

The Bays Mountain Astronomy Club Newsletter

A night sky photograph showing the Milky Way galaxy arching across the frame, with dark silhouettes of trees at the bottom.

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Cosmic Reflections

William Troxel - BMAC Chair



reetings Fellow BMACers!

Wow! Another year is here, 2022. I hope each of you had a wonderful holiday season. I hope Santa left you all new toys to enhance your hobby in astronomy. So, maybe we will have a lot of cool things to share in show and tell in the months to come?

First, I want to send a big thank you to Tom for sharing with us at the December Meeting. Tom, thank you so much. You always present a very interesting program and I personally learn something new each presentation you give. A big thank you.

At this point I want to remind everyone I always welcome anyone that would like to present or be a part of any upcoming meetings. Please consider being part of the meetings!

At the December 3rd meeting, the majority of those attending asked me to find a place where we could have a dinner for January. I have left messages at a few places and have not received any response as yet. I will try to see if I can get things

set very soon. I will then send out an e-mail with the details. Please remember, you are not required to attend this dinner. We are treating this as a private event, separate from the Park. You decide if you want to attend based on how you feel. Especially since case rates have more than tripled since we discussed this during the December meeting. As of this writing, we are about to pass our state's records since the beginning of the pandemic.

I want to thank each of you for a very good 2021, even when we are working with online meetings. I know it is/was very different for us. I am very proud of each of you for your willingness to adapt during these very unusual times the world is going through. I know this sounds like a broken record. I still believe that we will get through this pandemic if we stay focused and never give up hope. When we keep the focus and hope, we will come out stronger. Not only as a club, but as citizens of the Universe!

Until next time, this is your Chairman saying... Clear Skies!

BMAC Notes



Photos!



MACer Christa Cartwright sent in these photos!



Planetary conjunction of (r to l) Venus, Moon, Saturn and Jupiter from November 8, 2021. Image by Christa Cartwright taken with iPhone.



Lunar eclipse with the Pleiades, 4:05a, November 19, 2021. Image by Christa Cartwright taken with iPhone.

These images are by BMA Cer Greg Penner!



Comet C/2021 A1 (Leonard) with globular star cluster M3 - taken on 12/03/21 with Nikon D40 DSLR and Takahashi 90mm refractor. A single 75 second exposure at ISO 1600. Image by Greg Penner.



Partially eclipsed moon with Pleiades - taken on 11/19/21 with Nikon D40 DSLR and Takahashi 90mm refractor. A single 2 second exposure at ISO 1600. Image by Greg Penner.



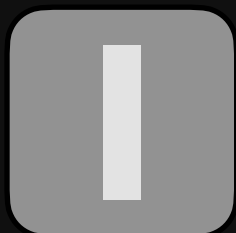
Partially eclipsed moon (max eclipse) - taken on 11/19/21 with Nikon D40 DSLR and Takahashi 90mm refractor with 24mm Panoptic eyepiece. A single 1 second exposure at ISO 1600. Image by Greg Penner.

This image is from BMA Cer Matthew Drummonds!



*Orion Nebula SHO Forax - Nov 2021. Imaging Camera: ZWO ASI6200MM;
Celestron EdgeHD 1100; Focal Reducer: Starizona Hyperstar V4; Mount:
Celestron CGX-L. Image by Matthew Drummonds.*

A Note from the Editor



I'm sure you noticed the changes in the newsletter. I hope you like them! The reason for the darker background is two-fold. One, to enhance the images submitted by you by surrounding them with a darker border. I learned from our Park's exhibits director that your eye is attracted to brighter parts of an image. A white frame means that your eye is looking all around the image, but not at the image. Notice all of the submitted images above by our members. Their point of interest is brighter than the background of the image. The second reason is that a white background is straining on the eyes. We all experience too much screen time anyway. The popular "dark mode" you see with browsers addresses this as well. I've also made the text larger so it is easier to read. A final change was to make the file size smaller. I've changed every text style setting as well as the dimensions of the document and all images used to match. This will help with equipment that may have issues with large PDF documents.

