The Bays Mountain Astronomy Club Newsletter

April 2021

Kingsport, TN

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Cosmic Reflections

William Troxel - BMAC Chair

reetings and welcome to April, fellow BMACers.

First, let me say “thank you” to everyone for signing on last month. I personally enjoyed the tour of the Green Bank Campus. I hope you enjoyed it as well. If you are interested in exploring any of the programs that Green Bank has to offer when they reopen, check out their **website**. Their site is very user friendly and you can easily find information. I would like to send a shout out to Luci for sharing with us. Should you get out to Green Bank, be sure to tell them you heard about the campus at the Bays Mountain Astronomy Club Zoom meeting in March.

Our next meeting will be more sociable as we’ll be “Getting to Know You.” We have had a number of new members join recently and we hope they can attend this month’s meeting. We could all introduce ourselves so we can all learn a little about each other. The new members (and possibly some long-term members) may not be fully aware of the many benefits of BMAC membership and the Astronomical League. We’ll cover some of those benefits, too. We’ll also have a little bit of a Game Night with a fun astro-puzzler. **Your assignment to get ready:** Have some paper and a pencil handy! We also hope that you’ll have something to share with Show & Tell. Maybe you’re reading an astro-book. Maybe you’ve been intrigued by an astro-article and would like to share your thoughts on it. Did you get out and observe this last month? If so, what did you enjoy seeing and why? Did you take a photo or sketch a celestial object? We’d all like to see it!

I want to remind each of you that I need your help with ideas for upcoming programing for future meetings. I know I sound like a broken record, however, I really hope you will share your ideas with me. This is your club as well as mine. I feel sure that there are some of you that have ideas and even programs that you would like to share. I have written this before and I still stand behind it. I will be happy to help you prepare, even with the presentation, if you wanted to consider doing a month. Please consider it and let me know. Either way, your ideas and thoughts would really help me out as I look for ideas, themes, fun things to do or games we could play. I know i am repeating things. It is so important that each of you take an interest in the club! Please consider sharing your ideas.

Don’t forget to get your new, or new to you, astro-equipment that you would like to share during our Show & Tell (I still have not come up with a really cool name for this). Maybe one of you can think of something cool. I was tossing around a name like: “The BMAC Equipment Junkie Show.” What do you think? Also, If you have had a chance to get out and take any pictures, be sure and share them with Adam so he can add them to the monthly newsletter. The weather is starting to get nice in the evening. If you can get out and get some pictures or just spend a few hours stargazing, who knows what you will see. Check out Jason’s section of the newsletter, he always has some great information on what is coming up in our skies here in the Tri Cities.

I also wanted to remind you about the new format of the newsletter. I personally think it is really very cool.

So until next time. it’s your chairman, William Troxel, hoping you have, Clear skies

