The Bays Mountain Astronomy Club Newsletter

June 2021

Kingsport, TN

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Cosmic Reflections

William Troxel - BMAC Chair

Greetings and welcome to June 2021. Time is really moving onward. Just like May, June signals the change to warmer nights and some clear nights. We all know that means, we get a little better chance to enjoy our hobby. Well, at least I want to believe it could happen here in Eastern Tennessee!

I hope you were able to attend the Zoom meeting last month. I want to thank Tom and his student for sharing her project and Tom for sharing a recap of his astronomy research program. Tom spoke about the possibility that maybe the month of May could still be a focus on students in astronomy and any science-related field could be a part of the program. What are your feelings?

Please note that I have changed the date of the BMAC meeting for June due to scheduling conflicts. The meeting will be June 11, 2021. Please note the change. I will be sending out the Zoom link the 1st part of the week of June 11th.

The June meeting will be BMACer Olivia Kuper! She is a newly appointed NASA Solar System Ambassador as well as the Chemistry/Honors Chemistry Teacher at North Greene High School. She will present "Authentic Astronomy Research Experience at McDonald Observatory." Please see the calendar below for the abstract. I know we are all looking forward to her presentation!

June, of course, is also the month that we elect the chairman for the next fiscal year (2021/22). If you are interested in putting your name in for consideration, be sure to reach out to Adam as soon as possible. I have decided to offer myself for reelection as your chairman. I have written and said this many times over the years and I still believe it holds true. This is a wonderful club with very diverse members of all ages. I see it as an honor to serve as the face of our club.

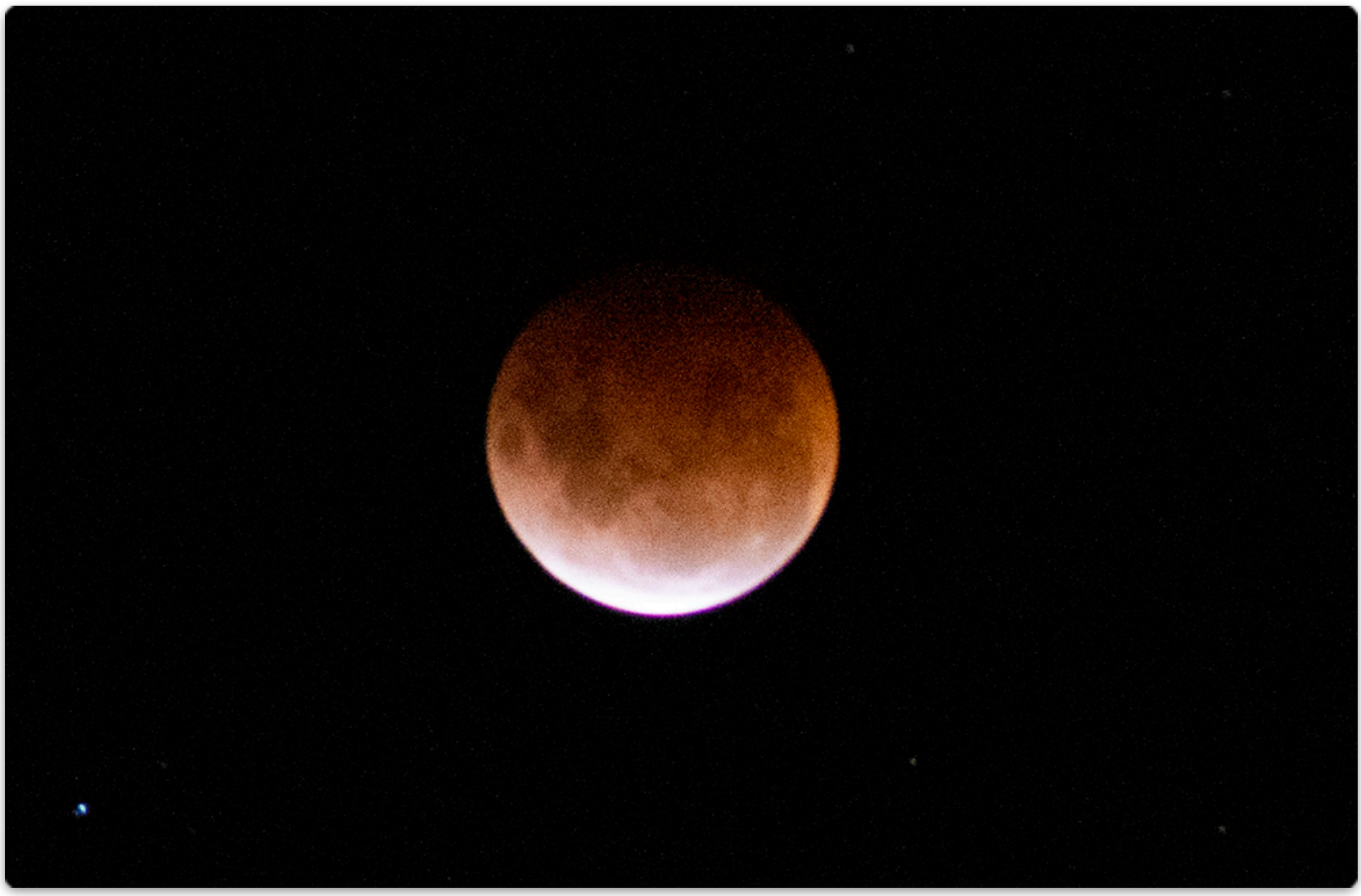
I am still looking for ideas for upcoming meetings. At some point, we will be able to meet together again. I would love to take some of the things that you enjoyed during the Zoom meetings and have them as part of the in-person meeting. For this to happen, I really need your thoughts concerning what you enjoyed and what you felt was not as much fun. Please

