hundred light-years apart. Both clusters are approximately magnitude 4 and 0.5 degrees in diameter. The clusters are both distinct from the surrounding star field and are clearly concentrated at their centers. The constituent stars, numbering over 100 in each cluster, range widely in brightness.

There are many other nebulae in Perseus.. NGC 1499, also known as the California Nebula, is an emission nebula that was discovered in 1884–85 by American astronomer Edward E. Barnard. NGC 1333 is a reflection nebula and a star-forming region. Perseus also contains a giant molecular cloud, called the Perseus molecular cloud; it belongs to the Orion Spur and is known for its low rate of star formation compared to similar clouds.

Perseus contains some notable galaxies. NGC 1023 is a barred spiral galaxy and is the principal member of the NGC 1023 group of galaxies and is possibly interacting with another galaxy. NGC 1260 is either a lenticular or tightly wound spiral galaxy. It was the host galaxy of the supernova SN 2006gy, one of the brightest ever recorded. It is a member of the Perseus Cluster (Abell 426), a massive galaxy cluster located 76.6 million light years from Earth.

The Perseids are a prominent annual meteor shower that appear to radiate from Perseus from mid-July, peaking in activity between 9 and 14 August each year. The meteors are associated with Comet Swift–Tuttle, they have been observed for about 2,000 years. The September Epsilon Perseids, discovered in 2012, are a meteor shower with an unknown parent body in the Oort cloud.

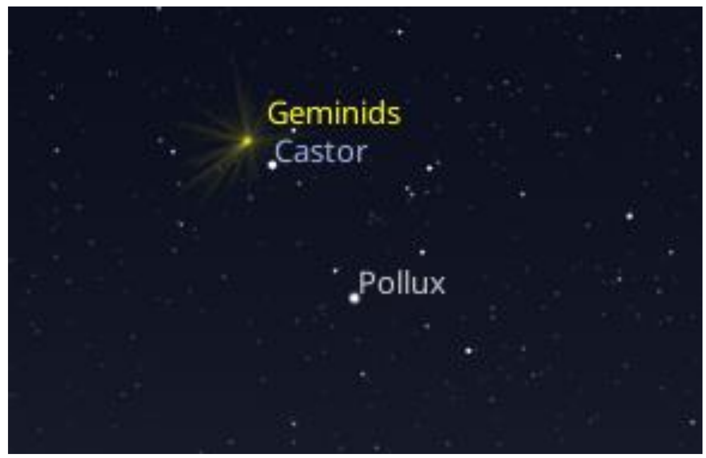
With the weather turning colder at night, it is a good time to bundle up, go outside and look up to enjoy the hero in our sky, Perseus.

The Bucket List
by Vince Sempronio

Here are some observing highlights for the month of December.

December 7, all night – Jupiter is at opposition. At magnitude -2.8, it is the 3rd brightest object in the night sky after the Moon and Venus. It can be seen in the constellation Taurus and is moving retrograde towards Aldebaran.

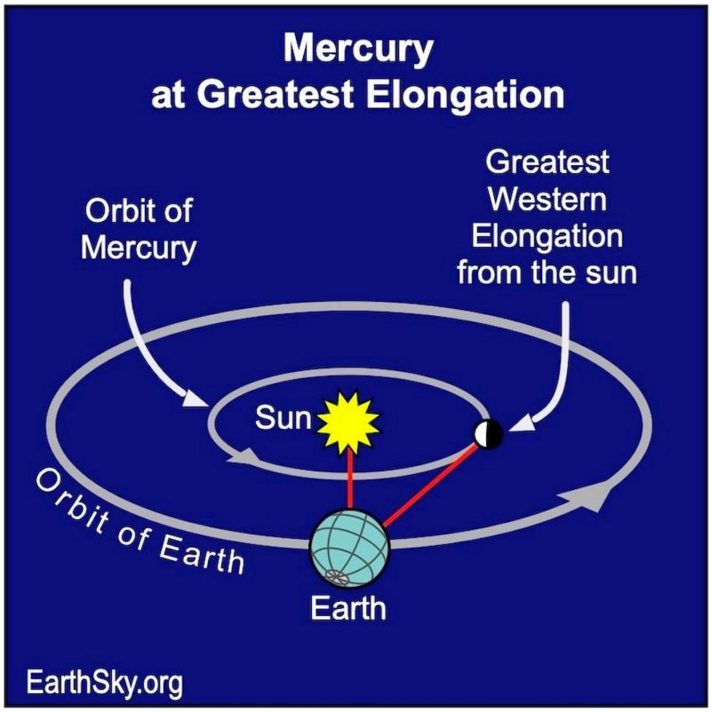
December 14/15, evening – The peak of the Geminid meteor shower occurs on these nights. Usually, it is one of the best showers of the year, this year it will be hampered by the full moon.