Stellar Observations

Greg Penner



Looking Forward to 2022

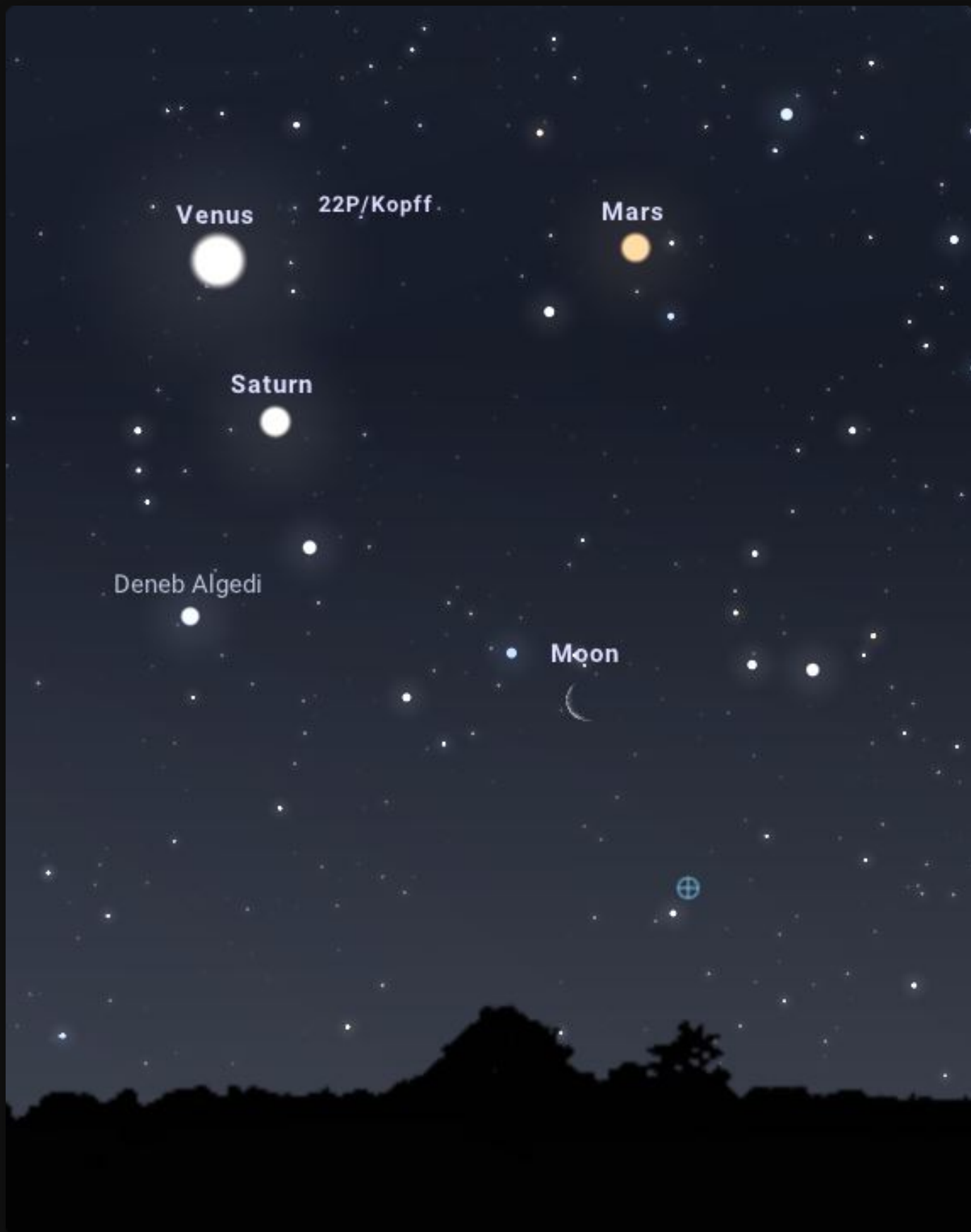


As we continue to face some uncertainty regarding COVID-19 and its variants, we CAN be certain that in 2022, we can enjoy a number of fascinating astronomical sights. The machinery of the Cosmos will continue moving forward, and thanks to online resources like Stellarium and In-The-Sky.org, we can get an advance view and make plans to observe some wondrous events in the sky. 2022 will bring us some close groupings of planets and the Moon, two near lunar occultations of planets and two total lunar eclipses! But, the first exciting astronomical event to follow in 2022 is man-made.

The James Webb Space Telescope is set to launch from European Spaceport near Kourou, French Guiana, on December 22nd at 07:20 EST. [Ed.: As we now know, launch occurred on Dec. 25, 2021.] As this mission progresses through late December and into January, we will have almost daily updates as Webb reaches various milestones related to its unfolding, deployment, and eventual L2 orbital insertion. Then for the following five months, the telescope's optics will be aligned

and scientific instruments will be calibrated. After six months, Webb will begin science operations, and we should look forward to some amazing astronomical discoveries!

In late March and early April, we will see the first notable planet groupings of the year. Venus (mag. -4.3), Saturn (mag. 0.7) and Mars (mag. 1.0) will be within about 5° of each other low on the horizon in the pre-dawn eastern sky from about March 24th through about April 4th. On March 28th, the very thin waning crescent Moon will also join the grouping. Toward the end of that period on April 4th, Saturn and Mars will draw to within less than $\frac{1}{4}^\circ$ ($18''$) of each other, both planets easily visible within a telescopic view. A few weeks later on April 30th, Venus will be joined in the pre-dawn sky by Jupiter shining brightly at magnitude -4.1 and -2.1 respectively. The two brightest planets will be about $\frac{1}{2}^\circ$ apart, and after the sun rises, they will continue to draw closer together to within $\frac{1}{4}^\circ$. If you are observing them with a tracking telescope, you should be able to keep viewing them in the daylight hours if sky conditions cooperate.