consider sharing your thoughts. My e-mail is wtroxel@mac.com. I welcome your comments.

Until next time, Clear skies…

Lunar Eclipse May 26, 2021 by Evan Lewis

We were lucky to have such a clear night to see the 100% eclipse of the Moon tonight in Thames, New Zealand. Taken with Nikon D750, with 70-300mm Nikkor lens, 128,000 ISO, 1/45 sec f/5.6.



Lunar eclipse image by Evan Lewis.

News:

- Our very own William Troxel was interviewed recently by the founder of the Love the Night Sky website, Adam Kirk. The inaugural interview! It is a site designed to share our common interest in astronomy and provides lots of information and tips on the hobby of astronomy. Click **here** to see the interview!
- Due to a very high workload with the new planetarium installation, there will not be a "Celestial Happenings" article this month.

The Queen Speaks

Robin Byrne

Happy Birthday Earth's Circumference

This month we celebrate the anniversary of an important measurement. Our story begins with Eratosthenes, who was born in 276 BCE in the city of Cyrene, which is now known as Shahhat, Libya. His education began locally until he went to Athens to study at the Lyceum. Eratosthenes is credited with many discoveries and writings, but was dubbed "Beta" by his peers because all of his work was good, but not great. Still, Eratosthenes was eventually noticed by Ptolemy, who invited him to come to Alexandria. Within a few years, the pharaoh appointed Eratosthenes to the position of Chief Librarian at the famed Library of Alexandria.

Eratosthenes Teaching in Alexandria by Bernardo Strozzi (1581–1644). Image from Wikipedia.

The idea that Earth was a spherical shape was first postulated by Pythagoras around 500 BCE, but with no proof of this concept. Aristotle first presented proof of Earth's shape almost 200 years later, citing such evidence as the shape of Earth's shadow during a lunar eclipse, the appearance of new constellations above the southern horizon as you travel farther south, and how a ship sailing out to sea will appear to sink hull-first from view. However, while the shape of Earth was now agreed upon, its size was not.

