

The Bays Mountain Astronomy Club Newsletter

A night sky photograph showing the Milky Way galaxy arching across the frame, with silhouettes of trees in the foreground.

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Cosmic Reflections

Greg Penner - BMAC Chair



reetings BMAC'ers!

If you came to our July meeting, you know that we were all set to watch a video about supernovas in the Farmstead building when the power went out in the whole park. We improvised by having an informal time sharing some of our astronomy interests and pursuits, had some snacks and visited around tables, and our StarFest committee did some StarFest planning. For our August meeting, we will plan once again to watch the video "Getting Ready for the Next Galactic Supernova".

I really appreciate everyone's vote of confidence in electing me to be club Chair for another year. Please remember that, as a member, this is YOUR club. If you would like to see certain types of programs at club meetings or content in the newsletter that would enhance your love for astronomy, please let me or Mackenzie (newsletter editor) know. If you yourself would like

to present something at a club meeting or contribute something to the newsletter, please let us know. The best way to grow in any discipline is to present topics to other people. My hope is that being in BMAC helps every member grow in their love for astronomy.

Since July is here, it is time for our club to take a pause from the normal meeting and have our annual picnic. This is a members-only (and families) event, so all members will receive an e-mail with info about the picnic. This will be a potluck, although our host will be providing a grill and burgers and/or hot dogs, so everyone should bring some kind of side dish, dessert, drinks, etc. Also, bring chairs for yourselves. The email will have details about the picnic location/facility, date and time. Hopefully, we will have clear skies and do some stargazing with a very nice telescope!

For our fall season, we have two great programs in the works, both about fascinating people in the world of astronomy and astrophysics. At our September meeting, BMAC member Dr. Nate Wentzel, Professor of Physics at Milligan University, will provide a program for us. We don't have a title for the program yet, but I assure you this program will rock you! At our October meeting, BMAC member and Associate Professor of Astronomy at Northeast State Community College, Robin Byrne, will provide a program for us about an astronomer who had such an amazing career that a telescope has been named for her in recognition of her enduring contributions to astronomy. Stay tuned for more info about these programs, and of course for more info about StarFest as we get closer to the opening of registration later in the summer.

Clear Skies!

BMAC Notes



Telescope for Sale!



A former Bays Mountain club member was curious to see if anyone would be interested in purchasing his telescope.

It is a like new Celestron 9.25 SCT. The price is \$975 for all the items. If you are interested or would like more photos, please contact the editor at this [email](#) to get contact information.



