The Bays Mountain Astronomy Club Newsletter

December 2024

Kingsport, TN

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Cosmic Reflections

Greg Penner - BMAC Chair

reetings and Happy Holidays BMACers!

This is a great season when we are spending time with family and friends over the holidays, looking back on an eventful year and looking ahead to the new year to come! In November we had a fantastic time at the 39th annual StarFest event. Thanks go to Adam, Jason and the club members who helped with setup/clean-up duties. [Ed: And a thank you to Greg for his welcome, introductions to the speakers and other labor duties.] Everyone had a part in making it a wonderful weekend. The speakers we had this year gave some lively and energetic presentations on a variety of topics related to Moons in our Solar System. We were able to get out the telescopes on Saturday evening for a couple hours before some clouds interfered. The meals and desserts were tasty as usual, especially the tiny cupcakes!

For our December 6th club meeting, we are going to have a club observing night! The goal for the evening will be for club members to bring their own telescopes and/or binoculars so that we have a variety of instruments to look at various celestial

sights. The Moon that night will be a waxing crescent about 32% illuminated in the western sky, so moonlight won't be too bright yet for finding some of the dimmer objects. The Moon itself is even a nice sight at that phase! If you don't have a telescope or binoculars to bring, that's OK. This could be an opportunity for you to compare the views through various instruments to help you decide if you want to get something in the future. Be on the lookout for an e-mail that will give the details.

Remember that in January we won't have a regular club meeting, but we will have our annual dinner for BMAC club members only and their families. We will be sending out an e-mail about the dinner when the details have been arranged. If anyone has ideas for programs or activities for the coming year, please let me know so we can start planning for the new year now.

Looking forward to seeing everyone at the December observing night: until then, Clear Skies!

BMAC Notes

Longtime BMACer Wayne Manly Passes

Longtime member of this and the Bristol Astronomy Club has recently passed. He was always generous with his time and a kind word to club members and the public alike. He was a stalwart volunteer for the club and public outreach for solar, nighttime and off-premise programming. He will be missed.

BoBfest 2025

The Regional Gathering of Amateur Astronomers, aka BoBfest 2025, is scheduled for January 25. It will be held at the Catawba Science Center in Hickory, NC.

Doors will open at 8:30a for a big day of presentations, swap tables, photo contest, a variety of displays, gastronomy and door prizes galore followed by a visit to the Lucile Miller Observatory that evening, weather permitting!

Please check out details **HERE**. You can register **HERE**.

Keeping checking the website for speaker schedules and other details. We are open to recommendations, suggestions and volunteers for presentations as well. If you have an interesting talk you would like to give or can recommend someone, please do so!

We'll see you soon!

Green Bank Star Quest XX

The 20th Green Bank Star Quest will be held June 25-28, 2025. It is the largest star party in the nation that combines both optical and radio astronomy. Held at the Green Bank Observatory, located in Green Bank, West Virginia, the rural location provides the dark skies so envied by many other astronomers.

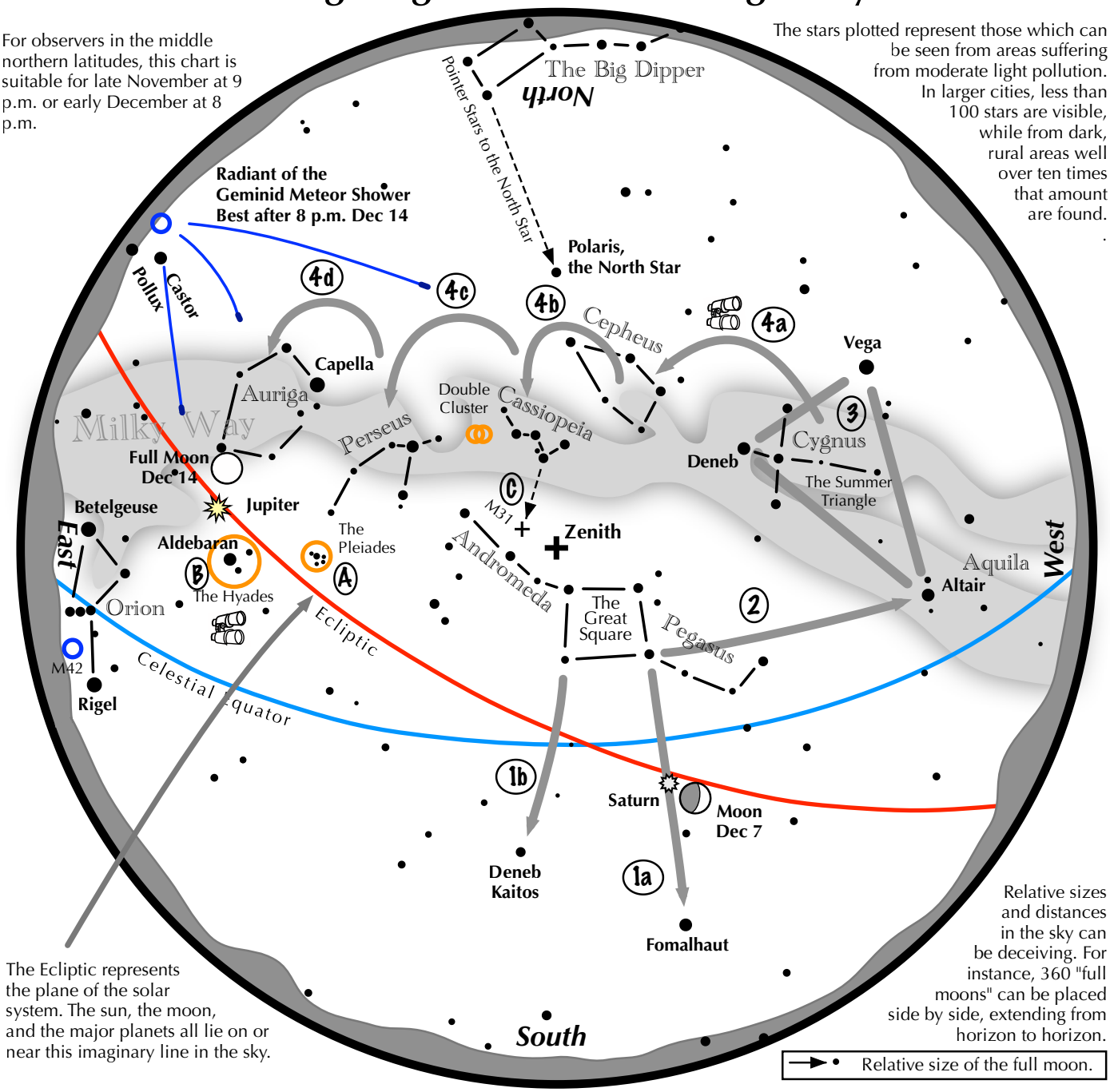
For all the info, click **HERE**.