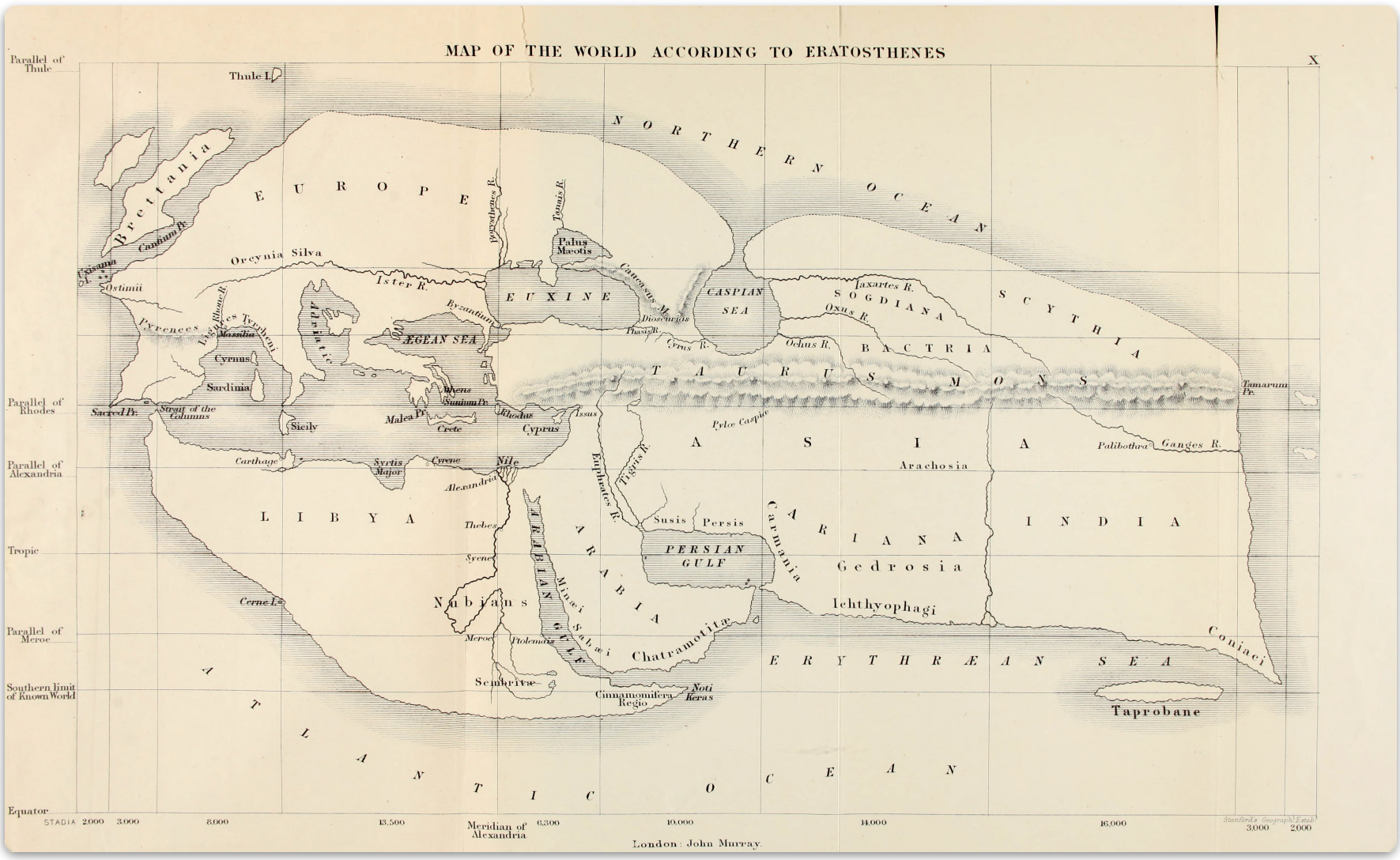
As the story goes, Eratosthenes had heard that there was a well in the city of Syene (modern-day Aswan, Egypt) in which there was no shadow at noon on the Summer Solstice, implying that the Sun was directly overhead on that day. Because Earth is curved, a location father north or south would not see the Sun directly overhead. Alexandria, being almost due north of Syene, gave Eratosthenes the opportunity to use geometry to measure Earth.