Photo of the Celestron 9.25 SCT

News from the Astronomical League

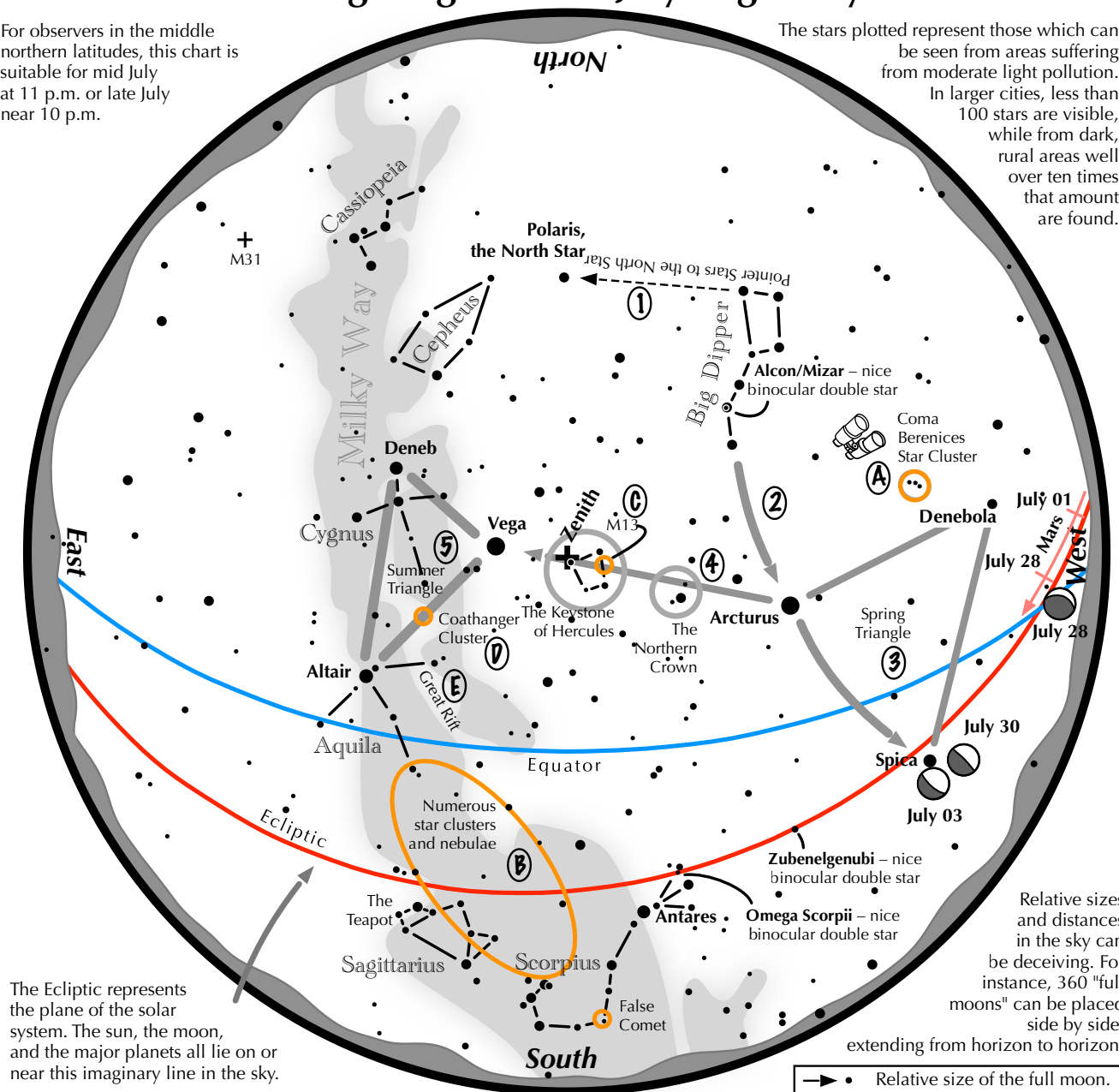


he Astronomical League has a plethora of educational content to help you learn and enjoy the night sky more. The following inserts are just a tiny bit of what they provide.

Navigating the mid July Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid July at 11 p.m. or late July near 10 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

→ • Relative size of the full moon.

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

- 1 Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
- 2 Follow the arc of the Dipper's handle. It first intersects Arcturus, the brightest star in the July evening sky, then continues to Spica. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
- 3 To the northeast of Arcturus shines another star of similar brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
- 4 High in the East lies the Summer Triangle stars of Vega, Altair, and Deneb.
- 5

Binocular Highlights

- A: Between Denebola and the tip of the Big Dipper's handle, lie the stars of the Coma Berenices Star Cluster.
- B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
- C: On the western side of the Keystone glows the Great Hercules Cluster, containing nearly 1 million stars.
- D: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
- E: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.

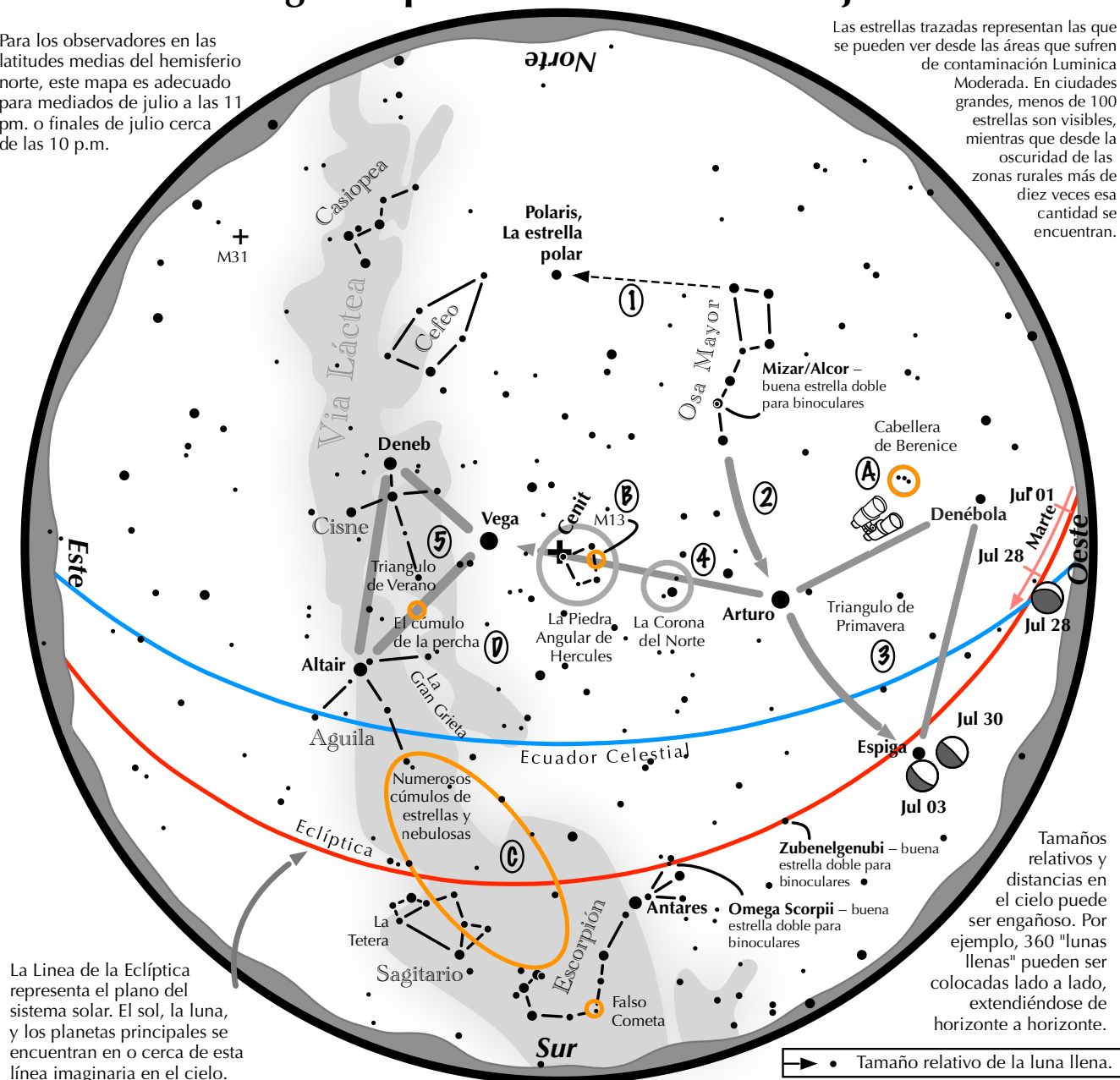
Astronomical League www.astroleague.org/outreach; duplication is allowed and encouraged for all free distribution.