The dish is bigger than it looks. Image from the CAAC Website.

Sky News from the Astronomical League

The Astronomical League has a plethora of educational content to help you learn and enjoy the night sky more. The following inserts are just a tiny bit of what they provide.

Navigating the December Night Sky



Navigating the December night sky: Simply start with what you know or with what you can easily find.

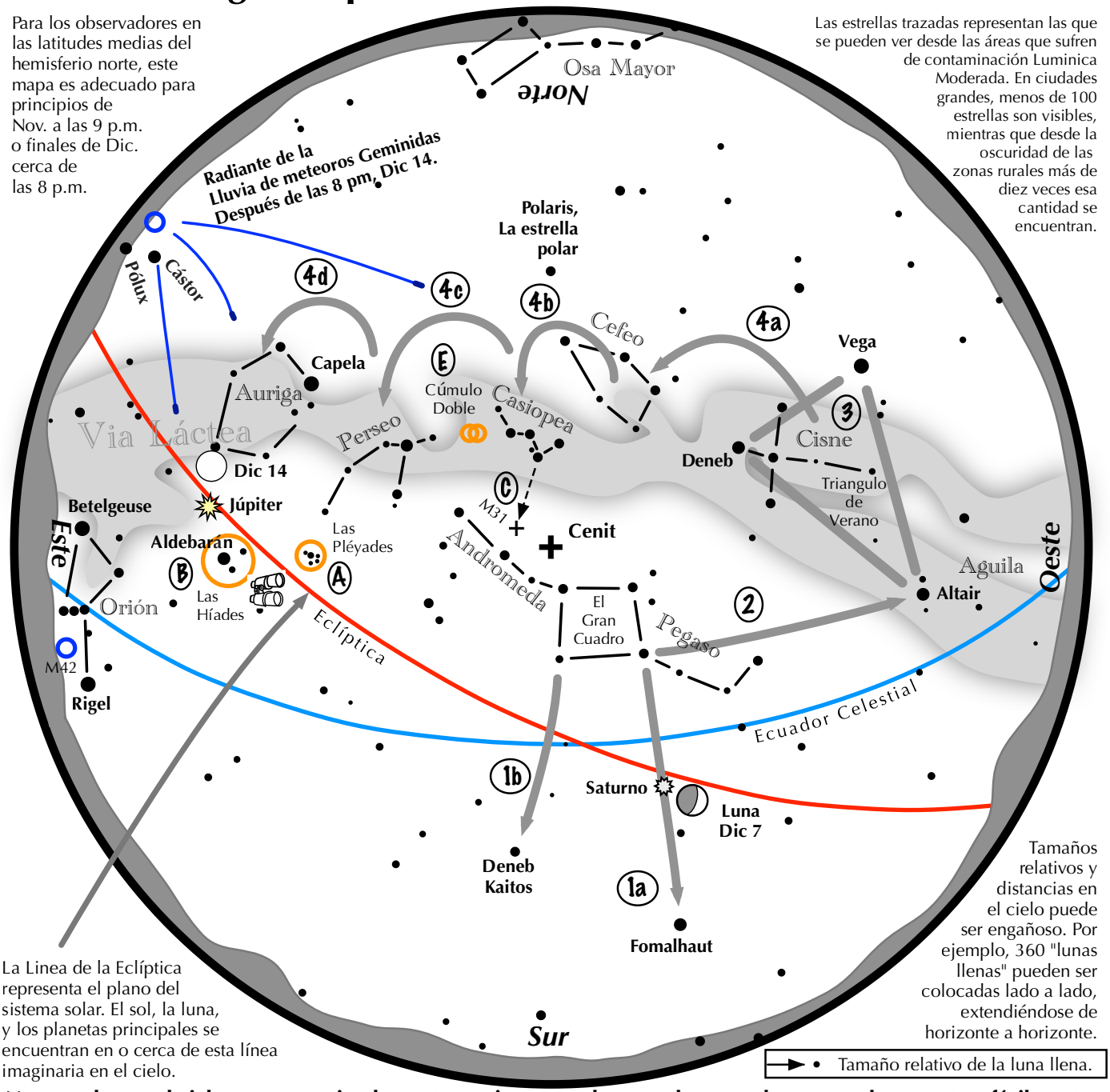
1. Face south. Almost overhead is the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend an imaginary line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the southwest. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second bright star in the south.
2. Draw another line, this time westward following the southern edge of the Square. It strikes Altair, part of the "Summer Triangle."
3. Locate Vega and Deneb, the other two stars of the "Summer Triangle. Vega is its brightest member while Deneb sits in the middle of the Milky Way.
4. Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, to Perseus, and finally to Auriga with its bright star Capella.

Binocular Highlights
A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters.
C: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.
D: Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas.

Navegando por el cielo nocturno de Diciembre

Para los observadores en las latitudes medias del hemisferio norte, este mapa es adecuado para principios de Nov. a las 9 p.m. o finales de Dic. cerca de las 8 p.m.

Las estrellas trazadas representan las que se pueden ver desde las áreas que sufren de contaminación Luminica Moderada. En ciudades grandes, menos de 100 estrellas son visibles, mientras que desde la oscuridad de las zonas rurales más de diez veces esa cantidad se encuentran.



La Linea de la Eclíptica representa el plano del sistema solar. El sol, la luna, y los planetas principales se encuentran en o cerca de esta línea imaginaria en el cielo.

Tamaños relativos y distancias en el cielo puede ser engañoso. Por ejemplo, 360 "lunas llenas" pueden ser colocadas lado a lado, extendiéndose de horizonte a horizonte.

Tamaño relativo de la luna llena.

Navegando por el cielo nocturno: simplemente comience con lo que sabe o con lo que puede encontrar fácilmente.