On the Summer Solstice of the year 240 BCE, Eratosthenes placed a stick of known length in the ground. At Noon, he measured the length of the shadow cast by the stick. From the length of the stick and the length of the shadow, he could determine the Sun's altitude in the sky. The shadow angle was found to be 7° 12' or 7.2°, so Syene, which would have a shadow angle of 0°, must be 7.2° south of Alexandria. This means that if you were to extend lines from Syene and Alexandria to the center of the Earth, they would form an angle of 7.2°. A complete circle has 360° in it, so if you divide that by 7.2° you get 50, thus 7.2° is 1/50th of a complete circle. This tells us that the distance from Syene to Alexandria is 1/50th of Earth's circumference.

The next step is to accurately measure the distance between the two cities. Eratosthenes hired professional surveyors, called bematists, who walk with strides of a precise length, to pace off the distance between the cities. Based on their measurements, Alexandria and Syene were found to be 5000 stadia apart. So if that is 1/50th of Earth's circumference, then the circumference should be 50 x 5000 stadia, or 250,000 stadia. But, how big is that in modern units? There's debate about the size of one stadium, but it is agreed that it falls between 500 and 600 feet, giving the circumference value found by Eratosthenes values

ranging from approximately 24,000 to 29,000 miles. The actual circumference of Earth is 24,900 miles, so Eratosthenes did pretty well!

The main reason Eratosthenes decided to measure the circumference was because he wanted to create a map of Earth. Using descriptions of landmasses found in some of the books in the Library of Alexandria, he created the first global map of the Earth. A three-volume set, titled “Geography,” was published in which Eratosthenes described: the method used to determine the circumference, the process of using historical accounts to determine the size and location of landmasses, the division of Earth into different climate regions, plus images of his final maps, including grid lines to help in estimating distances between locations. Sadly, the original work has been lost, but it is referenced by other Greek scholars whose work has been preserved.



19th century reconstruction (1883) of Eratosthenes' map of the known world, c. 194 BCE. Image from Edward Bunbury (1811–1895); Wikipedia.

After Eratosthenes' measurement of Earth became known, others attempted to repeat his experiment. Posidonius used light from the star Canopus to perform a similar procedure in the cities of Rhodes and Alexandria. However, he used an incorrect value for the distance between the cities, which resulted in a circumference for Earth that was about 7000 miles too small. However, this smaller value is the one that Ptolemy used in his writings on geography. Interestingly, it was this smaller circumference value that gave Christopher Columbus the idea that he could easily sail around the globe. Would Columbus have begun his journey if he had known the correct, larger circumference of Earth?

While there are some misguided souls who have been convinced the Earth is flat, we've known for almost 2,500 years that the Earth is, roughly, spherical. And, more amazingly, we've known its approximate size for almost all of that time. Thanks to Eratosthenes, we truly have a good measure of the situation.

References:

- **Eratosthenes - Wikipedia**
- **This Month in Physics History: June, ca. 240 B.C. Eratosthenes Measures the Earth; APS News; American Physical Society**
- **Bematist - Wikipedia**

The Space Place - NASA Night Sky Network

David Prosper

Astrophotography with Your Smartphone

Have you ever wanted to take nighttime photos like you've seen online, with the Milky Way stretched across the sky, a blood-red Moon during a total eclipse, or a colorful nebula? Many astrophotos take hours of time, expensive equipment, and travel, which can intimidate beginners to astrophotography. However, anyone with a camera can take astrophotos; even if you have a just smartphone, you can do astrophotography. Seriously!