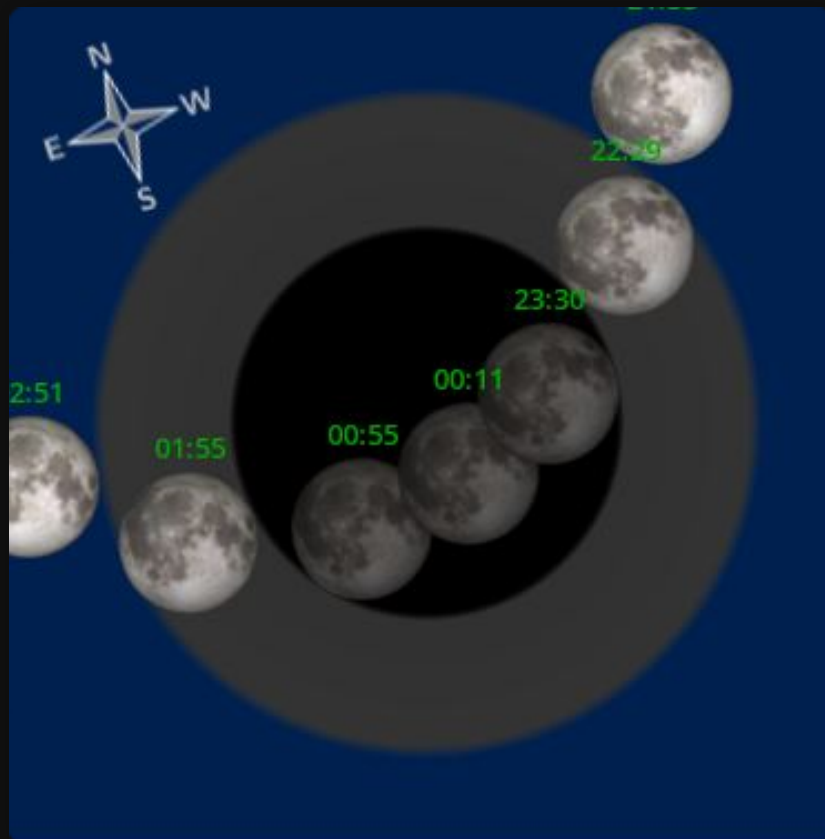
Venus, Saturn, Mars and the Moon grouped together in the pre-dawn sky on March 28th. (credit Stellarium)



*Venus and Jupiter only $\frac{1}{2}^\circ$ apart in the pre-dawn sky on April 30th.
(credit Stellarium)*

As we move later into the spring season, the Moon will put on its first big show of the year. During the night and early morning of May 15-16, we will see the first of 2022's two total lunar eclipses. The eclipse starts with the Moon entering the faint, penumbral shadow of the Earth (P1) at 9:32 p.m. EDT. Please note that it is next to impossible to see any shadowing until the umbral 1 (U1) contact point, where the Moon just

enters the darker, inner umbral shadow. U1 will be at 10:28 p.m. The Moon will be fully within the umbral shadow from 11:30 p.m. (U2) to 12:54 a.m. (U3) and mid-eclipse (GE) being at 12:13 a.m. The U4 contact point will be at 01:55 a.m. Later in the month on the morning of May 29th, Jupiter and Mars will be about $\frac{1}{2}^{\circ}$ apart in the pre-dawn hours. They will be best viewed around 04:30-05:00 a.m. when they have risen to about 20° above the horizon and the sky is still dark.



Path of the Moon through Earth's shadow during May 15-16 total lunar eclipse. (credit In-The-sky.org)



Jupiter and Mars close approach with Venus nearby in the pre-dawn sky on May 29th. (credit Stellarium)

For the remainder of the spring and summer observing seasons, we will not have any notable events, but of course all the wondrous sights in the summer milky way are at their prime viewing season. When we move into October, a notable near occultation of Uranus by the Moon occurs on October 11/12 after midnight. By 01:30-02:00 a.m., the greenish disk of Uranus

will be less than $\frac{1}{2}^\circ$ from the nearly full Moon. The apparent 30' diameter Moon will dominate the apparent 3" disk of Uranus, giving us a unique opportunity to sense the scale of the Solar System. Uranus appears tiny next to the Moon, but has a diameter of over 31,000 miles compared to the Moon's diameter of 2,100 miles. Meanwhile, Uranus is 1.76 billion miles from Earth compared to the Moon's distance of 239,000 miles.

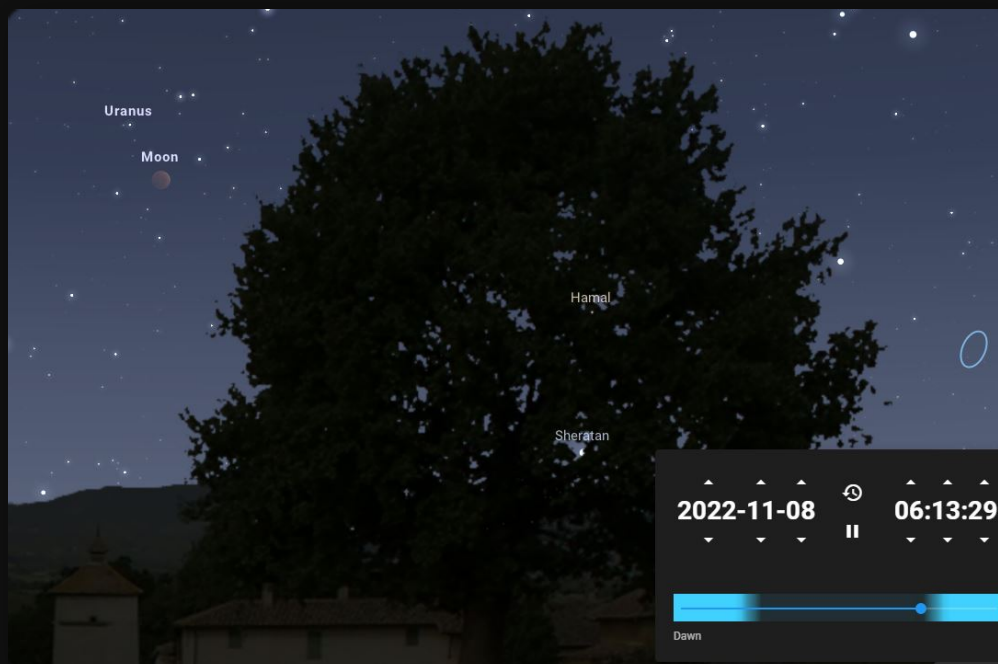


Moon and Uranus close approach October 11-12 (credit Stellarium)

