# The Bays Mountain Astronomy Club Newsletter

# Table of Contents

Table of Contents	2
Cosmic Reflections	3
BMAC Notes	6
Sky News from the Astronomical League	
Stellar Observations	12
Looking Forward to 2024	
The Queen Speaks	29
Happy Birthday Isaac Roberts	
The Space Place - NASA Night Sky Network	41
Connecting the 'Dots' with Asterisms	42
BMAC Calendar & More	48
Calendar:	49
Regular Contributors:	52
Connection:	
Chapter Background Image Credits:	54

# **Cosmic Reflections** Greg Penner - BMAC Interim Chair



I hope everyone is looking forward to an exciting 2024 in astronomy! You will see elsewhere in this newsletter there is much to look forward to in the coming year. The total solar eclipse in April, the moon occulting stars, and a couple of comets are among the celestial sights in 2024. We will be looking for our club members to share their experiences at our meetings.

BMAC members will be receiving an e-mail soon regarding our annual January dinner for members and their families. We will have a fun night with good food, conversation, and a memorable activity.

Plans are in the works for some programs in the coming months. We have connected with some professors at ETSU who have agreed to provide some presentations for us. One will be in the February/March period and another in August or September. We are going to cancel the April club meeting because it is the Friday before the Monday, April 8th eclipse. Club members who plan to travel to the path of totality won't have to worry about missing the meeting. At the May meeting, we will have the annual student presentations. For our June meeting, we would like to hear from club members about experiences seeing the solar eclipse.

I'm looking forward to seeing everyone in January, see you soon!

# **BMAC** Notes

# Sky News from the Astronomical League

Τ

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 January Night Sky



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

- Above the northeast horizon rises the Big Dipper. Draw a line from its two end bowl stars upwards to the North Star.
- 2 Face south. Overhead twinkles the bright star Capella in Auriga. Jump northwestward along the Milky Way first to Perseus, then to the "W" of Cassiopeia. Next Jump southeastward from Capella to the twin stars Castor and Pollux of Gemini.
- **3** Directly south of Capella stands the constellation of Orion with its three Belt Stars, its bright red star Betelgeuse, and its bright blue-white star, Rigel.
- **4** Use Orion's three Belt stars to point to the red star Aldebaran, then to the Hyades, and the Pleiades star clusters. Travel southeast from the Belt stars to the brightest star in the night sky, Sirius.

#### **Binocular Highlights**

**A:** Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **B:** Between the "W" of Cassiopeia and Perseus lies the Double Cluster. **C:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **D:** M42 in Orion is a star forming nebula. **E:** Look south of Sirius for the star cluster M41. **F:** M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux.



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

### Navegando por el cielo nocturno de Enero



January 2024



#### **ASTRONOMICAL LEAGUE Double Star Activity**





# Stellar Observations

Greg Penner

# Looking Forward to 2024



024 promises to be an exciting year for those of us who gaze skyward, and not only at night! This year's main attraction will be a spectacular daytime event

that we have been anticipating since 2017. The total solar eclipse on April 8th will be the headline astronomical event of the year, perhaps even more spectacular because the Sun is near the peak of its current activity cycle. Due to the peak solar activity, 2024 could be a year in which we have opportunities to see auroras without having to travel very far. Aside from the solar events in 2024, some other highlights for the year include a couple of comets (one that might reach naked eye visibility) and numerous times that the Moon will occult some bright stars.

In January, there will be a very nice grouping on the mornings of the 8th and 9th. Venus, Mercury, and a thin waning crescent Moon will be visible near the southeast horizon. You will notice that the Moon is very near the bright star Antares. Later, during daylight hours, the Moon will actually occult Antares. About a week later, on the night of the 15th, take a look at the waxing crescent Moon with binoculars or a small telescope around 7pm. Only about 1 degree to the right of the Moon, you will see a blue-greenish 8th magnitude "star," which is actually the most distant planet (sorry Pluto) Neptune. As a guide, two nearby stars of similar magnitude make a triangle shape with Neptune. If you have a medium to large aperture telescope, you might see the disk shape of the planet and possibly its moon Triton.