Navegando por el cielo nocturno de julio

Para los observadores en las latitudes medias del hemisferio norte, este mapa es adecuado para mediados de julio a las 11 pm. o finales de julio cerca de las 10 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.



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

- 1 Haz una línea hacia el norte desde las dos estrellas en la punta de la Osa Mayor. Pasa por Polaris, la estrella polar.
- 2 Siga el arco del mango del tazón de la Osa Mayor. Primero cruza Arturo, luego continúa hacia Espiga.
- 3 Arturo, Espiga y Denébola forman el triángulo de primavera, un gran triángulo equilátero.
- 4 Dibuja una línea desde Arturo a Vega. Un tercio del camino se encuentra "La Corona del Norte". Dos tercios de esa distancia llevan a la "piedra angular de Hércules." Se necesita un cielo oscuro para ver estas dos configuraciones estelares tenues.
- 5 En lo alto del este se encuentran las tres estrellas brillantes del Triángulo de verano: Vega, Altair y Deneb.

Puntos destacados con binoculares

A: Mira alto en el este para ver el cúmulo de estrellas perdidas de Cabellera de Berenice. **B:** M13, un brillo redondo de un cúmulo de más de 500,000 estrellas. **C:** Entre las brillantes estrellas de Antares y Altair, se esconde un área que contiene muchos cúmulos de estrellas y nebulosas. **D:** Casi a la mitad de la distancia entre Altair y Vega, Brilla la "Percha," un grupo de estrellas que describe un perchero.



Traducción al español por Dr. Salvador Aguirre

www.astroleague.org/outreach; Duplicación permitida y fomentada para toda distribución gratuita.

Liga Astronómica



M6 & M7

When these two big, bright, and beautiful open star clusters appear in the early evening in mid June, summer is not far behind.



If you have recently begun your journey under the stars, why not whet your appetite by exploring southeastern Scorpius and its two wonderful open star clusters, M6 & M7. You will return to them year after year!

While they are visible to the unaided eye from a dark location, binoculars help greatly.

1. Identify Scorpius standing low in the south-southeast on a late spring or early summer evening. As summer proceeds, it is found low in the south, then low in the southwest in the early fall.
2. From red Antares, direct your gaze southward down the scorpion's back, then turn eastward.
3. When its tail hooks northward, continue the length of that hook.
4. M6 and M7 should be plainly visible in the binocular field.

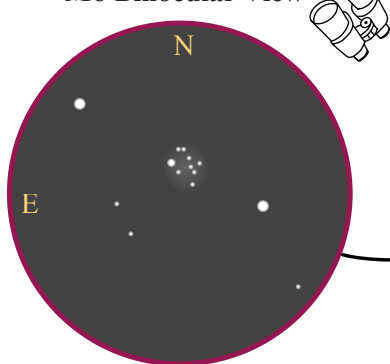
M6:

A faint hazy glow is seen by the unaided eye from a dark, clear site. Two dozen stellar lights can be discerned with 10x50 binoculars.