November 8th brings us to the Moon's second big show of the year with another total lunar eclipse. This eclipse will take place in the early morning hours with:

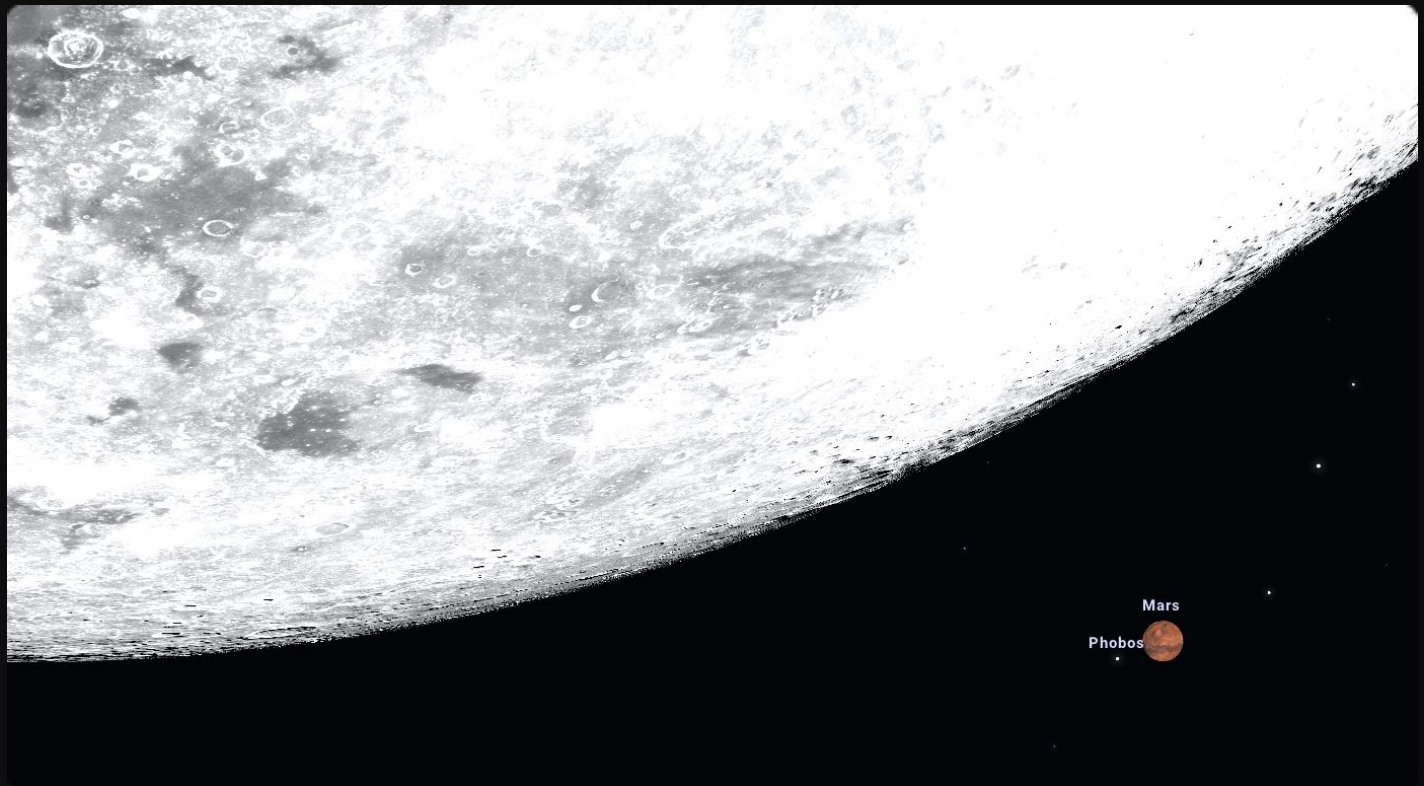
- U1 - 04:10 a.m.
- U2 - 05:17 a.m.
- GE - 06:00 a.m.
- U3 - 06:42 a.m.
- U4 - x

The total eclipse will end at 06:42 a.m. as the Moon is setting on the western horizon while the sky is brightening moments before sunrise.



Eclipsed Moon as it sets in the west in the pre-dawn hours on November 8th. (credit Stellarium)

Finally, in early December, Mars will put on a good show. On December 7th, the "Red Planet" will be visited by the full Moon barely missing an occultation by a few arc seconds. Much of the U.S. will see Mars disappear behind the Moon, but for East Tennessee, we will see a near miss. Additionally, from late November through early December, Mars reaches its maximum angular size of the year at 17", giving us the best opportunity to view surface markings since the fall of 2020.



The Moon nearly occults Mars on December 7th. (credit Stellarium)



Mars at maximum size from late November through early December as it reaches opposition December 8th. (credit [In-The-Sky.org](https://www.in-the-sky.org)).

Hopefully, 2022 will bring some fun astronomical surprises as well. Maybe a close visit by a recently discovered asteroid or comet. Perhaps a star somewhere in another galaxy will explode as a supernova. And of course, we can look forward to results from the Webb Space Telescope and other NASA science missions, so mark your calendars with these events and stay tuned!

The Queen Speaks

Robin Byrne



Book Review: *Blue Latitudes*



hen I came across the book, "Blue Latitudes: Boldly Going Where Captain Cook Has Gone Before" by Tony Horwitz, I was expecting a reenactment of Cook's voyages, including the astronomy. Well... it wasn't, but it was still a very enjoyable read. So, after reviewing the book, I will discuss some of the astronomy that did occur on the Cook voyages.