Location of the Geminid meteor shower radiant.
Credit: Stellarium

December 21, all night. Look for meteors from the Ursids shower, which has its radiant near the star Kochab, the brightest star in the bowl of the Little Dipper. Kochab is slightly dimmer than Polaris. At 8:45pm, Kochab is below Polaris. Dubhe, one of the pointer stars in the Big Dipper is to the right. Don't expect a storm of meteors, about 10/hour is expected. This event is an interesting camera target. Point your camera north once it gets dark and take long exposure photos to capture the stars rotating around the pole. If you are lucky, a meteor may show itself. The 3rd quarter moon rises around 12:45am, so you'll have 4 hours to enjoy the show.

December 25, morning – Mercury is at greatest western elongation, which means you must look to the East in the morning to see it. I know, it's confusing. Look low on the horizon in the ESE direction. Just to right of Mercury you might be able to see Antares which is making its "helical rising".



Credit: EarthSky.org

December 30 – daylight hours. This day marks the second New Moon of the month, which is called a "Black Moon" because you can't see it. Don't try either, as it will be between us and the sun!

NASA Night Sky Notes

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.org to find local clubs, events, and more!

Spot the King of Planets

by Dave Prosper

Updated by Kat Troche

Jupiter is our solar system's undisputed king of the planets! Jupiter is bright and easy to spot from our vantage point on Earth, helped by its massive size and banded, reflective cloud tops. Jupiter even possesses moons the size of planets: Ganymede, its largest, is bigger than the planet Mercury. What's more, you can easily observe Jupiter and its moons with a modest instrument, just like Galileo did over 400 years ago.

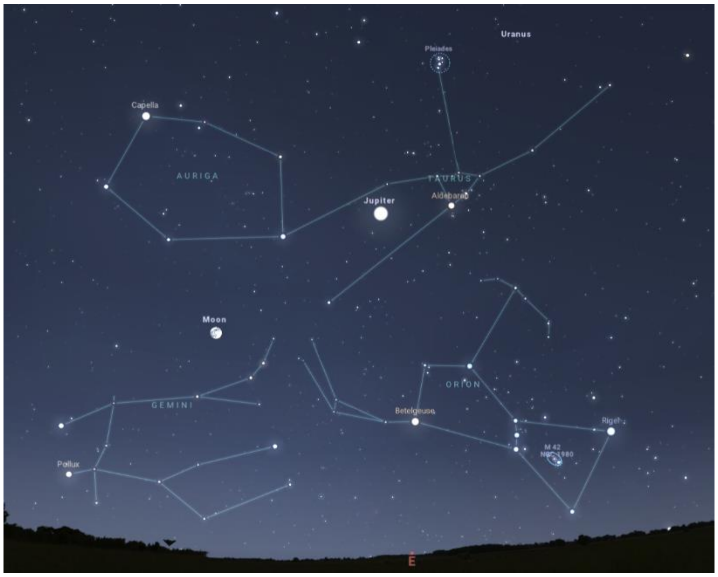
Jupiter's position as our solar system's largest planet is truly earned; you could fit 11 Earths along Jupiter's diameter, and in case you were looking to fill up Jupiter with some Earth-size marbles, you would need over 1300 Earths to fill it up – and that would still not be quite enough! However, despite its formidable size, Jupiter's true rule over the outer solar system comes from its enormous mass. If you took all of the planets in our solar system and put them together, they would still only be half as massive as Jupiter all by itself. Jupiter's mighty mass has shaped the orbits of countless comets and asteroids. Its gravity can fling these tiny objects towards our inner solar system and also draw them into itself, as famously observed in 1994 when Comet Shoemaker-Levy 9, drawn towards Jupiter in previous orbits, smashed into the gas giant's atmosphere. Its multiple fragments slammed into Jupiter's cloud tops with such violence that the fireballs and dark impact spots were not only seen by NASA's orbiting Galileo probe but also by observers back on Earth!

NASA's Juno mission captured this look at the southern hemisphere of Jupiter on Feb. 17, 2020, during one of the spacecraft's close approaches to the giant planet. This high-resolution view is a composite of four images captured by the JunoCam imager and assembled by citizen scientist Kevin M. Gill. Credit: NASA, JPL-Caltech, SwRI, MSSS | Image processing by Kevin M. Gill, © CC BY

Jupiter is easy to observe at night with our unaided eyes, as well-documented by the ancient astronomers who carefully recorded its slow movements from night to night. It can be one of the brightest objects in our nighttime skies, bested only by the Moon, Venus, and occasionally Mars, when the red planet is at opposition. That's impressive for a planet that, at its closest to Earth, is still over 365 million miles (587 million km) away. It's even more impressive that the giant world remains very bright to Earthbound observers at its furthest distance: 600 million miles (968 million km)! While the King of Planets has a coterie of 95 known moons, only the four large moons that Galileo originally observed in 1610 – Io, Europa, Ganymede, and Calisto – can be easily observed by Earth-based observers with very modest equipment. These are called, appropriately enough, the Galilean moons. Most telescopes will show the moons as faint star-like objects neatly lined up close to bright Jupiter.