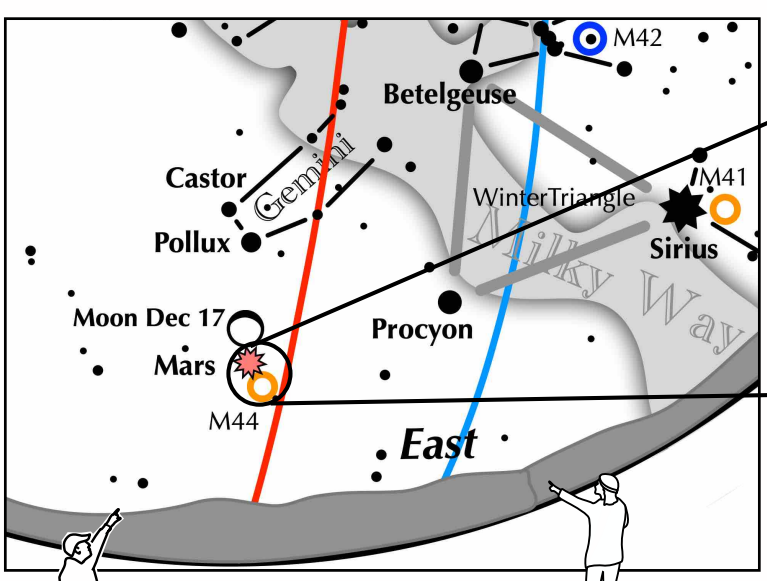
1. Hacia el sur. Casi arriba está el "Gran Cuadro" con cuatro estrellas con el mismo brillo que las de la Osa Mayor. Extiende una línea imaginaria hacia el sur siguiendo las dos estrellas más occidentales del Gran Cuadro. La línea lleva a Fomalhaut, la estrella más brillante del sur. Una línea que se extiende hacia el sur desde las dos estrellas más orientales, lleva a Deneb Kaitos, la segunda estrella más brillante del sur.
2. Dibuja otra línea, esta vez hacia el oeste siguiendo el borde sur del Gran Cuadro. Lleva a la estrella Altair.
3. Ubique a Vega y Deneb, las otras dos estrellas del "Triángulo de verano." Vega es su miembro más brillante, mientras que Deneb se localiza en el medio de la Vía Láctea.
4. Salta a lo largo de la Vía Láctea desde Deneb hasta Cefeo, que se asemeja al contorno de una casa. Continúa saltando a la "W" de Casiopea, a Perseo y finalmente a Auriga con su brillante estrella Capela.

Destacan con Binoculares. A y B: examina las estrellas de las Pléyades y las Híades, dos cúmulos de estrellas a simple vista. **C:** Las tres estrellas más occidentales de la "W" de Casiopea apuntan hacia el sur hasta M31, la Galaxia de Andrómeda, un óvalo "borroso." **D:** Barrer a lo largo de la Vía Láctea desde Altair, pasar Deneb, a través de Cefeo, Casiopea y Perseo, y luego a Auriga para visualizar muchos intrigantes cúmulos de estrellas y áreas nebulosas. **E.** Cúmulo Doble de Perseo.

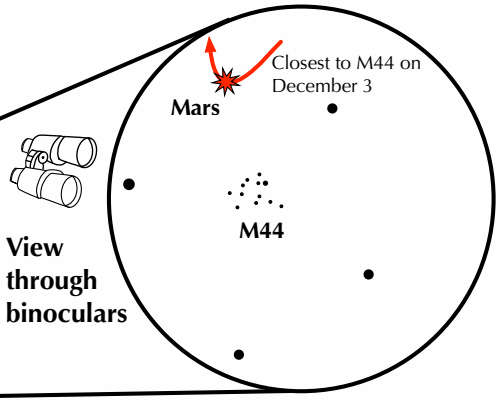
Traducción al español por Dr. Salvador Aguirre

Liga Astronómica

On a moonless evening in December, try this challenge:



View to the east-northeast in December 90 minutes after sunset



View through binoculars

On December 7, Mars starts its retrograde motion, moving slightly each evening westward until February.

Even though Mars and M44 lie near each other in binoculars, they are nowhere near each other in three-dimensional space. M44 is 50 million times farther than the Mars!

It has taken the light from M44's stars over 575 years to reach your eyes!

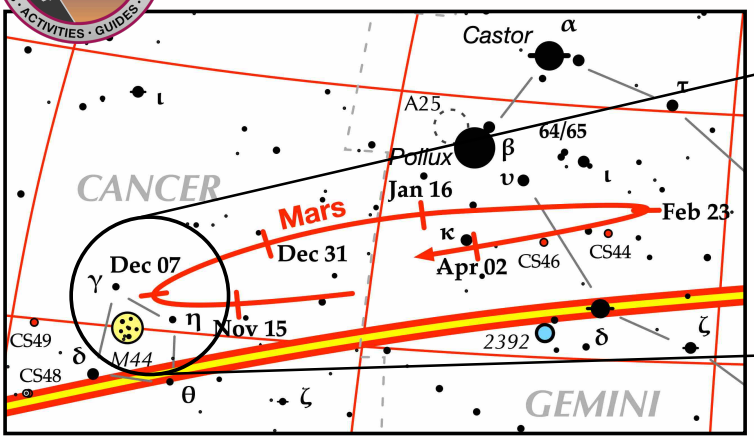
Mars approaches the Beehive

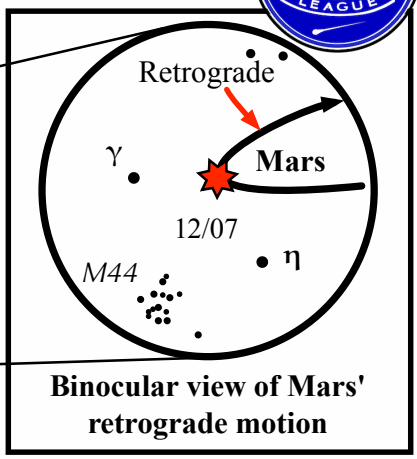
On evenings in December, the Red Planet flies near the Beehive star cluster. On the night of December 3, it is closest.

Be sure to use binoculars to spot the many stellar bees of M44. The cluster has over 1000 stars, but only two dozen or so will be picked out with binoculars.

Observing Project: Retrograde Motion of Mars

See this for yourself!