The author, Horwitz, decided to travel to the places that Cook visited, in roughly the same order as Cook. However, his mode of transportation was mostly by plane, with only a few ventures aboard ships. However, he did begin by spending a week on a recreation of one of Cook's ships as a crew member. If anything, his description of that short trip made me never want to sail on a historic ship.

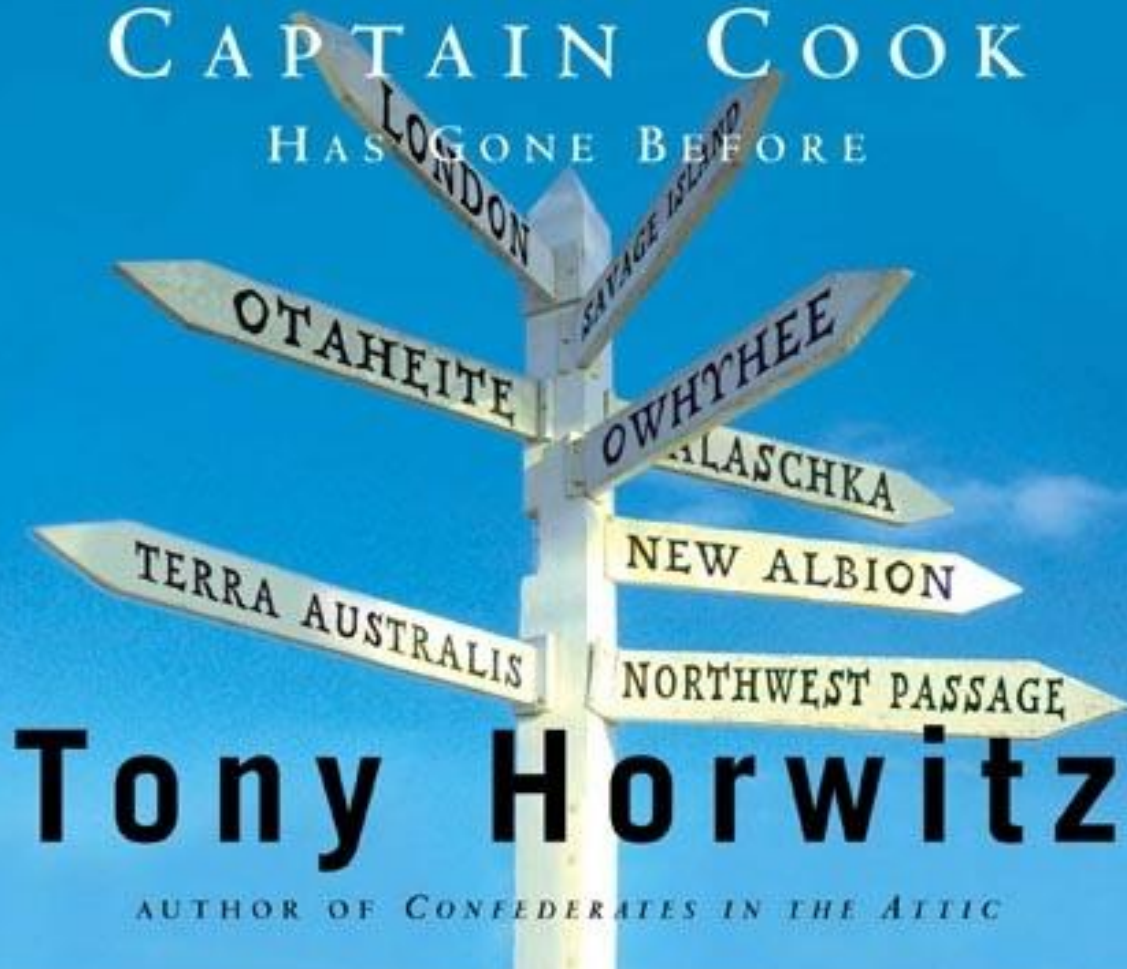
During the majority of his travels, Horwitz was accompanied by a friend who, if nothing else, provided much comic relief to

many of the situations they encountered. Their travels took them to Tahiti, Bora-Bora, New Zealand, Australia, Tonga, England (to visit Cook's hometown), Alaska, and Hawaii. In each location, they tried to discover how Cook was remembered, if at all, and the legacy of his encounters. Throughout the book, it is clear that the result of Cook's contact with the indigenous peoples in the various locations was largely negative. As more Europeans followed in Cook's footsteps, the local populations rapidly changed from the untouched lifestyle of pre-contact, to one of being exploited. Another legacy was the loss of the local culture. It is only recently that, in the majority of these places, the indigenous populations have taken renewed pride in their heritage, and the local governments have begun to recognize the importance of the indigenous peoples. One of the recurring ironies in the tale is that monuments to the indigenous peoples are now more prominent than any of the smaller memorials erected in honor of James Cook.

But what about the astronomy? Cook's first voyage had a most decidedly astronomical objective: observe the transit of Venus across the Sun. The plan was to sail to Tahiti, which had been "discovered" the previous year. There would be two official astronomers (Cook and Charles Green), plus several other crew members to assist them. After eight months at sea, Cook's ship arrived at Tahiti on April 13, 1769, giving them close to two months to prepare for the June 3rd event. The plan was to accurately time when Venus first appeared in front of the Sun, and when it departed. By comparing observations from 76 different points on the globe, the hope was to be able to triangulate the distance to Venus. This would then give the starting point to knowing all the other distances in the Solar System. At this time, only the relative scale of the Solar System was known, but not the actual distance values, so this would have been a phenomenal measurement.