Venus, Mercury, Moon, and Antares, dawn 1/8/24, Stellarium image



Moon and Neptune 1/15/24, Stellarium image

In February, we will see the Moon pass very near the Pleiades star cluster, which is just a preview to an interesting phenomenon. The period in which the Moon can occult the stars of the Pleiades occurs only every 18.6 years, which corresponds to the Moon's nodal cycle. The last occultation period happened in 2005-2011. So, we are now in a new occultation period, and later on in 2024 we will see the Moon actually occult numerous stars in the Pleiades.



Antares occulted by moon on 3/3/24, Stellarium image

March brings the first lunar occultation of a bright star for the year. Very early in the morning on the 3rd (after midnight of March 2nd) at around 2:10a, the bright limb of the 3rd quarter Moon will move in front of the first magnitude star Antares. Approximately 40 minutes later, Antares will reappear from behind the dark limb of the Moon. The exact timing is dependent on the exact location of the observer. This event will take place fairly low on the southeast horizon. Later in March, early morning on the 25th, there will be a penumbral lunar eclipse. From approximately 1a to 5a, the Moon will pass through only the penumbral shadow of the Earth, causing the Moon to be dimmed in brightness. Maximum eclipse will be shortly after 3a. The last thing to watch for in March will be the hopeful brightening of Comet 12P/Pons-Brooks. Towards the end of March and into early April, Pons-Brooks should be brightening from 5th magnitude to 4th magnitude low in the western sky. Binoculars and small telescopes should be able to find it. This comet has a history of sudden flare-ups, so it will be worth keeping an eye on it for unexpected brightening. On the

nights of March 30-31, the comet will be within a half-degree of the brightest star (Hamal) in the constellation Aries.



Comet Pons-Brooks on 3/30 & 31, Stellarium image

April brings us to the year's main event, the total solar eclipse on April 8th. Hopefully, by now, you have a plan to be somewhere from Texas to Maine to experience totality! With the Sun being near solar maximum, there are some special features that can be observed during this eclipse. The corona, the Sun's atmosphere, is uniquely visible during a total eclipse. During solar maximum, activity in the corona can stretch beyond the equator up to the poles. There may also be more of the pinkishred loops known as prominences. Normally, these features also would be confined along the equator, but at solar maximum they could be in numerous locations. During the few minutes of totality, looking in the wider vicinity around the Sun, try to identify objects that you can normally only see at night. Mercury will be about 5° to the northeast, Venus about 15° to the southwest, Jupiter about 25° to the east-northeast, and Saturn and Mars about 30° to the southwest. Comet 12P/Pons-Brooks will be about 6° west of Jupiter, perhaps visible in binoculars. If the weather cooperates, this eclipse should be quite a show!



Path of Total Solar Eclipse on 4/8/24,by Michael Zeiler, GreatAmericanEclipse.com



Solar eclipse with planets on 4/8/24, Stellarium image



Spica occulted by moon on 7/13/24, Stellarium image During the rest of spring and summer, there will be some interesting lunar occultations of bright stars and a very near lunar occultation of a planet. On May 23rd just as the full Moon is rising on the southeast horizon at about 9:20p, it will occult Antares yet again. Antares will reappear at about 10:13p as the Moon has risen to about 8° above the horizon. On July 13th at about 11:26p, the brightest star in the constellation Virgo, Spica, will be occulted by the Moon. This bright star will disappear behind the Moon's dark limb and reappear only 15 minutes before the Moon sets on the western horizon.

Early on the morning of September 18th just after 4a, the Moon will miss occulting the planet Neptune by only about 30", as viewed from Kingsport. Observers to the west in Middle Tennessee or to the north in Kentucky will be able to see the occultation. Before dawn on the morning of September 22nd, the waning gibbous Moon will be moving right through the middle of the Pleiades. Just before 6a, +3.6 magnitude "Electra" will be covered, followed by 5th magnitude Celaeno at 6:30a and 4th magnitude Merope at 6:42a as the sky starts to brighten. Many other stars will be occulted during daylight hours. But not to worry, in November there will be another opportunity to see a Pleiades occultation.