Binocular view of Mars' retrograde motion

Relative apparent size of Mars

94% illuminated

Dec. 7, 2024
Magnitude: -0.6
Diameter: 12 seconds
Distance: 71 million miles

100% illuminated

Opposition
Jan. 16, 2025
Magnitude: -1.4
Diameter: 15 seconds
Distance: 60 million miles

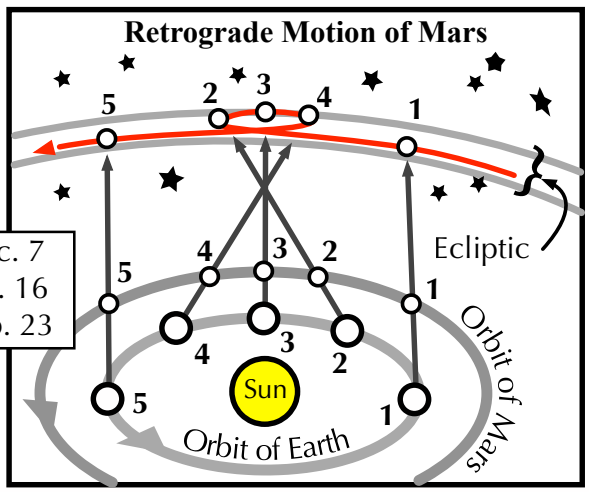
94% illuminated

Feb. 23, 2025
Magnitude: -0.4
Diameter: 11 seconds
Distance: 76 million miles

Over the next four months, observe Mars using binoculars on every clear night, then plot its changing position among the background stars.

Mars nears M44, the Beehive star cluster, in central Cancer in early December. It reaches its closest point to it on December 7, after which it enters retrograde motion, inching westward each evening until February 23, 2025. Mars then lies in central Gemini.

Mars will also be growing in angular size as Earth slowly overtakes it on January 16, 2025. (Actually, the two planets are closest on January 11. The discrepancy is due to Mars' elliptical orbit.) At this time, it shows it largest angular size – 15 arc seconds – until April 2031. By February 23, the Red Planet ceases moving westward nightly, shifting its direction eastward (called prograde motion).



Why do this activity? This planetary dance can only be explained if both Earth and Mars orbit our sun following definable elliptical paths. Our view from Earth clearly shows this to those people who take the time to look carefully enough.

Mars at its brightest, largest & closest:
Jan. 11, 2025
-1.4 mag., 15 arc seconds, 59.8 million miles
It won't come any closer until Apr 11, 2031.

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Stellar Observations

Greg Penner

Planetary Nebulae Techniques

In December, the popular objects to view through the telescope are Saturn (in the southwest sky) and Jupiter (rising in the eastern sky). On a dark, moonless night after getting your fill of these fine objects, try turning your telescope to some objects that have a "planetary" look to them but are actually nebulae: thus the name Planetary Nebulae! While the giant planets are quite obvious and easy to find, finding and viewing a planetary nebula through a telescope can be a bit of a challenge. But challenges are a great way to expand your telescopic skills, so following are some interesting targets to stretch your observing abilities.

Caldwell 15 Blinking Planetary Nebula

C 15 is located in the constellation Cygnus, which this month is in the northwest sky. You will want to catch it in the early evening before it gets too low on the horizon for optimal viewing. C 15 is relatively easy to find as it is very near 4th magnitude Theta Cygni and 6th magnitude 16 Cygni (see chart). Many planetary nebulae have a characteristic "blinking" effect. When viewed directly, the nebulosity seems to disappear, but when using averted vision (using your eye's more light sensitive peripheral rods) the nebulosity reappears. This effect is famously apparent with this object giving it the name "Blinking Planetary Nebula." Direct vision should show you the 11th magnitude central star, while averted vision will cause the nebulosity to pop into view while the faint star disappears.

Caldwell 15 "Blinking Planetary Nebula" location - Stellarium image annotated by Greg Penner

Caldwell 15 - Credit: HST/NASA/ESA

Caldwell 55 Saturn Nebula

This is another good object to view early in the evening before it gets too low on the horizon. I covered the Saturn Nebula in the October newsletter, so please refer to that article.

Caldwell 56 Skull Nebula

C 56, located in the constellation Cetus, is quite a bit larger than the others. "Blinking" and "Saturn" are in the range of 25" to 28" in diameter, while C 56 is about 4' in diameter (about 8x larger). Finding this nebula should not be too difficult as it creates an equilateral triangle pattern with two 5th magnitude stars in the "tail" of Cetus (see chart). Since the luminosity of the nebula is spread out over a large area, the result is a dimmer and more difficult to detect nebula. Four stars of 11th to 12th magnitude are superimposed in front of the nebula. Here is an opportunity to use another observing technique to overcome the challenge of seeing this somewhat dim nebula. If you have in your observing arsenal an ultra-high contrast (UHC) filter, now is the time to use it. Even though this filter is made to

screw into the end of the eyepiece, don't do that. Instead, leave the eyepiece in the focuser and hold the UHC filter between the eyepiece and your eye. Move the filter in and out of your view while looking through the eyepiece, and that should cause the stars to vanish while the nebula becomes more evident and vice versa. This becomes a sort of blinking nebula with the help of the filter.

Caldwell 56 "Skull Nebula" location - Stellarium image annotated by Greg Penner

Caldwell 56 - Credit: Adam Block/Mount Lemmon SkyCenter/University of Arizona

Caldwell 22 Blue Snowball

C 22 is a planetary nebula that presents a different challenge, that is, being difficult to find. This nebula is fairly small at about 17" in diameter, and this time of year is situated almost directly overhead. Anyone who has spent much time searching the skies with a telescope will tell you about the back and neck aching contortions that are sometimes encountered when looking through the finder scope to point a telescope at an object straight overhead. This, of course, assumes you are not using a computerized go-to mount. Also, the small size of this nebula means it will likely look like a faint star at low powers as you are searching the skies, making it difficult to identify. Fortunately, there are a couple of bright, nearby stars that will help us find the Blue Snowball. The 3rd magnitude star Omicron Andromedae is easily identified with the naked eye north of the Great Square of Pegasus (see chart). Point your telescope at that star, and in your eyepiece you should also see a 5th magnitude star (called 2 Andromedae A) just 1/2 degree away. Center a fairly high magnification eyepiece halfway between these two

stars and then just leave it alone for 23 minutes (set the timer on your smart phone and warm up your hands or have a hot drink). When the time is up and you look into the eyepiece, you should see a little bluish patch of light drifting into view. Because the starting point between those two stars and the location of the nebula are at the same declination in the sky (similar to latitude on land), the rotation of the earth brings the Blue Snowball to your eyepiece! Use this method in any situation where your starting point is west of the object you wish to observe. Since this planetary nebula is small, try using higher magnification eyepieces to perceive the nebulosity and blue color.

Caldwell 22 "Blue Snowball Nebula" location - Stellarium image annotated by Greg Penner

Caldwell 22 - Credit: HST/NASA/ESA

Astronomy is a great pursuit in which we get to wonder at amazing celestial sights, but it also is a fun way to learn various skills and techniques that allow us to go deeper into the night sky!