Most binoculars will show at least one or two moons orbiting the planet. Small telescopes will show all four of the Galilean moons if they are all visible, but sometimes they can pass behind or in front of Jupiter or even each other.

Telescopes will also show details like Jupiter's cloud bands and, if powerful enough, large storms like its famous Great Red Spot, and the shadows of the Galilean moons passing between the Sun and Jupiter. Sketching the positions of Jupiter's moons during the course of an evening – and night to night – can be a rewarding project!



Look for Jupiter near the Eye of the Bull, Aldebaran, in the Taurus constellation on the evening of December 15, 2024. Binoculars may help you spot Jupiter's moons as small bright star-like objects on either side of the planet. A small telescope will show them easily, along with Jupiter's famed cloud bands. How many can you count? Credit: Stellarium Web

You can download an activity guide from the Astronomical Society of the Pacific.

Now in its eighth year, NASA's Juno mission is one of just nine spacecraft to have visited this impressive world. Juno entered Jupiter's orbit in 2016 to begin its initial mission to study this giant world's mysterious interior. The years have proven Juno's mission a success, with data from the probe revolutionizing our understanding of this gassy world's guts. Juno's mission has since been extended to include the study of its large moons, and since 2021 the plucky probe, increasingly battered by Jupiter's powerful radiation belts, has made close flybys of the icy moons Ganymede and Europa, along with volcanic Io. What else will we potentially learn in 2030 with the Europa Clipper mission?

Find the latest discoveries from Juno and NASA's missions to Jupiter here .

Originally posted by Dave Prosper: February 2023
Last Updated by Kat Troche: November 2024

Four Years of Chasing Asteroids
by Vince Sempronio

Beginning in early 2021, soon after I moved to Sierra Vista from the east coast, I began in earnest to once again get involved in observing occultations, and more specifically, occultations involving stars and asteroids.

In my younger years, I observed lunar occultations which involve the moon passing in front of stars. I attempted to observe a few asteroid occultations in the past, all resulting in completely failed attempts. A lot changed in the decades that followed. The technology got better and the old method of using a tape recorder with WWV (radio time signal) broadcasting in the background is now a thing of the past., Once PCs became available, a new world of predicting events was available to any observer who wished to participate.

In the mid-2000s, I marketed a device called the KIWI-OSD that overlays time on an analog video signal. While this kept me in the game, so to speak, it left very little time to attempt many observations. I did record a notable lunar occultation of the Pleiades cluster in 2006 and recorded a total of 12 disappearances.

Once I retired, I decided to move to Arizona, where under better skies I could get back into the citizen science that I had little time for in the past. I needed to catch up on the technology since it had been 15 years since I had recorded any data. The device I marketed is no longer being made (long story), but a suitable replacement was available. Camera technology has come a long way, with more sensitive sensors and the use of digital cameras.

I decided to stick with equipment from the analog world since analog cameras are more sensitive (they can see dimmer stars) than their digital counterparts. Once I had all the equipment in hand, I worked on configuring a laptop with all the software I would need. I spent many evenings practicing setting up the equipment and worked out the best methods for slewing to and recording in different areas of the sky. My first observation, in March of 2021, was a failure, as the conditions prevented the target star from being visible.

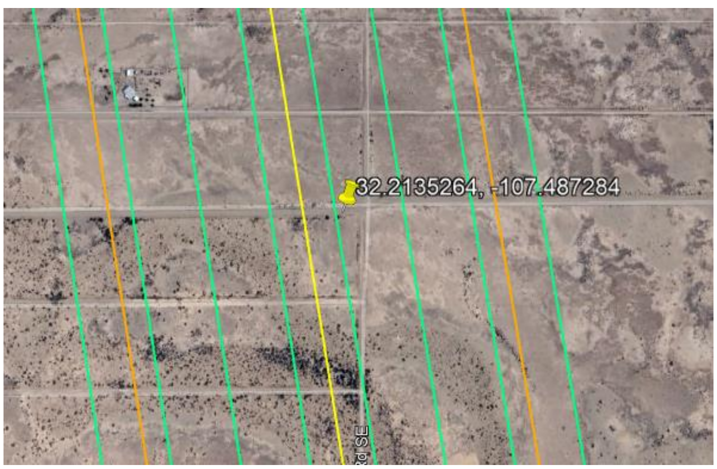
The following is a record of two of my more notable observations.