Blue Latitudes

BOLDLY GOING WHERE
CAPTAIN COOK
HAS GONE BEFORE



The cover to "Blue Latitudes: Boldly Going Where Captain Cook Has Gone Before"

To make the observations, they brought a variety of telescopes, quadrants, sextants, clocks, and tent observatories. During the transit, they discovered that knowing the precise time of the start and end of the transit was trickier than expected. What they didn't know is that Venus has an atmosphere, so it doesn't present a sharp edge, but instead, a fuzzy, indistinct boundary. This led to differences in the timing by as much as 42 seconds among those observing the transit. Sadly, because of these difficulties, the observations weren't precise enough to be useable.

However, that wasn't the only astronomical job during the voyage. As new lands were encountered, their precise location was measured. To do this, astronomical observations were made. To measure latitude, the Sun's altitude at local noon was measured. This value was compared to the Sun's declination in the published almanac to quickly determine their location north-south. Longitude was trickier. For this, precisely timed astronomical events could be observed (lunar occultations or timings of Jupiter's moons were popular), and the local time of

the event is then compared to when the event would have occurred in Greenwich, England. The difference in the timing then determined the location East-West. However, this requires accurate clocks, which were difficult to come by. Despite the challenges, Cook and his crew measured relatively precise coordinates for all of the places they visited.

Venus was not the only transit that was observed on Cook's first voyage, either. On November 9, 1769, Mercury also transited the Sun. This time Cook was in New Zealand, which he "discovered" on this voyage. The timing of the transit and measurement of the Sun's altitude allowed them to accurately determine the latitude and longitude of their location, which they dubbed "Mercury Bay."

On Cook's subsequent voyages, the astronomy exclusively involved measuring latitudes and longitudes of the various islands and coastlines encountered. His second voyage had the goal of discovering a large continent in the southern Pacific Ocean that was theorized to exist. (It doesn't.) The third voyage

had the goal of finding a “northwest passage” linking the Atlantic and Pacific oceans. None was found, but they did measure the coordinates of spots along the western American coast and “discovered” Hawaii. That last stop didn’t end well for Cook (spoiler - he was killed there).

Meanwhile, back to the book.... There are many entertaining episodes described in the book, which I don’t want to spoil, though I will say that alcohol and the author’s friend were often involved. Just be prepared to laugh frequently. Whether you are interested in James Cook, issues related to indigenous peoples, travel stories, or just enjoy a well-told tale, “Blue Latitudes: Boldly Going Where Captain Cook Has Gone Before” by Tony Horwitz is a book I would highly recommend.

References:

Blue Latitudes: Boldly Going Where Captain Cook Has Gone Before by Tony Horwitz, Henry Holt and Company, 2002

Exploring the History of New Zealand Astronomy by Wayne Orchiston, 2016, Chapter 4

Exploring the History of New Zealand Astronomy by Wayne Orchiston, 2016, Chapter 5

Exploring the History of New Zealand Astronomy by Wayne Orchiston, 2016, Chapter 6