The Queen Speaks

Robin Byrne

Happy Birthday Maarten Schmidt

This month, we celebrate the life of a man most associated with quasars, but who did so much more. Maarten Schmidt was born on December 28, 1929 in Groningen, the Netherlands. His father, Wilhelm, was an accountant who worked for the government, eventually rising to a position in charge of all of the country's accountants. Maarten had one brother, Cees, who would go on to become a professor of Middle Age Dutch.

In 1940, the Netherlands were occupied by the Germans. Despite the constant threat during the five years of occupation, Maarten did find one source of joy. During the blackouts, the view of the night sky was perfect. Maarten and his father would take walks under the stars and enjoy the view. In the summer of 1942, Maarten visited his uncle, Dik, who was an amateur astronomer. During his visit, Maarten got his first glimpse through a telescope. That inspired him to build his own telescope, using lenses he found in his grandfather's workshop

and a toilet paper roll for the tube. One of Maarten's school friends, Jan Borgman, was also interested in astronomy. The two worked together to grind mirrors to make more telescopes. Borgman would also go on to become a professor of astronomy. On April 13, 1945, Canadian troops went to battle with the Germans to liberate the Netherlands. The Schmidt home was caught between the two sides. After a night of cowering on the floor of their kitchen, the Schmidt family emerged to a liberated country.

With the end of the war, Maarten could finally return to school in 1945, after over a year of absences. He quickly worked through the missed material, graduating in 1946. Maarten then enrolled in Groningen University, majoring in physics, astronomy, and mathematics. While a student, Maarten got experience making astronomical observations for one of his professors. In 1949, Maarten Schmidt graduated with a bachelor's degree, followed shortly by obtaining his master's degree at the same university.

That year, at a conference attended by astronomy students and professors from all over the country, Maarten met Jan Oort. Oort offered Maarten a job as an assistant at the Leiden Observatory. While there, Maarten focused on creating a light curve for a variable star. His studies were interrupted by being called to military duty to serve in a "police action." However, before he even completed basic training, the action ended. Instead of going to battle, Maarten spent about two months writing out weekend passes for the other soldiers. Upon his return to Leiden, Maarten continued his graduate work with Jan Oort, measuring how the brightness of comets change with distance from the Sun. He found that comets coming to the inner Solar System for the first time brightened at a much slower rate than did comets that had been near the Sun previously.

However, before completing his doctorate, Oort asked Schmidt if he would be interested in, what would become known as, "The Leiden Expedition" to Kenya. For 15 months, from 1950 to 1951, Schmidt worked at an observatory on Timboroa Hill in

Kenya (located at an altitude of 9600 feet and near the Equator), measuring star positions to help determine the structure of the Milky Way galaxy. Some of Schmidt's memories from that trip include: learning Swahili, playing lots of bridge, beautiful views of the sky, and being on the alert for leopards in trees.

Upon his return to the Netherlands, Schmidt had to readjust to the much lower altitude and very different climate, as well as getting back into the rhythm of taking classes. At this time, Schmidt became interested in doing radio observations of the recently discovered 21 cm emission produced by neutral hydrogen. Not only would this allow for the detection of hydrogen in our galaxy, but also has the advantage of being such a long wavelength that it would pass through all the gas and dust that blocks our view in the visible part of the spectrum. Schmidt's task was to help survey the northern part of the Milky Way. From 1953 to 1954, he used a radar mirror that had to be moved by hand to track the stars to make the observations. Then all the data had to be reduced into the first

map of our galaxy. As Schmidt remembered it, "It was a hot summer night, late with all the windows open, when I had finished writing the density at each location on the map, allowing me to draw isodensity contours. And here it came, the first plot showing the spiral structure in the inner parts of our Galaxy. To be the first one to see it was momentous, an experience that I was to have once more later in my career."

In 1954, another momentous event occurred in Maarten Schmidt's life. The ladies of the Leiden Observatory held a party. At the party, Schmidt met Cornelia "Corrie" Tom, a kindergarten teacher. The following year, they married. Maarten and Corrie would go on to have three daughters: Anne, Elizabeth, and Marijke.

In 1956, Schmidt used his radio observations to then determine the speeds of the stars he observed as they orbited around the center of the Milky Way. This then allowed him to calculate the mass distribution within the central portion of our galaxy. His work with the 21 cm observations was the basis of his

dissertation, and Maarten Schmidt was awarded his doctorate that year.

Thanks to help from Jan Oort, Schmidt was offered a Carnegie Fellowship at the Mount Wilson Observatory. After a boat trip across the Atlantic, a brief stay in New York City (with Pete Seeger's brother!), Maarten and Corrie drove across America to Pasadena, California. At Mount Wilson, Maarten spent the next two years making observations of star clusters, getting the data necessary to make color-magnitude diagrams (also known as HR Diagrams) for each cluster.

When the fellowship ended, Maarten briefly returned to the Netherlands before coming back to America to work at the California Institute of Technology (Caltech) as an associate professor of astronomy. During this time Schmidt studied the gas distribution in galaxies and related that to the rate at which stars form. He found that the higher the concentration of gas, the higher the star-formation rate. This relationship is now known as Schmidt's Law.

In 1962, Schmidt became interested in observing the optical counterparts to radio sources. Many of the strong radio sources seemed to be coming from stars. Looking at the spectra of these objects, the spectral lines did not look like the lines associated with any known elements. One such object that Maarten worked on was called 3C 273. Thanks to being occulted by the Moon more than once, the radio observations were able to provide a very accurate position in the sky so that the optical astronomers could observe the source of the radio signals. It appeared to be a 13th magnitude star. Schmidt took its spectrum, and found it to have several emission lines, but nothing recognizable. After trying many different options, he noticed something about the spacing between the lines that looked familiar. It dawned on him that he was looking at emission lines from hydrogen, but more redshifted than had ever been previously observed.

The redshift indicated that this object was moving away from us at a very high velocity (30,000 miles per second). At such a large speed, it could not be a star in the Milky Way, because it

would have escaped the galaxy long before now. If Hubble's Law is applied, which relates the speeds of galaxies to their distance from us, then this object would be the most distant body ever observed at that time - about 3 billion lightyears. Meanwhile, 3C 273 must be incredibly bright, emitting tremendous amounts of energy, to appear as 13th magnitude from such a large distance. Because 3C 273, and other objects like it, seem to be stars, they were dubbed "Quasi-Stellar Objects" or Quasars, for short. Maarten Schmidt became an astronomical celebrity for this discovery, even appearing on the cover of Time magazine in 1966. Over time, and thanks to ever-improving technology, such as the Hubble Space Telescope, we know that quasars are due to supermassive black holes at the centers of galaxies in the early universe. As tremendous amounts of matter fall into the black hole, the material in the accretion disk gets enormously heated, creating all of the emissions that have been observed.