Moon nearly occults Neptune on 9/18/24, Stellarium image



Moon and Pleiades 9/22/24 at 6a, Stellarium image

The big story during the September/October period MIGHT be about comet C/2023 A3 Tsuchinshan-ATLAS. This comet was discovered in February 2023. Current data indicates that it completes an orbit every 80,000 years. The comet will reach perihelion (closest point to the Sun) on September 28, 2024. Current estimates show that it could reach magnitude 1 or 0, and possibly even become a naked-eye comet (although it is still too early to know for sure). The last week of September and first week of October, C/2023 A3 should be visible low on the eastern horizon shortly before sunrise. By October 6 or 7, it will be too close to the Sun to view. On the evenings of the 11th or 12th, it should start being visible in the western sky, gradually climbing above the horizon as it starts its outward bound journey away from the Sun. During this time may be the best time to view the comet after it has interacted with the Sun and still nearby and bright enough to make an interesting sight. Will it be a "Great Comet" in a class with Hale-Bopp? We will wait to find out!



Comet Tsuchinshan-ATLAS on 10-12-24, Stellarium image

Finally, during a four hour period in the early morning hours of November 16th, the full Moon will pass right through the heart of the Pleiades star cluster, occulting two dozen of the brightest stars in the cluster! Starting around 2a, the Moon will cover the western most member, Electra, and proceed to cover Merope, Alcyone, Atlas and many other stars of lesser magnitudes.



Moon in Pleiades 11/16/24 at 3am, Stellarium image

As our "spaceship" Earth zooms around the Sun in the coming year, we will have a front row seat with telescopes, binoculars, and eyes witnessing numerous celestial events. Seeing our perfectly-sized Moon cover the Sun is always an amazing sight! Watching the Moon cover so many distant other suns throughout the year will be fascinating, and we'll be hopeful that a couple of comets will put on a show as well as we look forward to a great 2024!

# The Queen Speaks

### Robin Byrne

-

# Happy Birthday Isaac Roberts



his month we celebrate the life of a man who took astrophotography to a new level. Isaac Roberts was born into a family of farmers on January 27, 1829 in North Wales, in the town of Groes. When Isaac was six years old, his family moved to Liverpool, England. Despite moving to England at such a young age, Isaac remained fluent in Welsh for the rest of his life.

Most of Isaac's early education came from his father. But when he was 15 years old, Isaac started a 7-year apprenticeship with the mechanical engineering firm John Johnson & Son. Even with 13-hour workdays, Isaac managed to pursue his education by taking night classes at the Mechanic's Institute, as well as other schools.



Isaac Roberts

In 1852, Roberts met the woman who would become his first wife, Ellen Anne Cartmel. Three years later, Isaac was promoted to manager at the engineering firm, which he eventually left in 1859 to open his own business as a builder. Isaac was quite successful in this field, as evidenced by his being named President of the Master Builders Association.

With the growing success of his business came the means to pursue his other interests. Isaac always had a scientific aptitude, and now he could explore some of the ideas that intrigued him. In 1869, he made a scientific study of the wells and water in Liverpool, publishing a paper on his results. As a member of the Liverpool Biological Society, he provided equipment used to measure water temperatures at large oceanic depths. He even was a member of the Geological Society and wrote a paper about the ability of sandstone to filter sea water.

In 1878, Isaac's interests turned to astronomy. With a 7-inch Cooke refractor, Roberts began making astronomical observations. By 1882, Roberts had set aside enough money to retire, which allowed him to devote his full attention to his scientific interests. That year, he was elected a Fellow of the Royal Astronomical Society. But he also continued his other studies, such as monitoring the motion of underground water to see if it was affected by the Sun and Moon. He even built special devices for measuring the vertical and lateral pressure produced by grains stored in tall hoppers, publishing his findings in the Proceedings of the Royal Society in 1884.

It was in 1883 that Roberts began to pursue astrophotography. He started with a camera equipped with a variety of lenses, up to 5-inches in diameter. It was around this time that he built an observatory and purchased an 18-inch reflector, in the hopes of getting better photographic results. Roberts constructed a mount for the 18-inch that replaced the counterbalance with his 7-inch refractor, which he then used as a tracking scope. Knowing that the secondary mirror of the reflector would degrade his images, Roberts mounted the photographic plates at the prime focus to optimize his results. In 1886, Roberts formally shared with the Royal Astronomical Society at Liverpool some of his 200 images taken the previous year. This included the first photograph to show extensive nebulosity around the Pleiades, the result of a 3-hour exposure.