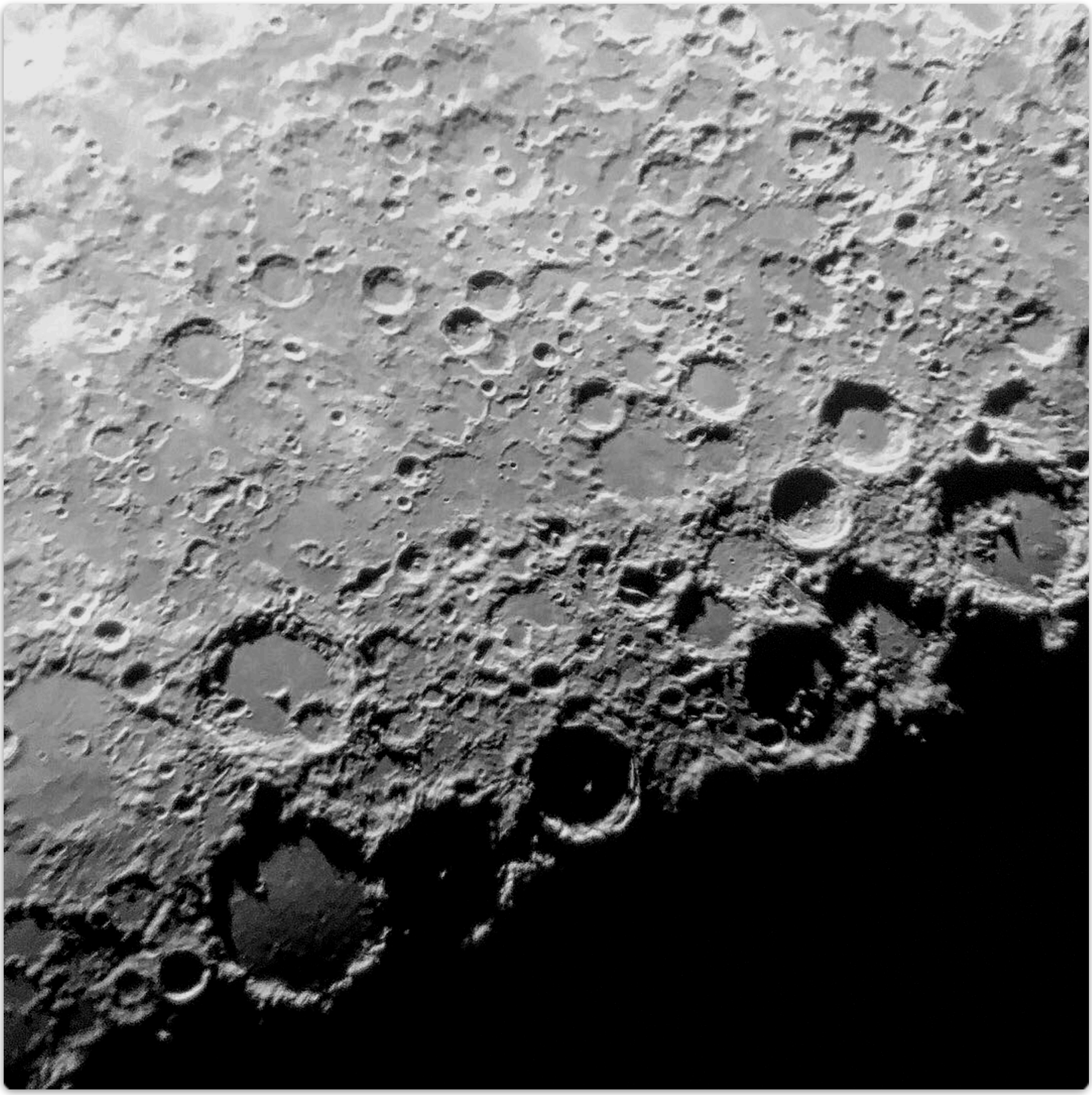
Don't expect Hubble-level images starting out! However, you can take surprisingly impressive shots by practicing several basic techniques: steadiness, locked focus, long exposure, and processing. First, steady your smartphone to keep your subjects sharp. This is especially important in low light conditions. A small tripod is ideal, but an improvised stand, like a rock or block of wood, works in a pinch. Most camera apps offer timer options to delay taking a photo by a few seconds, which reduces the vibration of your fingers when taking a shot. Next, lock your focus. Smartphones use autofocus, which is not ideal for low-light photos, especially if the camera readjusts focus mid-session. Tap the phone's screen to focus on a distant bright star or streetlight, then check for options to fine-tune and lock it. Adjusting your camera's exposure time is also essential. The longer your camera is open, the more light it gathers - essential for low-light astrophotography. Start by setting your exposure time to a few seconds. With those options set, take a test photo of your target! If your phone's camera app doesn't offer these options, you can download apps that do. While some phones offer an "astrophotography" setting, this is still rare as of 2021. Finally, process your photos using an app on your phone or computer to bring out additional detail! Post-processing is the secret of all astrophotography.