James Cook and the Transit of Venus, NASA Science, May 27, 2004



The Space Place - NASA Night Sky Network

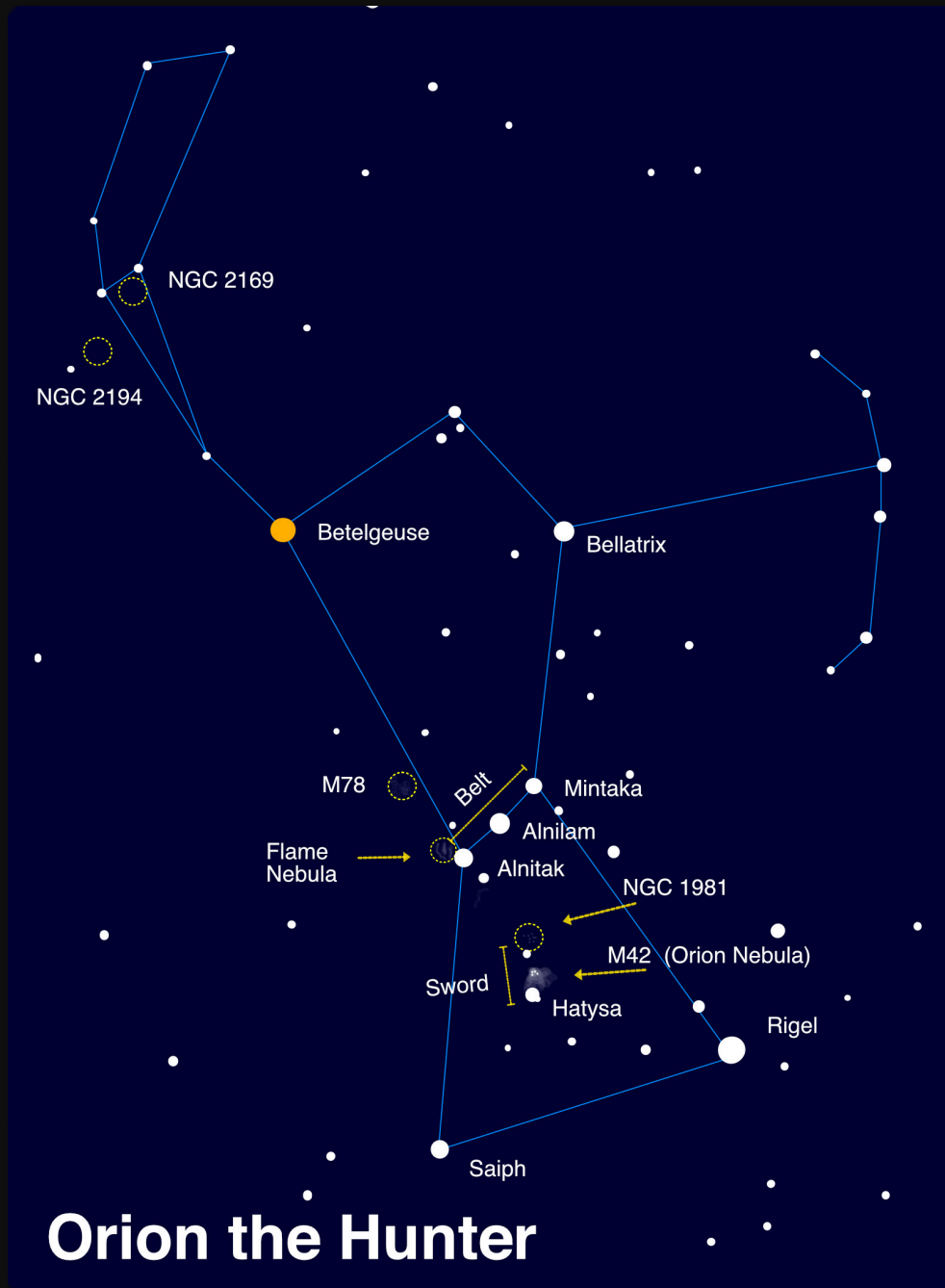
David Prosper

Hunting the Hunter: Observing Orion

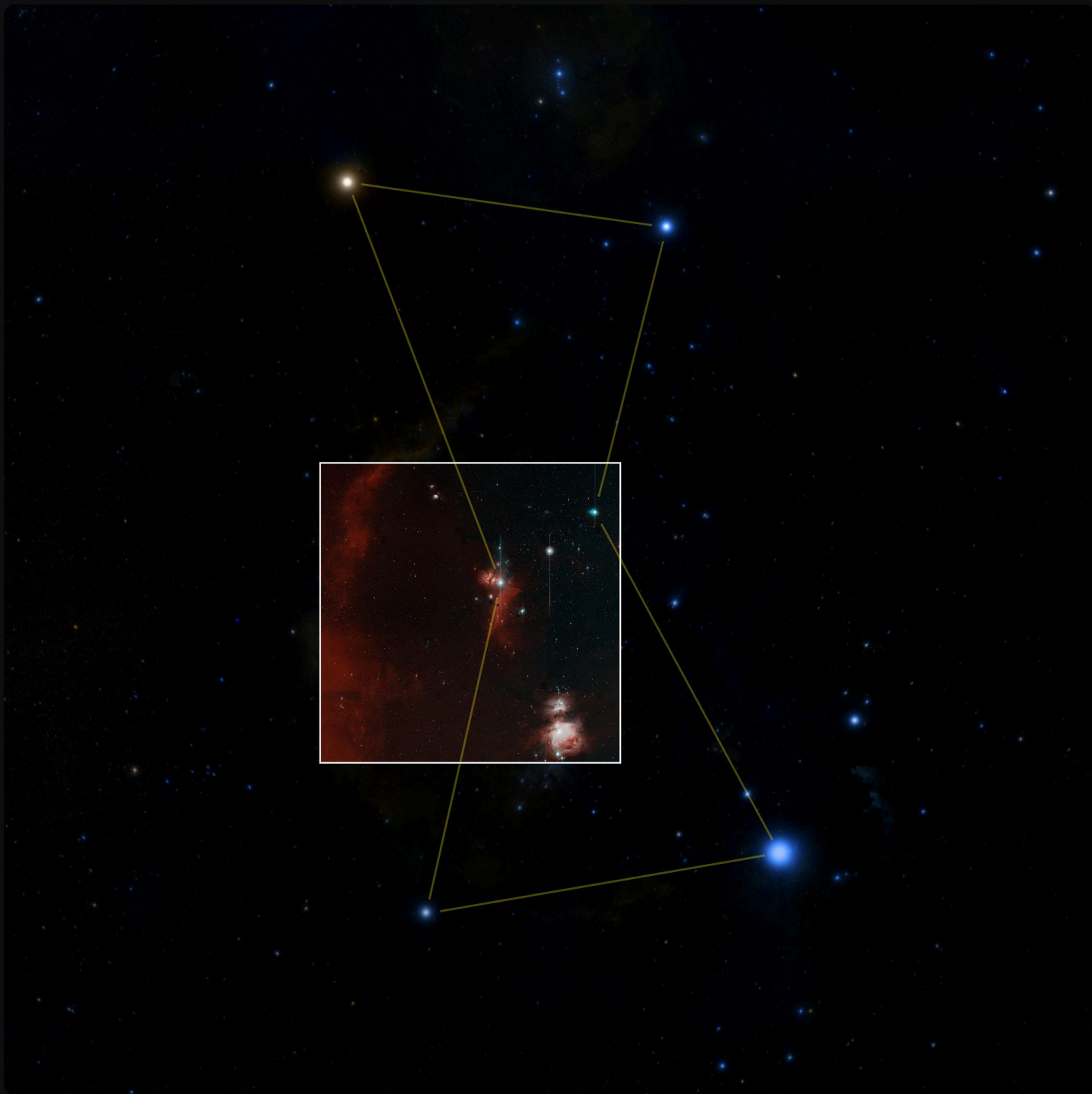


If you are outside on a clear January night, it's hard not to notice one distinctive star pattern above all: Orion! While we've covered Orion in earlier articles, we've never discussed observing the constellation as a whole. Perhaps you've received a new telescope, camera, or binoculars, and are eager to test it out. Orion, being large, prominent, and full of interesting, bright objects, is a perfect constellation to test out your new equipment and practice your observing skills - for beginners and seasoned stargazers alike.