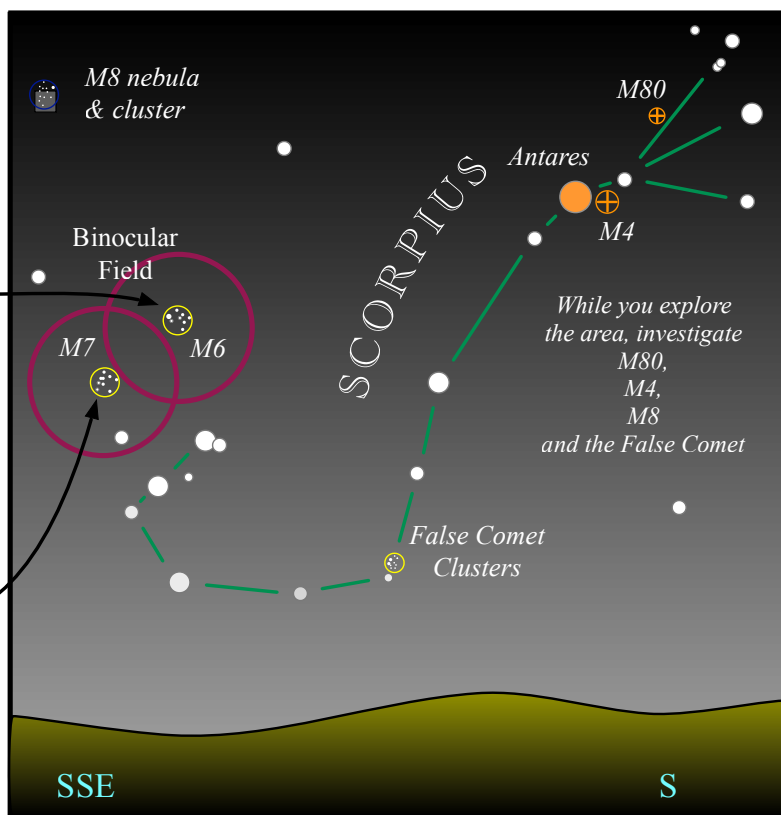
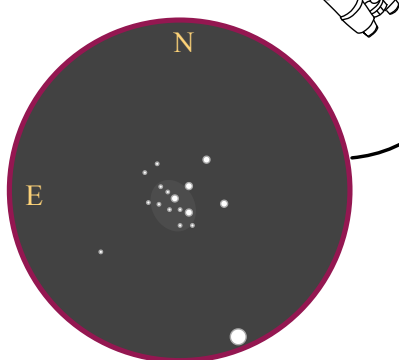
M7:

A glittery glow is easily spotted off the scorpion's tail by the unaided eye. Binoculars reveal many faint stars.

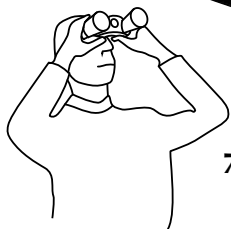
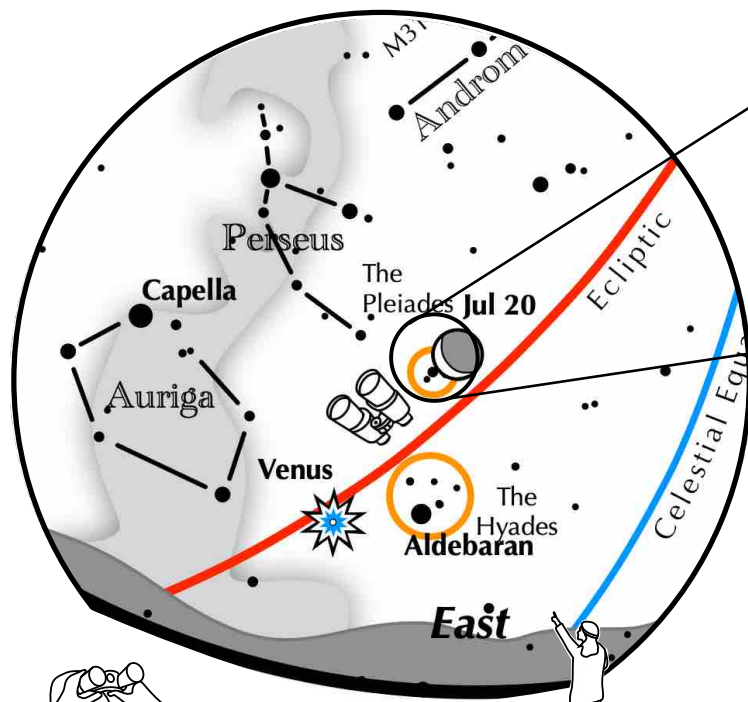
M6 Binocular View



M7 Binocular View



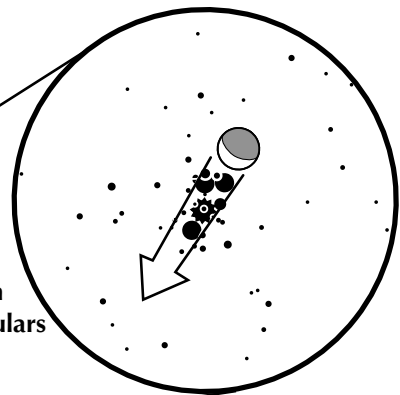
**If you can observe only one morning celestial event
this month, consider this one:**



**East-northeast
75 minutes before sunrise
on July 20.**



**View through
10x50 binoculars**



Crescent moon occults the Pleiades

Look to the east-northeast 75-90 minutes before sunrise.

- On July 20 at 4:10 a.m. EDT, look for the crescent moon and the Pleiades low in the east-northeast.
- When the moon rises for West Coast viewers, the event will already be in progress.
- With binoculars, watch Pleiads disappear one-by-one behind the bright leading edge of the moon, and reappear along the moon's dark edge.
- The moon moves eastward about its own diameter every hour.

What a great way to start your day!

Stellar Observations

Greg Penner



Follow that Moon!



urning your attention to the Moon in July will reward you with some unique and interesting observations.