Saving the World?

In April of 2021, I joined an expedition to New Mexico to observe an important event, the occultation of magnitude 10.2 star, TYC 1376-848-1 by the 300-meter wide Near-Earth Objects (NEO) asteroid (99942) Apophis. Apophis is considered one of the most dangerous NEO we know of. In March of 2021 it had come within 0.115 A.U. (10.7M miles) from Earth (not a close encounter that time), and at the time of the observation its distance had increased to 0.155 A.U. (14.4M miles). It was in no danger of striking Earth during that pass, but future possible close encounters were the real concern. Even then, it was known that Apophis would come VERY close to Earth on Friday, April 13th, 2029 (UT). So close, in fact that it will be visible to the naked eye, though at its brightest it will only be visible in the Eastern Hemisphere. It will pass closer than the orbits of our Geosynchronous satellites! But that isn't the worry, future passes are. For more information regarding the Apophis pass in 2029, refer to this article by NASA.

NASA and other organizations have many tools in which to keep track of asteroids. Large telescopes are used to image their location among the backdrop of distant stars, but the accuracy is only as good as the resolution of the telescope and imaging scale. This technique has been in use since the first use of photography on telescopes. Radar is also used, but it can only ascertain the distance to an object at a given instant, not its sky position. Occultations on the other hand, can provide a very accurate way to measure the position of an object, but only if it gives itself away by passing in front of a star. Using typical technology, we measure the instant the leading edge of the asteroid covers the light from the star and likewise the time of the reappearance as the asteroid moves away. These times can be measured to less than 10ms accuracy. In addition, from the timings, the size of the asteroid can also be determined, given enough observations.

Occultation behave like solar eclipses, but the predicted times of events are not as accurate. The light from a star casts a shadow on Earth by an object between it and us. Instead of the Moon blocking the light from the Sun, an asteroid blocks the light from a star. We can't see the shadow of the star, they are not bright enough, but their paths can be mapped onto the surface of the Earth. So back on the night of April 10th local time, the prediction said to be in Demming, New Mexico along a strip 700 meters wide (a bit larger than the size of the asteroid). I coordinated my observation location with Norm Carson, an observer from Tucson, and we both set up our telescopes along a dirt road a couple of miles south of Interstate 10.



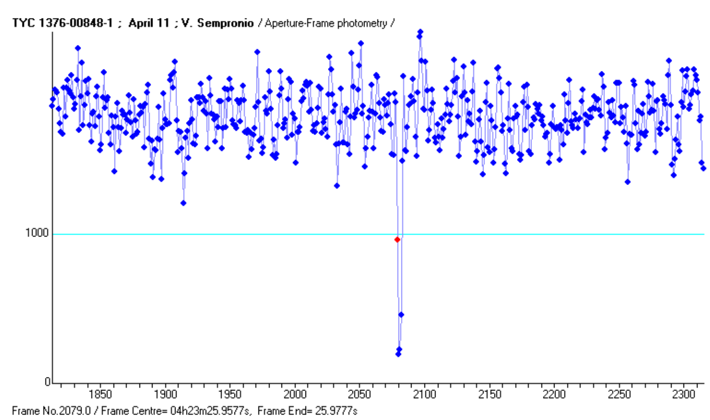
The ground path of Apophis occultation on April 11th UT near Demming, NM. The width of the path between the leftmost and rightmost green lines is 0.7km. North is up. The separation between green lines is 100m. Observers are assigned to one of the chords. It turned out that predicted path was wider than the actual diameter of the asteroid. The pinned location is where the author set up his equipment.

A third observer from the mid-west was also observing this event. We were assigned locations across the path to prevent two observers from observing from the same chord as this would result in duplicated data. Norm set up 100 meters to the west (the green line to the left of my pinned location). As seen in the photo below, I observed the event using a Celestron CPC800 scope. I still use that same scope today as my "daily driver" mobile occultation scope, though I now use a more sensitive camera than the one I used then, and my equipment configuration is more efficiently organized.

I set up my equipment and waited for the event, but I was still cautiously nervous since this was an important event, and my previous failure was still fresh in my mind. In the end, all three of us got positive results and our data, and along with data from several other Apophis occultations that spring was used to help refine Apophis's orbit. A positive result means that both a disappearance and a reappearance (D/R) are recorded, rather than nothing at all (a miss).

Occultation setup used by the author for the April 11th (UT) Apophis event.