In Greek mythology, Orion is a strong hunter, with numerous legends about his adventures. Being such a striking group of stars, cultures from all around the world have many myths about this star pattern. There are so many that we can't list them all here, but you can find a wonderful interactive chart detailing many cultures' legends on the [Figures in the Sky website](#).



Northern Hemisphere observers can find Orion during January evenings in the east/southeast skies. Can you spot the Orion nebula with your naked eye, in Orion's sword? How does it look via binoculars or a telescope? What other details can you discern? Please note that some deep sky objects aren't listed here for clarity's sake. For example, M43, a nebula located directly above M42 and separated by a dark dust lane, is not shown. Orion's Belt and Sword are crowded, since they are star-forming regions! You can read more in our November 2019 article [Orion: Window into a Stellar Nursery](#). Image created with assistance from Stellarium.



The inset image is the "first light" photo from the Zwicky Transient Facility, a large survey telescope designed to detect changes in the entire night sky by detecting "transient objects" like comets, supernovae, gamma ray bursts, and asteroids. For many astronomers, amateur and pro alike, Orion is often the "first light" constellation of choice for new equipment! Image Credit: Caltech Optical Observatories

What sights can you see in Orion? Look above the variable orange-red supergiant "shoulder star" Betelgeuse to find the stars making up Orion's "club," then move across from Betelgeuse towards the bright star Bellatrix (Orion's other "shoulder") and the stars of his bow and arrow - both essential tools for the Hunter. Many interesting sights lie near Orion's "belt" and "sword." Orion's belt is made up of three bright giant stars forming an evenly spaced line (from left to right): Alnitak, Alnilam, and Mintaka. Move from the belt stars towards the stars Rigel and Saiph (Orion's "feet" or "knees") to arrive at Orion's distinctive sword, parts of which may appear fuzzy to your unaided eyes. Binoculars reveal that fuzz to be the famed Orion Nebula (M42), perched right next to the star Hatysa! Diving in deeper with a telescope will show star clusters and more cloud detail around the Nebula, and additional magnification brings out further detail inside the nebula itself, including the "baby stars" of the Trapezium and the next-door neighbor nebula M43. Want to dive deeper? Dark skies and a telescope will help to bring out the reflection nebula M78, the Flame Nebula (NGC

2024), along with many star clusters and traces of dark nebula throughout the constellation. Very careful observers under dark, clear skies may be able to spot the dark nebula known as the Horsehead, tracing an equine outline below both the Belt and the Flame Nebula. Warning: the Horsehead can be a difficult challenge for many stargazers, but very rewarding.

This is just a taste of the riches found within Orion's star fields and dust clouds; you can study Orion for a lifetime and never feel done with your observations. To be fair, that applies for the sky as a whole, but Orion has a special place for many. New telescopes often focus on one of Orion's treasures for their first test images. You can discover more of NASA's research into Orion's stars - as well as the rest of the Cosmos - online at [NASA](#).

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:



MAC Meetings:

- **BMAC meetings will be held on Zoom until further notice.**
- Friday, February 4, 2022 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.
- Friday, March 4, 2022 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.
- Friday, April 1, 2022 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.
- ? - Friday, May 6, 2022 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA. May be cancelled if we have Astronomy Day 2022.
- Friday, June 3, 2022 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.
- Friday, August 5, 2022 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.



unWatch:

- **Cancelled until further notice.**
- Every clear Saturday & Sunday - 3p-3:30p - March-October - On the Dam
 - View the Sun safely with a white-light & H α 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:

- **Cancelled until further notice.**
- March 5 & 12, 2022 - 7p
- March 19 & 26, 2022 - 8p
- April 2, 9, 16, 23 & 30, 2022 - 8:30p
- October 1 & 8, 2022 - 7:30p
- October 15, 22, 29 & November 5, 2022 - 7p
- November 12, 19 & 26, 2022 - 6p
 - 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:

- All special events are cancelled until further notice.
- **BMAC Dinner - January 2022 - Day & Time TBD**
 - Look for an e-mail with the latest information.
- **Astronomy Day - May 7, 2022 - 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 2022 - Day TBD - 6p?**
 - 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.
 - Please bring a dish to share and bring your own chair.
- **StarFest 2022 - November 4, 5 & 6, 2022**
 - Our 37th 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. 14, 2022 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."
 - MeadowView Marriott special hotel rate.
 - [StarFest Link](#)

Regular Contributors:



William Troxel



Robin Byrne



Greg Penner



Adam Thanz

William is the current chair of the club. He enjoys everything to do with astronomy, including sharing this exciting and interesting hobby with anyone that will listen! He has been a member since 2010.

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).

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.

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 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 Association member (which incurs a separate, additional fee), then a 50% reduction in BMAC dues are applied.
- Dues can be paid in many ways. For renewals, you will be sent an e-mail with an invoice and a direct link to pay online. You can also pay by mail, over the phone or in person at the gift shop.

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.**