Schmidt continued to work at Caltech, taking on a variety of administrative positions over the years, but always returning to

research. One of his areas of interest was how the characteristics of quasars change with time. He and his collaborators found that there was a peak concentration of quasars in the earliest era of the universe, and that their numbers decline as you look at distances corresponding to eras closer to present day. The quasars also show a definite decline in brightness as they transition from the early universe to more recent times.

In 2008, Maarten Schmidt and Donald Lynden-Bell were awarded the Kavli Prize for Astrophysics for their discovery of quasars. The award included a substantial monetary component. After Maarten won this, Corrie decided that they could afford to eat out for dinner every night, so that she didn't have to cook. From then on, they could be found almost daily at their favorite restaurant, Celestino, in Pasadena.

Upon retirement, Maarten and Corrie moved to Fresno, California. Corrie passed away in 2020, and Maarten died two years later, on September 17, at the age of 92.

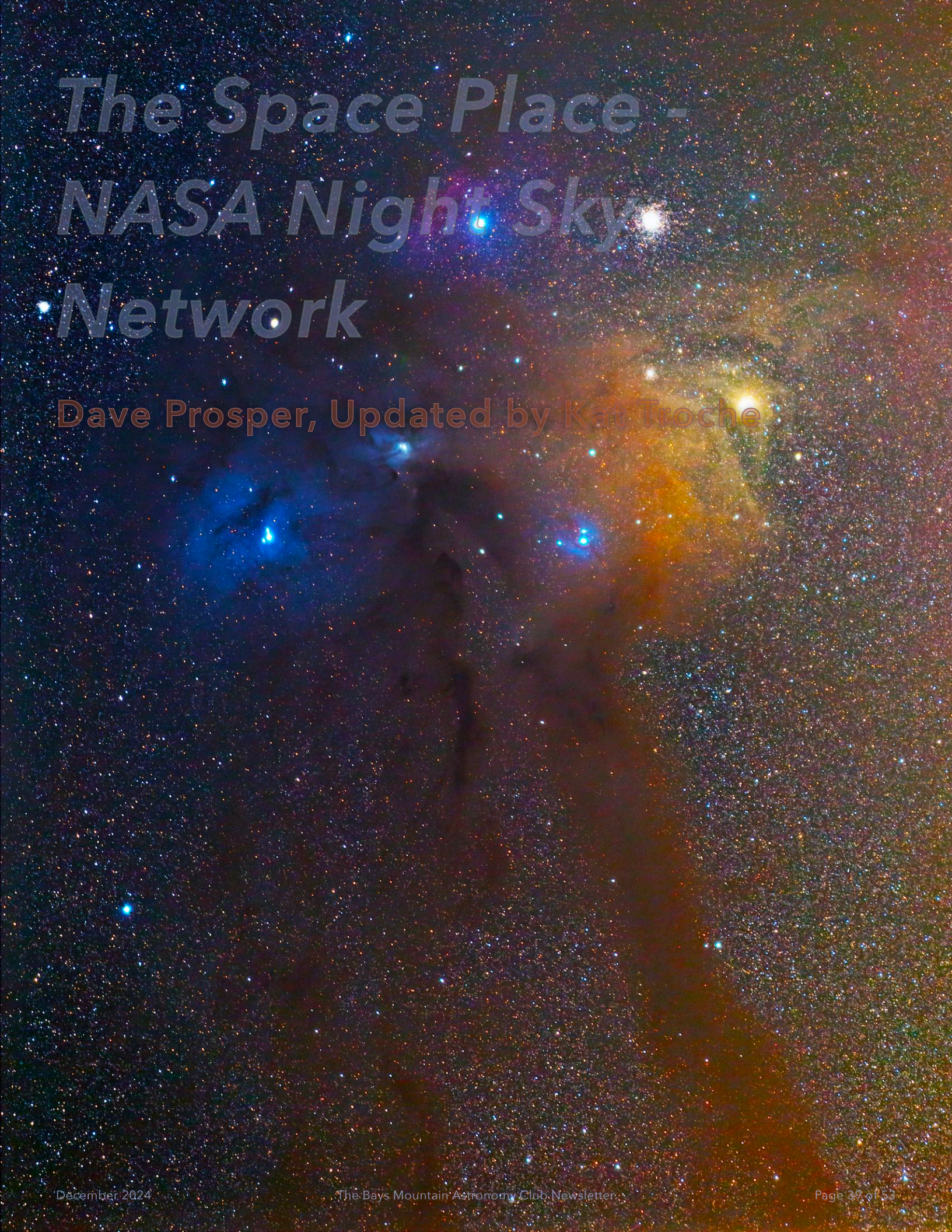
While quasars are not a typical object for amateur astronomers to observe, 3C 273 is bright enough to see through larger amateur telescopes and makes for an interesting way to challenge yourself. While now isn't the best time of year to see it, as Spring approaches, and Virgo becomes better placed, take a stab at seeing one of the more distant objects visible through a telescope and remember the man who helped us understand what these strange objects actually are - Maarten Schmidt.

References:

Wikipedia - **Maarten Schmidt**

Remembering Maarten Schmidt, 1929 - 2022 by Whitney Clavin, September 20, 2022, Caltech

Exploring the Universe As Told by Maarten Schmidt, 2008 Kavli Prize in Astrophysics