In the unique category, the Moon will occult several bright stars this month, both in the evening and in the early morning in different parts of the sky. Whether you're a night owl or an early riser, Luna has you "covered" (or occulted, wink wink). In the interesting category, during both occultations, the Moon's terminator (the dividing line between shadow and sunlight where surface features show the greatest detail) will be near a crater with fascinating surface features for any size telescope.

On the evening of July 6-7 in the southwestern sky, the Moon will occult the 2.9 magnitude star Pi Scorpii, which will be a fairly rare occurrence. The rare nature of the event is that the Moon is currently in a "major lunar standstill", which occurs

every 18.6 years. The Moon doesn't exactly follow the plane of the ecliptic, instead orbiting the Earth at an angle tipped by 5.1 degrees. The result is that during this lunar standstill event, which started in 2024 and will continue for most of 2025, the Moon will be significantly further south in the sky than usual. Thus, the Moon can occult the star Pi Scorpii, which is at a southerly declination of -26 degrees. The 87% illuminated waxing gibbous Moon will occult Pi shortly after midnight at about 12:48am EDT (for observers in the Tri-Cities area). The star will disappear behind the Moon's dark limb and reappear from behind the bright limb a little more than an hour later.



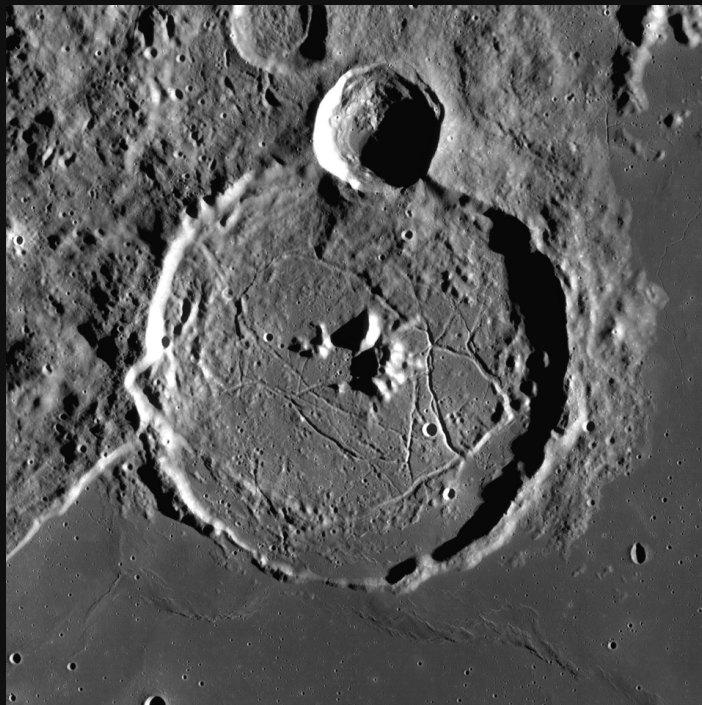
Moon approaching Pi Scorpii - from Stellarium

During the time that you are waiting for the occultation to begin, and while you are waiting for Pi to reappear, your time will be well spent exploring the lunar crater Gassendi. With a diameter of about 110 kilometers, this crater is easily identified by its numerous physical characteristics. The crater wall is well defined all the way around except at the northern end where

the 34-kilometer diameter craterlet Gassendi A adjoins. At Gassendi's southern end, there is evidence that lava once flowed over the wall from adjacent Mare Humorum. At the center of the crater floor are several peaks, the tallest of which rises about 1.2 kilometers. The floor of the crater is where the most interesting features are found. The aforementioned lava flow from Mare Humorum also welled up underneath the crater, uplifting and fracturing the floor, causing numerous rilles (long, narrow depressions or channels). Depending on the size of your telescope and the quality of the seeing conditions, you should be able to see 2-3 rilles and possibly up to half a dozen. Use the highest reasonable magnification for your telescope. With the lunar terminator nearby, the low sun angle playing across these surface features should create shadows that enhance their visibility.



Moon, Pi Scorpii, and crater Gassendi - from Stellarium



Gassendi by NASA Lunar Reconnaissance Orbiter



Gassendi by NASA Apollo 16

The second lunar occultation of the month happens early in the morning on July 20th. Fittingly, the 56th anniversary of the Apollo 11 lunar landing is a great time to turn your attention to the Moon! The Moon will be 24% illuminated in a waning crescent phase as it approaches the famous Pleiades star cluster in the eastern pre-dawn sky. The bright limb of the Moon will cover the first Pleiad, 3.6 magnitude Electra, at about 4:25am (for the Tri-Cities area), followed by 5.4 magnitude Celaeno at 4:35am, 3.8 magnitude Maia at 5:00am, 4.2 magnitude Taygeta

at 5:06am, and finally 21 and 22 Tauri (known together as Asterope) will be covered from 5:23am - 5:31am (all times are estimated from Stellarium simulation). The fun will come as we watch for the occulted stars to “pop” back into view from behind the dark limb of the Moon. As we are watching the final Pleiads disappear, Electra and Celaeno will reappear as morning twilight is well underway at 5:24am and 5:28am, followed by Taygeta at 5:31am. By the time Asterope reappears at 5:50am, the sky is getting much brighter. Will it be possible to see Maia reappear just before 6:00am? Using the web-based Stellarium simulator will help you plan your observations of this unique event.