Below is the light curve from the event. It was a very short event for me, but the signal to noise ratio (SNR) was good enough to ensure that I indeed had an event and not noise. When compared to the other observations there was no doubt that I had an actual good observation.



The author's light curve of the Aprill 11th, 2021 Apophis event.

After crunching all the data, NASA announced a few months later that we were safe from Apophis for at least 100 years.

Hitting the Jackpot

Back in June of 2023, I observed what I thought was a routine occultation. Another observer (David Oesper), from Tucson, also observed the same event. We both had positive results though unbeknown to me, there was something different with David's observation. Months later, after the data was analyzed by those I refer to as our "data gurus", I received an email informing me that David and I had discovered a double star. This has happened before by other observers, but the geometry of our observation was unique. I had observed the D/R of the bright star of the system while David captured the D/R of the dimmer secondary. I won't get into the details of this observation yet, as we are attempting to have a professional astronomer on a big telescope use a spectrograph to confirm our discovery. Once that happens, we will write and publish a paper.

Looking Forward

Since 2021, I have attempted over 250 asteroid occultations of which 116 had positive results. That is less than a 50% success rate, but a lot of observations were low probability of success attempts, or there were technical or weather failures. But as a long-time observer of these events told me, "*You can't get a positive result unless you try*".

The total community of worldwide observers is a small group of mostly amateur observers, numbering around 4,200 since record keeping began. There have been almost 12,000 positive occultation observations. The most observations are from North America, followed by Europe and Australia. The top observer has almost 900 credited (*) events. At the time of this writing, I have 87 credited observations, which puts me at #86 on the all-time observing list. I am not trying to pat myself on the back, but I want to make the point that most of the work is being done by very few people. Almost 2,400 of the 4,200 observers have only 1 observation to their credit.

My total credited events are less than my positives because of delays in the processing of prior events.

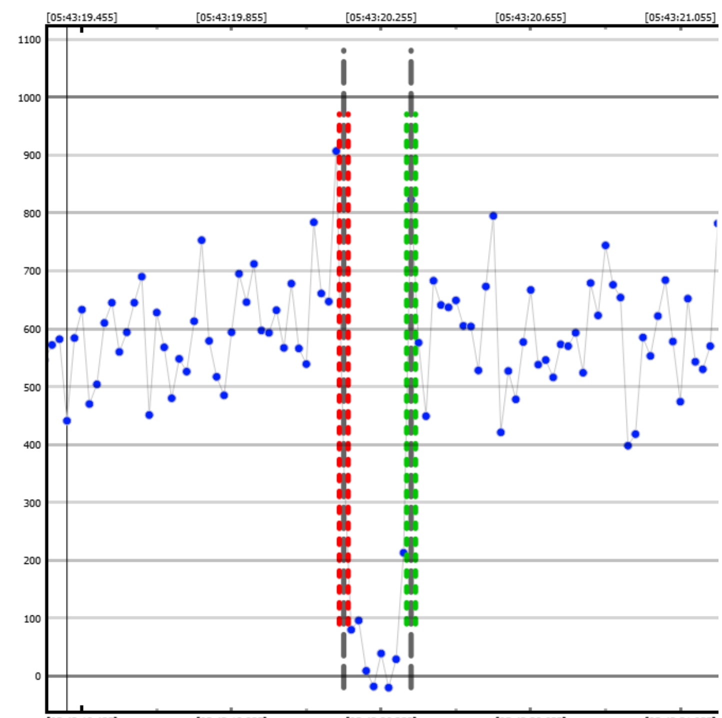
(*) There is a difference between positives and credits. We discussed what a positive is, but it is still possible to get an observation credit even if you have a miss. If an observer is working alone, then they only get a credited observation if they record a positive event. If there are multiple observations of the same event, as long as one observer has a positive, all other observers with misses still are credited with being involved. This rule is in place because even though someone has a miss, the miss defines a constraint on where the asteroid can't be located. Observing alone doesn't provide any information about where the asteroid might be when a miss is observed.

I am working to automate one of my telescopes to be able to observe many events in a night, unattended. A few observers are already doing this with good results.

Joining the Dark Side

Some time ago, our own Richard Lighthill expressed interest in trying an occultation observation. I met with him at his home observatory, and we configured his pier mounted 8" LX200 Meade scope with the necessary equipment needed to record occultation events. This required the installation of some software on his laptop, but soon we were testing the equipment under dark skies. He attempted his first event back at the end of October, but unfortunately, his first attempt ended up a miss. I also observed the event from home, and I too had a miss (no credits for either of us). Since then, we upgraded his equipment with a more sensitive camera. Then, on November 21st, we both observed another event. I was mobile for that event, observing from Hereford. Richard was successful, while I got a miss. Congratulations to Richard for bagging his first positive occultation. For this event, both he and I will be credited as explained in the previous section. When he gets his next positive, he will be in the top 1,800 observers!