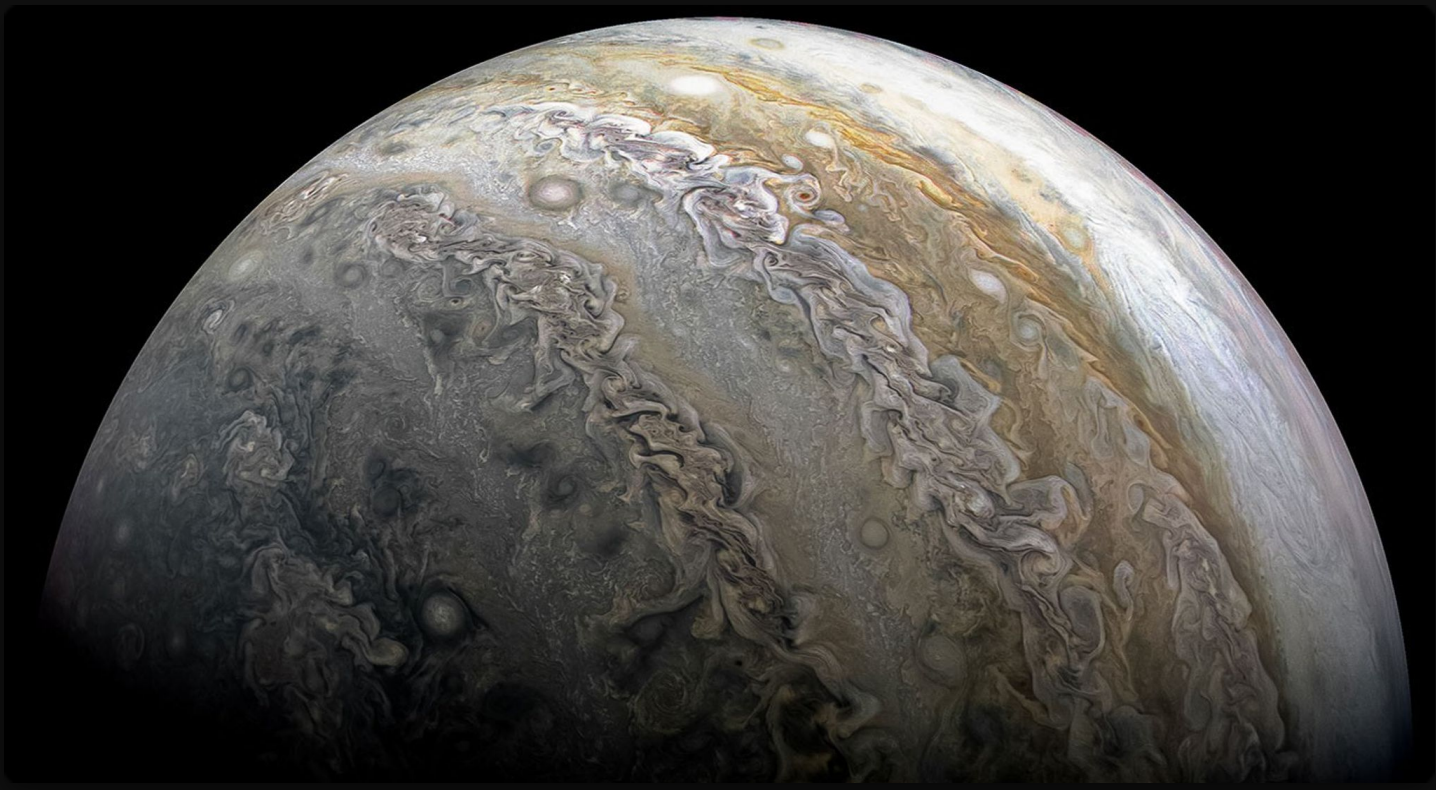


The Space Place - NASA Night Sky Network

Dave Prosper, Updated by Kat Troche

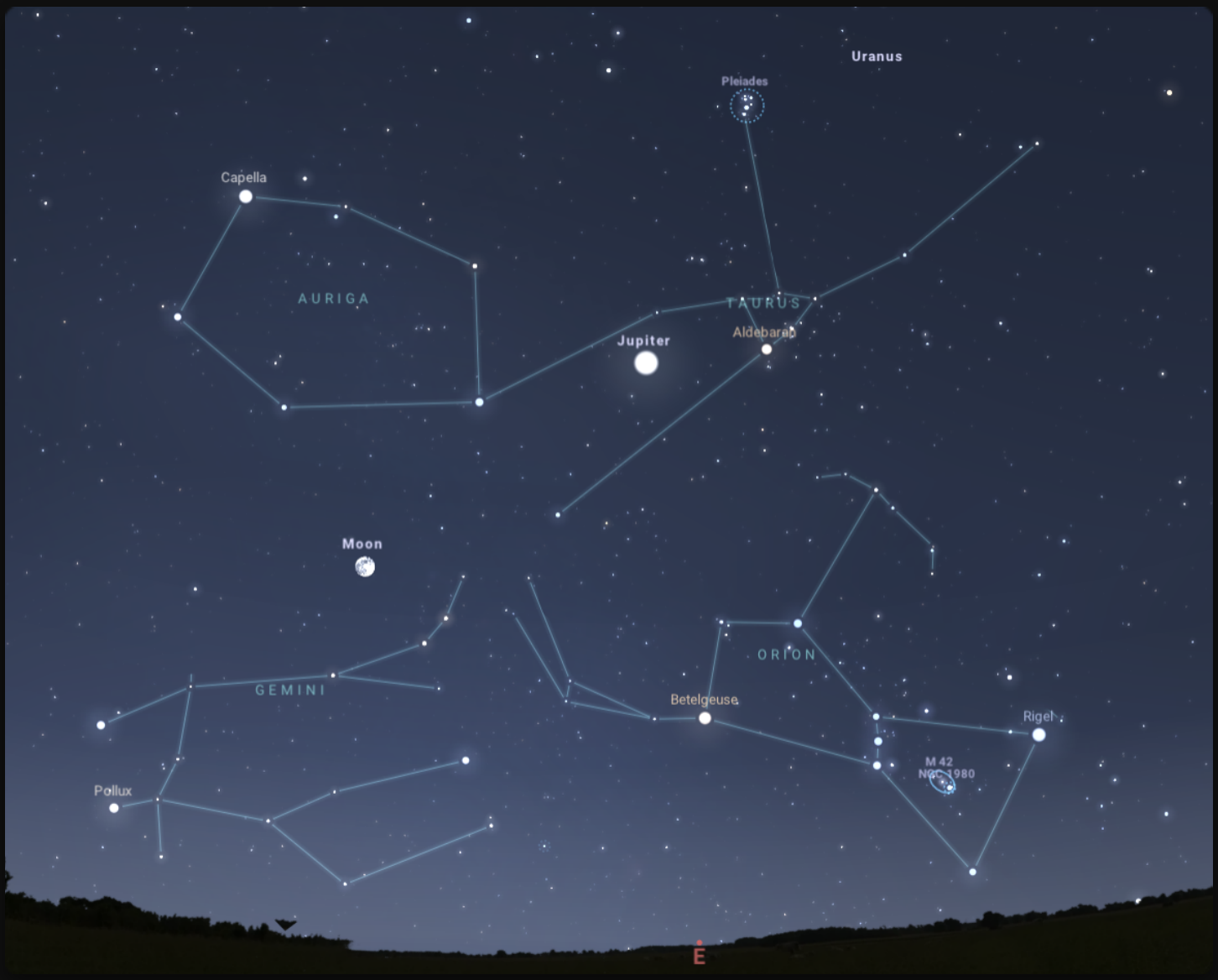
Spot the King of Planets!