Moon approaching Pleiades - from Stellarium



Moon, Pleiades, and crater Gassendi - from Stellarium

In the gaps of time between members of the Pleiades being occulted, you can redirect your attention back to the crater Gassendi. The crater will again be near the terminator, although that line between light and shadow will be on the opposite side of the crater. Make observations of all those surface features you saw on July 6-7 and see if there are any differences because of the different angles of sunlight. Taking photographs or making sketches on both dates could make some interesting observations. Following the Moon in July will bring you some unique and satisfying observations.

The Queen Speaks

Robin Byrne



Happy Discovery Anniversary Comet Hale Bopp



his month we celebrate the anniversary of the discovery of one of the brightest comets in my lifetime.

During the evening of July 23, 1995, Alan Hale had become frustrated by the fact that he had devoted hundreds of hours trying to find a new comet with no success. So this evening, he would set up his telescope in his New Mexico driveway, and just observe some known comets. A little after midnight, looking in the constellation Sagittarius near the globular cluster M70, he noticed a 10.5 magnitude fuzzy patch where no documented deep sky objects were listed. Next, he checked to see if any comets had been reported in the area, and none had been. Hale observed the new object long enough to confirm that it was moving relative to the background stars. At that point, he emailed the Central Bureau for Astronomical Telegrams with his observations.

That same evening, Thomas Bopp was observing with some friends near Stanfield, Arizona. Since Bopp didn't own a telescope, he was using one belonging to a friend. They were primarily observing star clusters and galaxies that night, including M70. Looking through the eyepiece, Bopp also noticed something in the field of view that wasn't on the star chart. Taking the name "Central Bureau for Astronomical Telegrams" literally, Bopp sent a telegram with his observation. Brian Marsden, then the director of the Minor Planet Center, had said, "Nobody sends telegrams anymore. I mean, by the time that telegram got here, Alan Hale had already e-mailed us three times with updated coordinates."

By the next day, the comet had been confirmed and given the designation C/1995 O1 by the International Astronomical Union. At the time of discovery, the comet was located between the orbits of Jupiter and Saturn, making it the most distant comet to be discovered by amateur astronomers. The reason

they could see it at such a large distance was because it was much brighter than a typical comet. In comparison, Hale-Bopp was a thousand times brighter than Comet Halley when it was the same distance away, and Hale-Bopp already had an observable coma. As astronomers scanned through earlier images of the sky to see if the comet had been captured, they found a photograph taken two years earlier, when the comet was almost twice as far away, where most comets would not be visible at all. As the comet was studied and measured, the reason for its easy visibility became more apparent - it was huge - possibly as much as 6 times as big as Halley's Comet.

By May of 1996, Hale-Bopp had reached naked-eye visibility for those in dark locations. After being blocked from view by the Sun in December, Hale-Bopp emerged in January 1997 appearing bright enough to even be seen from large, light-polluted cities, and it hadn't even reached its closest approach to the Sun yet! In February, at a brightness of 2nd magnitude,

Hale-Bopp's two tails were easily distinguished, with a blue gas tail pointed away from the Sun, while the broad, curved yellow/white dust tail showed the path the comet had followed in its orbit. On March 22, 1997, Hale-Bopp came closest to Earth, at 1.3 Astronomical Units.

NASA's Jet Propulsion Laboratory had created a web page devoted to the comet. Even though the internet was still relatively new, they were getting over 1.2 million hits per day, and two mirror sites had to be set up to handle the traffic. Hale-Bopp was so popular, it almost broke the internet, and it wasn't even at its brightest, yet!

On April 1, 1997, Hale-Bopp made its closest approach to the Sun, achieving its brightest appearance with a magnitude of -1.8. And if that weren't impressive enough, its tail spanned about 40° across the sky. After its close approach to the Sun,

Hale-Bopp left the Northern Hemisphere skies, but observers in the Southern Hemisphere continued to see it through December of 1997. In total, Hale-Bopp was visible to the naked eye for 18 months - longer than any other comet in recorded history.

Even after fading from naked-eye visibility, astronomers continued to follow Hale-Bopp through telescopic observations. The last recorded Earth-based observation of Hale-Bopp was made in 2001 by the European Southern Observatory with the La Silla Telescope in Chile, when the comet was about half-way between the orbits of Saturn and Uranus. In 2022, the James Webb Space Telescope observed it at a distance of 46.2 AU from the Sun, beyond the orbit of Pluto.

Like most comets that visit the inner solar system, every passage involves interactions with the planets, especially the large Jovians. These interactions change the shape and period

of the orbit. It is estimated that Hale-Bopp previously visited our skies about 4200 years earlier, around the year 2215 BC. This may have been its first trip to the inner solar system. A close encounter with Jupiter changed its orbit during that trip, and in 1996, Hale-Bopp flew close enough to Jupiter again to alter its orbit even more. This encounter shortened its orbital period almost in half, to 2399 years, bringing it back to our skies in the year 4385. Mark your calendars! Because its orbit is now almost vertical compared to the orbital plane of the planets, future orbital changes are less likely, so this may be close to its permanent orbital rate.