In December of 1888, Roberts created his most famous image. His careful tracking and long exposure showed that the Andromeda "Nebula" (now known as the Andromeda Galaxy) had a spiral structure. At this time, all nebulae were thought to be star-forming regions, so the observed structure was completely unexpected. Coupled with the incredibly detailed images he took of the Orion nebula, Roberts' photographs sparked a transition in our understanding of the heavens.



### Nebula in Andromeda - 1888

In search of a location that would be better for his bronchitis, and for his astronomical observing, Roberts moved to the town of Crowborough in Sussex. He bought four acres from Neeson Prince, who already had his own observatory on his portion of the property. Overseeing all aspects of its construction, Roberts built an observatory and house on his newly acquired land, dubbed "Starfields," which he moved into in 1890. Sitting atop a hill 800 feet above sea level, the observatory had an excellent view in all directions. In addition to the observatory, the property also boasted a fruit orchard, kitchen garden, a grass tennis court, and a meteorological station.



Isaac Roberts' observatory and home in Sussex. From "A Selection of Photographs of Stars, Star-clusters and Nebulae."

Joining Roberts at his observatory was William Franks, who was placed in charge of taking the photographs. The two men produced a wealth of images through their collaboration. With this vast collection of photographs, Roberts published the first of two volumes of his images in 1893, in a collection titled "Selections of Photographs of Stars, Star Clusters and Nebulae." The second volume was published six years later. In 1896, Isaac joined a group of people on a steamship to observe a total solar eclipse. The eclipse was clouded out, but Isaac met someone who would later become an important part of his life, Dorothea Klumpke, who was head of the Carte du Ciel Office at the Paris Observatory. This led to a collaboration of measuring images of nebulae using both Isaac's and the observatory's collection of photographic plates. Isaac became widowed in 1901, while his friendship with Dorothea grew, culminating with their marriage in 1902.

On July 17, 1904, Isaac had spent the morning walking in his garden, but later began to feel ill. Dorothea sent for medical help, but Isaac had died before the doctor's arrival. For four years, Dorothea kept Isaac's ashes, but in 1908, a granite pillar was erected in the cemetery at Flaybrick Hill, which includes engravings of Isaac's images of the Andromeda Galaxy and the California Nebula. The epitaph reads in part: "In memory of Isaac Roberts ... one of England's pioneers in the domain of Celestial Photography..., who spent his whole life in the search after Truth, and the endeavour to add to the happiness of others."

The work that Isaac and Dorothea had begun years earlier was completed by Dorothea. In 1929, she published "Isaac Roberts' Atlas of 52 Regions, a Guide to William Herschel's Fields of Nebulosity." Dorothea also used some of her inheritance to donate a substantial sum to the French Astronomical Society. The money was used to create the Prix Dorothea Klumpke -Isaac Roberts "for the encouragement of the study of the wide and diffuse nebulae of William Herschel, the obscure objects of Barnard, or the cosmic clouds of R.P. Hagen."

Isaac Roberts pioneered the notion that exceptional astronomical photographs could be used to advance our knowledge of those objects. His attention to detail and painstaking endeavors helped to demonstrate that the process could be done successfully. In recognition of his work, he has been immortalized by having a crater on the far side of the Moon named for him. Whether you are out observing the Andromeda Galaxy, gazing at the Pleiades, or practicing your own astrophotography skills, take a moment to remember this month's honoree - Isaac Roberts.

### References:

Isaac Roberts - Wikipedia

Scientist of the Day - Isaac Roberts, Jan. 27 2021 by Dr. William

B. Ashworth, Jr.

Dr Isaac Roberts (1829-1904) and his observatories by Stephen

H. G. James, Journal of the British Astronomical Association,

vol.103, no.3, p.120-122

# The Space Place NASA Night Network

Kat Troche

January 2024

### Connecting the 'Dots' with Asterisms



n our **December Night Sky Notes**, we mentioned that the Orion constellation has a distinct hourglass shape that makes it easy to spot in the night sky. But what if we told you that this is not the complete constellation, but rather, an <u>asterism</u>?

An asterism is a pattern of stars in the night sky, forming shapes that make picking out constellations easy. Cultures throughout history have created these patterns as part of storytelling, honoring ancestors, and timekeeping. Orion's hourglass is just one of many examples of this, but did you know Orion's brightest knee is part of another asterism that spans six constellations, weaving together the Winter night sky? Many asterisms feature bright stars that are easily visible to the naked eye. Identify these key stars, and then connect the dots to reveal the shape.