Below is the light curve from Richard's observation. Each blue dot is a data point of the intensity of target star for each frame in the video. Time runs from left to right. The blue dots bounce up and down very quickly between frames mostly because of atmospheric conditions (noise). When the invisible (very dim) asteroid passes in front of the star, the light from the star drops to the level of the background of the sky. Once the asteroid passes by, the star light is once again recorded and jumps back to its original intensity. The software that processes the data points paints a red line at the time of the disappearance and a green line at the time of the reappearance. These two times are reported and is what constitutes the actual data. All the other data points don't matter, except for analysis.



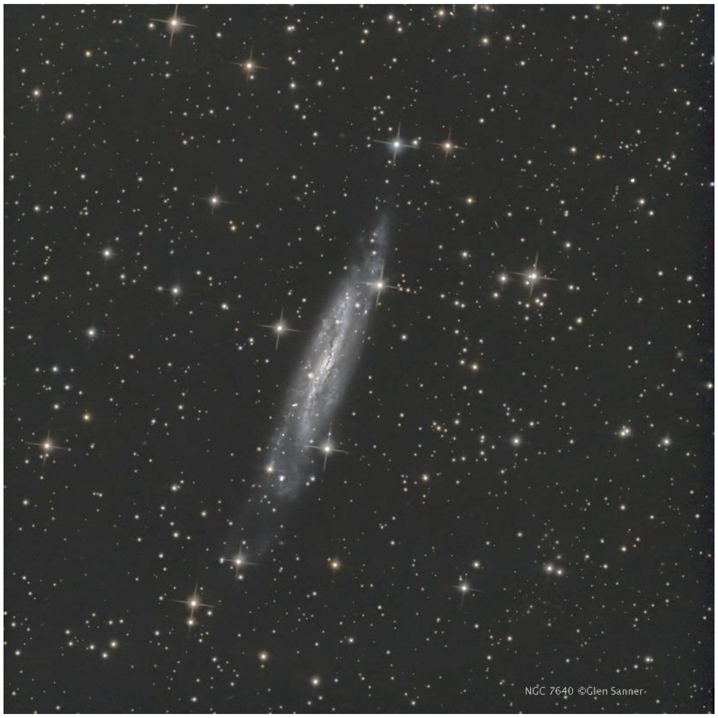
Light curve from Richard Lighthill's first positive occultation.

In Summary

So, what does the scientific community gain from these observations? Events of NEOs, such as the Apophis event provide important information about the orbit of dangerous asteroids. Occasionally, observers might discover something new, such as double stars or asteroids that have companions. Most observations though help keep track of where the 1.4 million plus known asteroids are located. Once the Simonyi Survey Telescope at the Rubin Observatory comes online, it is estimated that it will discover as many new asteroids as those already discovered. That is a lot of potential new targets!

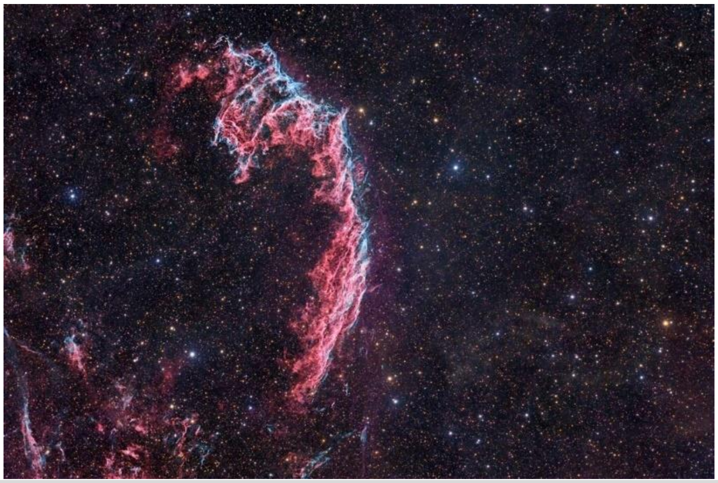
In conclusion, observing occultations requires a lot of preparation and processing, but they are still very rewarding, and in some cases, very important work!

Images
by HAC Members & Friends



This is a composite image of NGC 7640, a barred spiral type SB(s)c in the constellation Andromeda. It is a stack of 77 x 10min. images (12hr. 50min) taken with the ZWO 533mcpro and the 8” Visac. It is at a distance of 30-40 million light years. I was able to bring out some of the structure within the core area. It is postulated that the galaxy interacted with another galaxy sometime in the past. A rather nice galaxy very seldom imaged. Glen Sanner.