During its time in our celestial neighborhood, professional astronomers extensively studied Comet Hale-Bopp. Using the Hubble Space Telescope, its diameter was found to be about 19-25 miles across, compared to most comets being at most a few miles across. Assuming a density similar to that of other comets, Hale-Bopp would be about 100 times more massive

than Halley's Comet. Observations of distinct gas jets on the nucleus allowed astronomers to determine its rotation period to be 11 hours 46 minutes. And in addition to the gas and dust tails, Hale-Bopp was found to have a third, faint tail, composed of sodium, something never before observed.

Because it was so bright, Hale-Bopp may go down as the most-observed comet in history. In the U.S. alone, at least 70% of the population had witnessed the celestial visitor. That prominence did have one tragic consequence, when 39 members of the Heaven's Gate cult committed suicide in the belief that their spirits would be transported to a spaceship hidden in the tail of the comet.

While we have had a few good comets since Hale-Bopp, none have blazed in the sky with as much intensity, nor have been seen by so many people. Hopefully we won't have to wait until 4385 to see something as spectacular as Hale-Bopp again.

References:

Comet Hale-Bopp Wikipedia

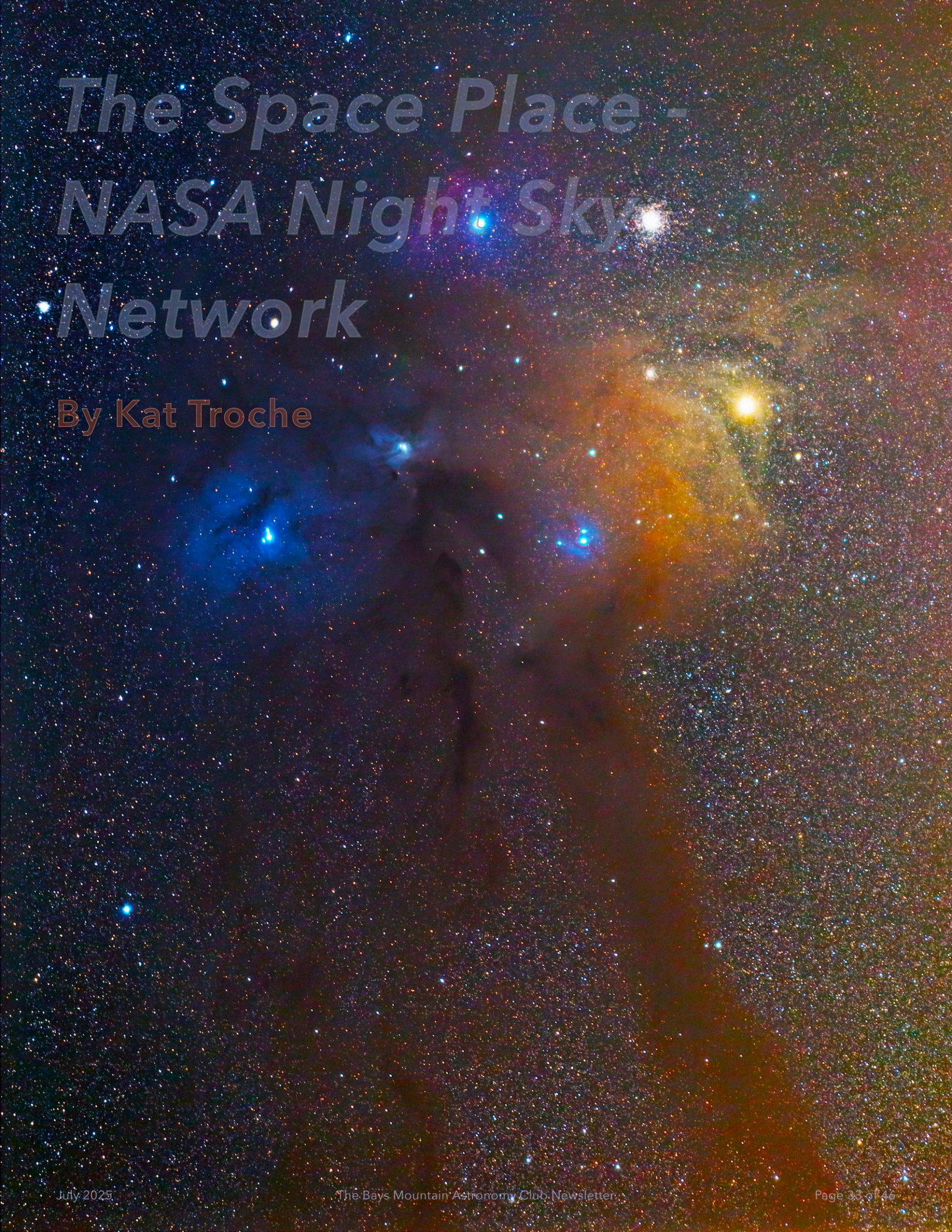
https://en.wikipedia.org/wiki/Comet_Hale-Bopp

Comet Hale-Bopp: Facts about the bright and tragic comet by
Daisy Dobrijevic, Elizabeth Howell April 18, 2022, Space.com

<https://www.space.com/19931-hale-bopp.html>

Comet Hale-Bopp closest to the sun 27 years ago today; April 1
2024, EarthSky

<https://earthsky.org/space/this-date-in-science-comet-hale-bopp/>



The Space Place - NASA Night Sky Network

By Kat Troche

Spy the Scorpion



As summer deepens in the Northern Hemisphere, a familiar constellation rises with the galactic core of the Milky Way each evening: Scorpius the Scorpion.