### Asterisms Through the Seasons



Stars that make up the Winter Circle, as seen on January 1, 2024 - Image from Sky Safari

Try looking for these asterisms this season and beyond:

- Winter Circle this asterism, also known as the Winter Hexagon, makes up a large portion of the Winter sky using stars Rigel, Aldebaran, Capella, Pollux, Procyon, and Sirius as its points. Similarly, the Winter Triangle can be found using Procyon, Sirius, and Betelgeuse as points. Orion's Belt is also considered an asterism.
- Diamond of Virgo this springtime asterism consists of the following stars: Arcturus, in the constellation Boötes; Cor Caroli, in Canes
  Venatici; Denebola in Leo, and Spica in Virgo. Sparkling at the center of this diamond is the bright cluster Coma Berenices, or Bernice's Hair an ancient asterism turned constellation!
- Summer Triangle as the nights warm up, the Summer Triangle dominates the heavens. Comprising the bright stars Vega in Lyra, Deneb in Cygnus, and Altair in Aquila, this prominent asterism is the inspiration behind the cultural festival <u>Tanabata</u>. Also found is Cygnus the Swan, which makes up the Northern Cross asterism.
- Great Square of Pegasus by Autumn, the Great Square of Pegasus can be seen. This square-shaped asterism takes up a large portion of the sky, and consists of the stars: Scheat, Alpheratz, Markab and Algenib.



This image shows the region around the Hyades star cluster, the nearest open cluster to us. The Hyades cluster is very well-studied due to its location, but previous searches for planets have produced only one. A new study led by Jay Farihi of the University of Cambridge, UK, has now found the atmospheres of two burnt-out stars in this cluster – known as white dwarfs – to be "polluted" by rocky debris circling the star. Inset, the locations of these white dwarf stars are indicated – stars known as WD 0421+162, and WD 0431+126. NASA, ESA, STScI, and Z. Levay (STScI) Tracing these outlines can guide you to objects like galaxies and star clusters. The Hyades, for example, is an open star cluster in the Taurus constellation with <u>evidence of rocky</u> <u>planetary debris</u>. In 2013, Hubble Space Telescope's <u>Cosmic</u> <u>Origins Spectrograph</u> was responsible for breaking down light into individual components. This observation detected low levels of carbon and silicon - a major chemical for planetary bodies. The Hyades can be found just outside the Winter Circle and is a favorite of both amateur and professional astronomers alike.

### How to Spot Asterisms:

- Use Star Maps and Star Apps Using star maps or stargazing apps can help familiarize yourself with the constellations and asterisms of the night sky.
- Get Familiar with Constellations Learning the major constellations and their broader shapes visible each season will make spotting asterisms easier.
- Use Celestial Landmarks Orient yourself by using bright stars, or recognizable constellations. This will help you navigate the night sky and pinpoint specific asterisms. Vega in the Lyra constellation is a great example of this.

Learn more about how to stay warm while observing this Winter with our upcoming mid-month article on the <u>Night Sky Network</u> page through NASA's website!

# 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 <u>nightsky</u> to find local clubs, events, and more!

# BMAC Calendar & More

# Calendar:



#### **MAC Meetings:**

- Friday, February 2, 2024 7p Topic TBA.
- Friday, March 1, 2024 7p Topic TBA.
- No April meeting due to eclipse.
- Friday, May 3, 2024 7p Student presentations.
- Friday, June 7, 2024 7p Eclipse stories.
- Friday, August 2, 2024 7p Topic TBA.
- Friday, September 6, 2024 7p Topic TBA.
- Friday, October 3, 2024 7p Topic TBA.
- Friday, December 6, 2024 7p Topic TBA.
- Friday, February 7, 2025 7p Topic TBA.



- 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:

- March 2 & 9, 2024 7p
- March 16, 23 & 30, 2024 8p
- April 6, 13, 20 & 27, 2024 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.

pecial Events:



#### • BMAC Dinner - January 2024

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

#### • Astronomy Day - May 18, 2024 - 1p-4p; 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 2024

• 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 2024 - November 1-3, 2024

- Our 39th 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. 2024 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

**G** reg 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.

obin 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).

dam 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:**

**B** ays Mountain Astronomy Club:

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



- 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 <u>link</u>. 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.
- All background images used with permission by their authors.