You now have your own first astrophotos! Wondering what you can do next? Practice: take lots of photos using different settings, especially before deciding on any equipment upgrades. Luckily, there are many amazing resources for budding astrophotographers. NASA has a free **eBook** with extensive tips for smartphone astrophotography and you can

also join the **Smartphone Astrophotography Project**. Members of astronomy clubs often offer tips or even lessons on astrophotography; you can find a club near you by searching the "**Clubs and Events**" map on the Night Sky Network's website. May you have clear skies!

A small tripod for a smartphone. They are relatively inexpensive – the author found this at a local dollar store!

The Moon is large and bright, making it a great target for beginners. The author took both of these Moon photos using an iPhone 6s. This crescent Moon at sunset was taken with a phone propped on the roof rack of a car.



This closeup shot of lunar craters was taken through the eyepiece of a friend's Celestron C8 telescope.

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:

- **Note the date change!** Friday, June 11, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Olivia Kuper, NASA Solar System Ambassador, Chemistry/ Honors Chemistry Teacher, North Greene High School, will present “Authentic Astronomy Research Experience at McDonald Observatory.” In the summer of 2019, myself and three teachers from the University of Texas EXES Teacher Astronomy Group were selected to participate in an astronomy research project with Dr. Chris Sneden, Astronomy Professor Emeritus. Dr. Sneden's primary research is spectroscopic study of old stars in the galactic halo to determine their chemical composition. The teacher group was tasked with identifying stars that contained europium. We traveled to McDonald Observatory and collected data using the historic 2.1-meter Otto Struve Telescope with a Sandiford Echelle Spectrograph. The teachers selected targets, used the telescope and spectrograph, collected our own data, and are currently working to reduce the data. Our group presented an education poster at the American Astronomical Society Winter Meeting in January 2020 and gave a presentation at the Space Exploration Educators Conference at Johnson Space Center in February 2021. This research project is ongoing, with another observing run to McDonald Observatory once COVID-19 restrictions are lifted and continued data reduction.
- Friday, August 6, 2021 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.
- Friday, September 3, 2021 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.
- Friday, October 1, 2021 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.
- Friday, November 5, 2021 - 7p - Via Zoom? - Social time 30m before and after meeting. Topic TBA.

- Friday, December 3, 2021 - 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 & Hα 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.**
- October 2 & 9, 2021 - 7:30p
- October 16, 23, 30 & November 6, 2021 - 7p
- November 13, 20 & 27 - 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.

pecial Events:

- **All special events are cancelled until further notice.**

- **Annual Club Picnic - July 2021 - 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 2021 - October 29, 30 & 31, 2021**
  - 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. 8, 2021 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."**
  - MeadowView Marriott special hotel **rate**.
  - **StarFest Link**
- **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.

Regular Contributors:

William Troxel

Robin Byrne

Jason Dorfman

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).

Jason Dorfman works as a planetarium creative and technical genius at Bays Mountain Park. He has been a member since 2006.

Adam Thanz has been the BMAC Newsletter Editor for all but a 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.
- **Celestial Happenings image of sunset at the Bays Mountain Park Lake during a twilight kayak program by Jason Dorfman.**
  - Image captured October 1, 2020.
- **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.**