One of the twelve zodiacal constellations, Scorpius contains many notable objects, making it an observer's delight during the warmer months. Here are some items to spy in July:



The star map of the Scorpius constellation highlights the star Antares and several notable deep-sky objects like the Rho Ophiuchi Complex, Messier 4, the Cat's Paw Nebula, and Caldwell 76, the Baby Scorpion Cluster. Credit: Stellarium Web

- **Antares:** referred to as “the heart of the scorpion,” this supergiant has a distinct reddish hue and is visible to the naked eye. If you have good skies, try to split this binary star with a medium-sized telescope. Antares is a double star with a white main-sequence companion that comes in at a 5.4 magnitude.
- **Messier 4:** one of the easiest globular clusters to find, M4 is the closest of these star clusters to Earth at 5,500 light years. With a magnitude of about 5.6, you can spot this with a small or medium-sized telescope in average skies. Darker skies will reveal the bright core. Use Antares as a guide star for this short trip across the sky.
- **Caldwell 76:** If you prefer open star clusters, locate C76, also known as the Baby Scorpion Cluster, right where the ‘stinger’ of Scorpius starts to curve. At a magnitude of 2.6, it is slightly brighter than M4, albeit smaller, and can be spotted with binoculars and the naked eye under good sky conditions.



*A digital map of the Rho Ophiuchi Complex. Credit:
Stellarium Web*

Lastly, if you have an astrophotography set up, capture the Cat's Paw Nebula near the stinger of Scorpius. You can also capture the Rho Ophiuchi cloud complex in the nearby constellation Ophiuchus. Brilliant Antares can be found at the center of this wondrous structure.

Manaiakalani

While many cultures tell tales of a 'scorpion' in the sky, several Polynesian cultures see the same stars as the demigod Māui's fishhook, Manaiakalani. It is said that Māui didn't just use his hook for giant fish in the sea, but to pull new islands from the bottom of the ocean. There are many references to the Milky Way representing a fish. As Manaiakalani rises from the southeast, it appears to pull the great celestial fish across a glittering sea of stars.

Measure Your Darkness

While you can use smartphone apps or dedicated devices like a Sky Quality Meter, Scorpius is a great constellation to measure your sky darkness with! On a clear night, can you trail the curve of the tail? Can you see the scorpion's heart? Use our free printable Dark Sky Wheel, featuring the stars of Scorpius on one side and Orion on the other for measurements during cooler months. You can find this resource and more in the Big Astronomy Toolkit.

ADDITIONAL LINKS:

[Messier 4](#)

[Caldwell 76](#)

[Cat's Paw Nebula](#)

[Rho Ophiuchi](#)

[Manaiakalani](#)

[Dark Sky Wheel](#)

[Big Astronomy Toolkit](#)

IMAGE CREDITS:

[Scorpius Constellation](#)

[Rho Ophiuchi Digital Image](#)

BONUS IMAGE - [JWST Rho Ophiuchi](#)

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](https://nightsky.org) to find local clubs, events, and more!

BMAC Calendar & More



Calendar:



MAC Meetings:

- Friday, August 1, 2025 - 7p - Watching the video "Getting Ready for the Next Galactic Supernova".
- Friday, September 5, 2025 - 7p - Topic TBA.
- Friday, October 3, 2025 - 7p - Topic TBA.
- Friday, December 5, 2025 - 7p - Topic TBA.
- Friday, February 6, 2026 - 7p - Topic TBA.
- Friday, March 6, 2026 - 7p - Topic TBA.
- Friday, April 3, 2026 - 7p - Topic TBA
- Friday, July 1, 2026 - 7p - Topic: TBA



unWatch:

- 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.



tarWatch:

- Every Saturday in October and November - By the observatory
 - 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:

- **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.](#)

- **BMAC Dinner - January 2026**

- This event is for members and their families. Look for an e-mail in January with all the information.

Regular Contributors:



Greg Penner



Robin Byrne



Mackenzie Henley

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).

Mackenzie Henley is our new head editor of the Bays Mountain Astronomy Club newsletter. She is an undergraduate student at the University of Tennessee Knoxville.

Connection:

Bays Mountain Astronomy Club:

- 853 Bays Mountain Park Road; Kingsport, TN 37650
- (423) 229-9447 - [Park Site](#) - [Club Site](#)
- Newsletter edited by [Mackenzie Henley](#)

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, July 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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