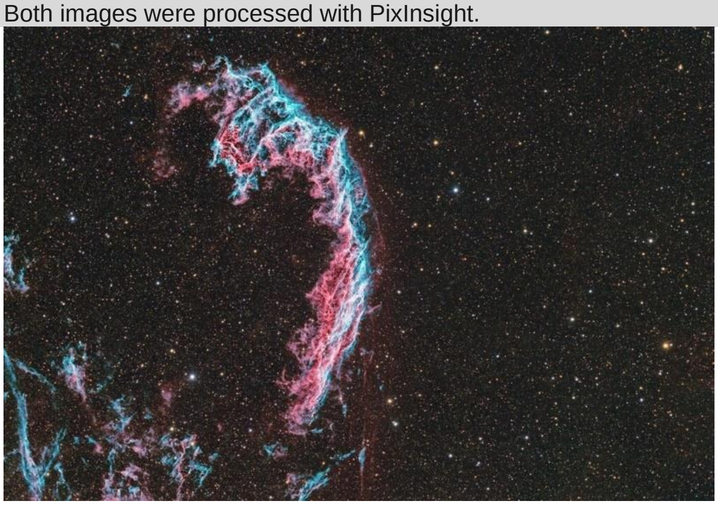
Sometimes, clouds are all we need! Photographed by Richard Pattie



Mark Orvek writes: Above and below are two images of NGC6992. The above is RGB, the lower is HOO (Ha, OIII) using an Optolong L-eXtreme dual band filter. Both were taken on November 1st at my lot at the Chiricahua Sky Village in Pearce, AZ. Below are details of the equipment and integration times.

Telescope: Sky-Watcher 100ED Esprit APO Triplet
Mount: ZWO AM5
Camera: ZWO ASI2600MC Pro
FOV: 2.4x1.6 degrees
RGB Integration: 2 hours, 5 minutes (25x5 minute subframes)
HOO integration: 1 hour, 40 minutes (20x5 minute subframes)

Both images were processed with PixInsight.



Trivia Question of the Month

- In 1963, I was the first to be identified but not the first to be found
- At magnitude 12.9, I am the brightest
- I was the first to have my red shift measured
- I am in the constellation Virgo
- I am the most powerful radio source in the sky
- I am the first to be found to be an X-ray source
- I am 2.4 billion light years away.

What am I? A bonus if you know my name.

From Len Amburgey

NGC 7635 is an H II region and emission nebula in the constellation Cassiopeia. It lies close to the direction of the open cluster Messier 52. The "bubble" is created by the stellar wind from a massive magnitude-8.7 young central star, The nebula is near a giant molecular cloud that contains the bubble's expansion while itself being excited by the hot central star, causing it to glow. (Extracted from Wikipedia)

Narrow Band imaging collects light in defined wavelengths. The data from each wavelength is assigned a color relative to the wavelength and the resulting image reflects density of those colors but is not a standard RGB image (full spectrum). Narrow band imaging is immune to moon light brightness in the sky and light pollution. Although my sky is quite dark the moon light would affect any full spectrum photography but not narrow band. 200 minutes of my exposure was under a moon with 76% illumination.

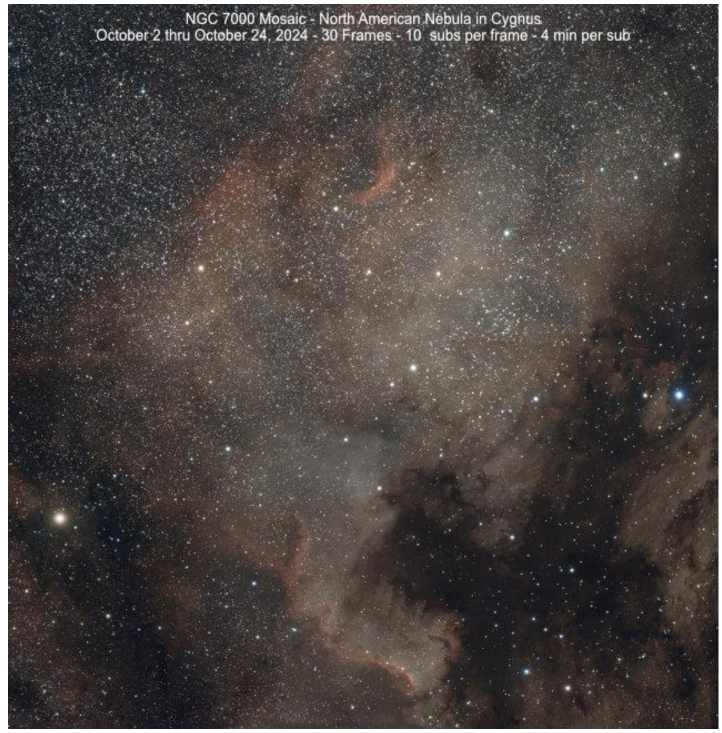
NGC 7635 was photographed with 3 Narrow band wavelengths of Ha, Oiii, and SII and was processed in 'Pixinsight' and presented in SHO the standard pallet for 3 narrow band filters. Again, the colors in the pallet are not random, but to reflect the composition of the subject. If you only have 2 bands and use an OSC (one shot color camera) you use a different pallet to display those data. The most common is a dual band of Ha and Oiii the data is displayed using the HOO pallet. I will post another image in that format. I believe you will start seeing more of the narrow band images as they display far more detail than broad band images.