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.



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’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 1,300 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!



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*

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 Callisto – 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. [Ed.: Any binoculars of any diameter will show all four. It is important to keep the

binoculars steady.] 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! You can download an activity guide from the Astronomical Society of the Pacific **HERE**.

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*

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** to find local clubs, events, and more!

BMAC Calendar & More

Calendar:

BMAC Meetings:

- Friday, December 6, 2024 - 7p - BMACer's Observing Night.
- Friday, February 7, 2025 - 7p - Topic TBA.
- Friday, March 7, 2025 - 7p - Topic TBA.
- Friday, April 4, 2025 - 7p - Topic TBA.
- Friday, May 2, 2025 - 7p - Topic TBA.
- Friday, June 6, 2025 - 7p - Topic TBA.
- Friday, August 1, 2025 - 7p - Topic TBA.
- Friday, September 5, 2025 - 7p - Topic TBA.
- Friday, October 3, 2025 - 7p - Topic TBA.
- Friday, December 5, 2025 - 7p - Topic TBA.

SunWatch:

- Every clear Saturday & Sunday - 3p-3:30p - March-October - By the Dam
  - View the Sun safely with a white-light view if clear.; Free.
  - You must have completed the Park Volunteer Program in order to help with the public program. If you have, and have been trained, please show up at least 30 minutes prior to the official start time.

StarWatch:

- November 23 & 30, 2024 - 6p
- March 1 & 8, 2025 - 7p
- March 15, 22 & 29, 2025 - 8p
- April 5, 12, 19 & 26, 2025 - 8:30p
  - View the night sky with large telescopes at the observatories. If poor weather, an alternate live tour of the night sky will be held in the planetarium theater. Free.
  - You must have completed the Park Volunteer Program in order to help with the public program. If you have, and have been trained, please show up at least 30 minutes prior to the official start time.

Special Events:

- **BMAC Dinner - January 2025**
  - This event is for members and their families. Look for an e-mail in January with all the information.
- **Astronomy Day - ?, 2025 - 12p-3p; 8:30p-9:30p**
  - Come help share the fun of astronomy with the public. There will be tables with different themed topics plus solar and night viewing.
- **Annual Club Picnic - July 2025**
  - Date and site location will be sent directly to full BMAC members. BMACers and their families are welcome to enjoy an evening of astronomy-themed games and activities along with a potluck dinner and observing.
- **StarFest 2025 - November 7-9, 2025**
  - Our 40th annual astronomy convention / star gathering for the Southeast United States. Three days of astronomy fun, 5 meals, 4 keynote speakers, unique T-shirt and more!
  - **Pre-registration by Oct. 16, 2025 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."**
  - **Link for all the StarFest info including registration and hotel reservation links.**

Regular Contributors:

Greg Penner

Robin Byrne

Adam Thanz

Greg Penner is a semi-retired architect living in the Tri-Cities area since 2018. He has enjoyed astronomy since childhood when he received a “department store telescope” and viewed Saturn for the first time. He has been a member since 2018.

Robin Byrne has been writing the science history column since 1992 and was chair in 1997. She is an Associate Professor of Astronomy & Physics at Northeast State Community College (NSCC).

Adam Thanz has been the BMAC Newsletter Editor for all but a small number of issues since 1992. He is the Planetarium Director at Bays Mountain Park and an astronomy adjunct instructor at NSCC since 2000.

Connection:

Bays Mountain Astronomy Club:

- 853 Bays Mountain Park Road; Kingsport, TN 37650
- (423) 229-9447 - **Park Site** - **Club Site**
- Newsletter edited by **Adam Thanz**

Dues:

- Dues are highly supplemented by the Bays Mountain Park Association and volunteerism by the club. As such, our dues are kept at an extremely low cost.
- $16 / person / year
- $6 / each additional family member
- Note: if you are a Park Member (which incurs a separate, additional fee), then a 50% reduction in BMAC dues are applied.
- Dues can be paid in many ways. The easiest way is to pay via the CivicRec online portal. If you are a current member, please log in with your e-mail address and reset your password if you have not already done so. You can then update your membership. Here's the direct **link**. If you want to add family members, then add them via the internal link. You can also pay at the gift shop, by mail or over the phone.

Chapter Background Image Credits:

- **Cover image of Southern Milky Way by Adam Thanz.**
  - *Sony A7ii with Zeiss Batis 2.8/18 lens, f/2.8, 8 sec., ISO 6,400, August 9, 2020.*
- **Table of Contents image of Comet NEOWISE (C/2020 F3) by Adam Thanz**
  - *Sony A7ii with Sony FE 2.8/90 Macro G OSS lens, f/2.8, 8 sec., ISO 4,000, July 15, 2020.*
- **Cosmic Reflections image of the Summer Triangle area of the Milky Way by William Troxel.**
  - *Image captured July 23, 2016.*
- **BMAC Notes painting of the Moon with moon glow by Christa Cartwright.**
  - *Painting based on a photograph of the Moon Christa captured July 2020.*
- **Stellar Observations image of Crescent Nebula by David Reagan.**
  - *This image was taken with a 140mm refractor in his suburban backyard using an AstroPhysics 900 mount, 8.7 hours of 5 minute Ha and OIII subexposures, combined in AstroPixelProcessor as an HOO image and processed in Lightroom and Photoshop. Image captured in 2022.*
- **The Queen Speaks image of a solar halo by Robin Byrne.**
  - *iPhone 7, June 8, 2020.*
- **The Space Place - NASA Night Sky Network image of the Rho Ophiuchi cloud complex by Brandon Stroupe.**
  - *Canon 6D with Canon 2.8/70-200mm lens, f/2.8 @200mm, 20 x 120 sec. exposures, ISO 1,000, stacked in Deepsky Stacker, processed in Adobe Photoshop CC, Skywatcher Star Adventure mount, September 19, 2015.*
- **BMAC Calendar & More image of the Moon by Greg Penner.**
  - *iPhone shooting through a 9mm eyepiece and 12.5" Truss Tube Dobsonian @212x.*
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