Telescope: Hyperion – Corrected CDK design Aperture: 320 mm Focal length 2585 mm. Camera: ASI 2400 OSC pixels 5.94 microns, Resolution .47^sec. Exposure 90 minutes 5-minute subs. Filter: Optolong HaOiii, under sky brightened by moon (78% illuminated), Askar 2 SIIOiii filter exposure 200 minutes. 5-minute subs.

Processed: Pixinsight WBPP, color correction NARROW BAND SHO pallet, color saturation and curves applied. Removed SHO stars and replace with RGB stars based upon photometric calibration of Optolong: HaOiii but processed as RGB.

"Compared to a star, we are like mayflies, fleeting ephemeral creatures who live out their lives in the course of a single day."

-Carl Sagan.



Michael Morrison offers this image of a classic nebula; NGC 7000, or the North American Nebula in Cygnus. The image states the image is based on 30 frames – 10 subs per frame – 4 minutes per sub

Capture: Sky X Imaging
Telescope: TEC 180FL F/7 Focal length 1260mm
Camera: ZWO 533MC - set at 0C
Guide Scope: SvBony 60mm F4
Guide Camera: ZWO ASI1200
Focuser: ZWO EAF

Club Officers and Contacts

President: *Penny Brondum* ***Vice President:*** *Mark Orvek*
Secretary: *Del Gorden* ***Treasurer:*** *Ted Forte*
Past President: *David Roemer*

Board Members-at-Large
Vince Sempronio Mike Morrison Gary Grue Richard Lighthill

Nightfall Editor: *Vince Sempronio* *nightfall@hacastronomy.org*
Webmaster: *Ken Kirchner*
Facebook Editor: *Richard Lighthill*

Website: *http://www.hacastronomy.org*
Facebook: *http://www.facebook.com/HuachucaAstronomyClub*
Email: *info@hacastronomy.org*

Club Meetings: Monthly at 7pm at the Cochise College Downtown Center at 2600 E Wilcox Drive, Sierra Vista, AZ in Room A102. Refer to the calendar for specific dates.

HAC Calendar of Events (December '24 – January '25)

SU	MO	TU	WE	TH	FR	SA
Dec 1	**2**	**3**	**4**	**5** Patterson Public Night 6 - 8 pm	**6**	**7** Jupiter Opposition
8 **8:27 AM**	**9**	**10**	**11**	**12** Geminid Meteors	**13** HAC Holiday Party at Brondums 5 pm Geminid Meteors	**14** Solar Saturday at S.V. Library 10am – 12pm Geminid Meteors
15 **2:02 AM**	**16**	**17**	**18** Mars/Moon 0.9º	**19**	**20**	**21** Winter Solstice 2:21 AM
22 **3:18 PM**	**23**	**24**	**25** Mercury greatest western elongation Pre-dawn Christmas Day	**26**	**27**	**28** Sky & Ice Event Veteran's Park 7-10 pm
29	**30** **3:27 PM**	**31**	**JAN 1,2025** New Year's Day	**2** Patterson Public Night 6 - 8 pm	**3** Quadrantid Meteors	**4** Saturn/Moon 0.7º Quadrantid Meteors
5	**6** **4:56 PM**	**7**	**8**	**9**	**10** HAC Meeting 7 pm Room A102	11 Solar Saturday at S.V. Library 10 am – 12 pm
12	**13** **3:27 PM**	**14**	**15** Mars at opposition	**16**	**17**	**18**
19 Venus/Saturn 3º	**20**	**21** **1:31 PM**	**22**	**23**	**24** Antares/Moon 3º	

All dates and times are local MST
Join the HAC Astro forum to keep up to date with all the Huachuca Astronomy Club events
Send an email to: HACAstro+subscribe@groups.io

From the Editor: Embedded links are provided to give the reader a place to delve deeper into a topic or phrase. To save research time, Wikipedia (love it or hate it) is the source for most additional information. If you wish to opine, use the email address found above.

Answer to trivia question: Quasar 3C 273