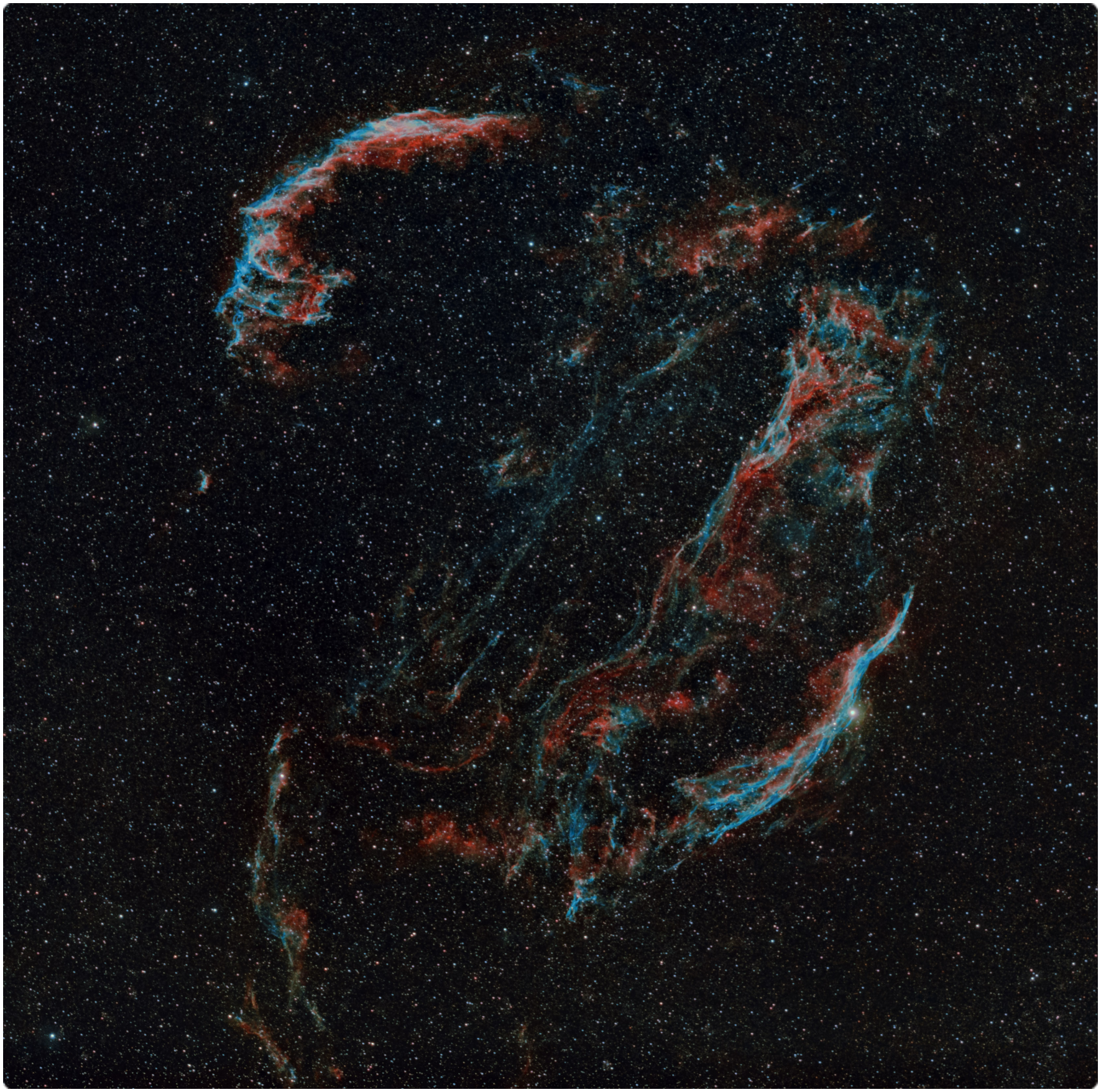
Astronomy Art Corner

This month's issue includes an image captured by a new member, Spencer Hochstetler. I think the inclusion of the story behind the image really makes us, the reader, more understanding and appreciative of what it takes to capture the elusive night sky. Whether it is with very costly and complex equipment, a smart phone or a palette of oils, we applaud your efforts and want to celebrate our fellow members by sharing their art and stories here.

Spencer writes: This past year included two very popular and exciting events in the skies – Comet NEOWISE and the Great Conjunction of Saturn and Jupiter. A keen interest in astrophotography sprung up in many people, including myself. My interest had been latent for many years. I've been an amateur photographer for roughly 25 years and had, on various occasions, thought about building a barn door tracker, but the project never materialized. Last summer, I noticed that portable battery-powered trackers existed and after obsessing about what I might be able to do with such a device, the itch was scratched when I received a Star Adventurer for my birthday last summer; just in time for the still visible, but waning comet NEOWISE. I was able to take a few photographs of the comet, and while doing so, was also able to learn about some basic stacked photo processing tools. However, the clouds from my vantage point prevented a "nice" picture from being captured. No one told me that cloudy skies were guaranteed for the next few weeks after any astronomy-related purchase!

Despite this, while learning about the little equatorial mount and what others were achieving with it, I caught the bug to go deeper into space with the tracker and my existing camera and lenses. I read articles. I watched YouTube. I read forum discussions. I learned about star-hopping. I learned about H-alpha and OIII emission. I saw pictures of the Eastern Veil Nebula (NGC6992) and was absolutely mesmerized. Could I actually do this kind of photography??? More reading and a purchase of a dual-narrowband filter that fit my camera and my astrophotography journey really began. This image is my first deep space object image of what is often referred to as the Cygnus Loop. [Ed.: The loop is a giant space bubble caused by a supernova explosion long ago.] I was hooked and

continue to be hooked. My equipment and knowledge has grown and a small library of photos have been collected so far. I can't wait to capture more of the beauty of space while learning about the objects that I photograph and improving my acquisition and image processing skills. What a big place, space.



Eastern Veil Nebula (NGC6992) by Spencer Hochstetler.
Fujifilm X-T3 (APS-C) camera, 200mm f/2 lens @ f/2, STC Duo-Narrowband clip-in filter, Sky Watcher Star Adventurer star tracker, 5 hours total exposure time over 4 nights (August 17 – September 21, 2020). Stacked in Deep Sky Stacker and further processed in PixInsight and Photoshop.

Astronomy Down Under

This next submission is from a member from the past, Evan Lewis. He is now retired and is currently living in his country of origin, New Zealand. Following are excerpts from an e-mail conversation we had. He agreed to share this along with some images.

Evan writes: We just had a one-month long trip around the South Island of New Zealand (6666 km). It included three nights in a tiny town called Naseby (about 45 degrees south) where there is gold mining. In the town is a British astronomer, Paul Bishop, who runs very dark sky astronomy **tours**. I signed up and enjoyed it very much. I felt I learned a lot.

It was a perfectly clear night, not a cloud in the sky and no Moon. So Paul was not pleased when the local farmer in the next paddock started hay making with huge lights! He finished about 11 p.m. and I took a photo [of the Southern Milky Way] with the camera on a fence post looking straight up.

Evan using Paul's telescope.

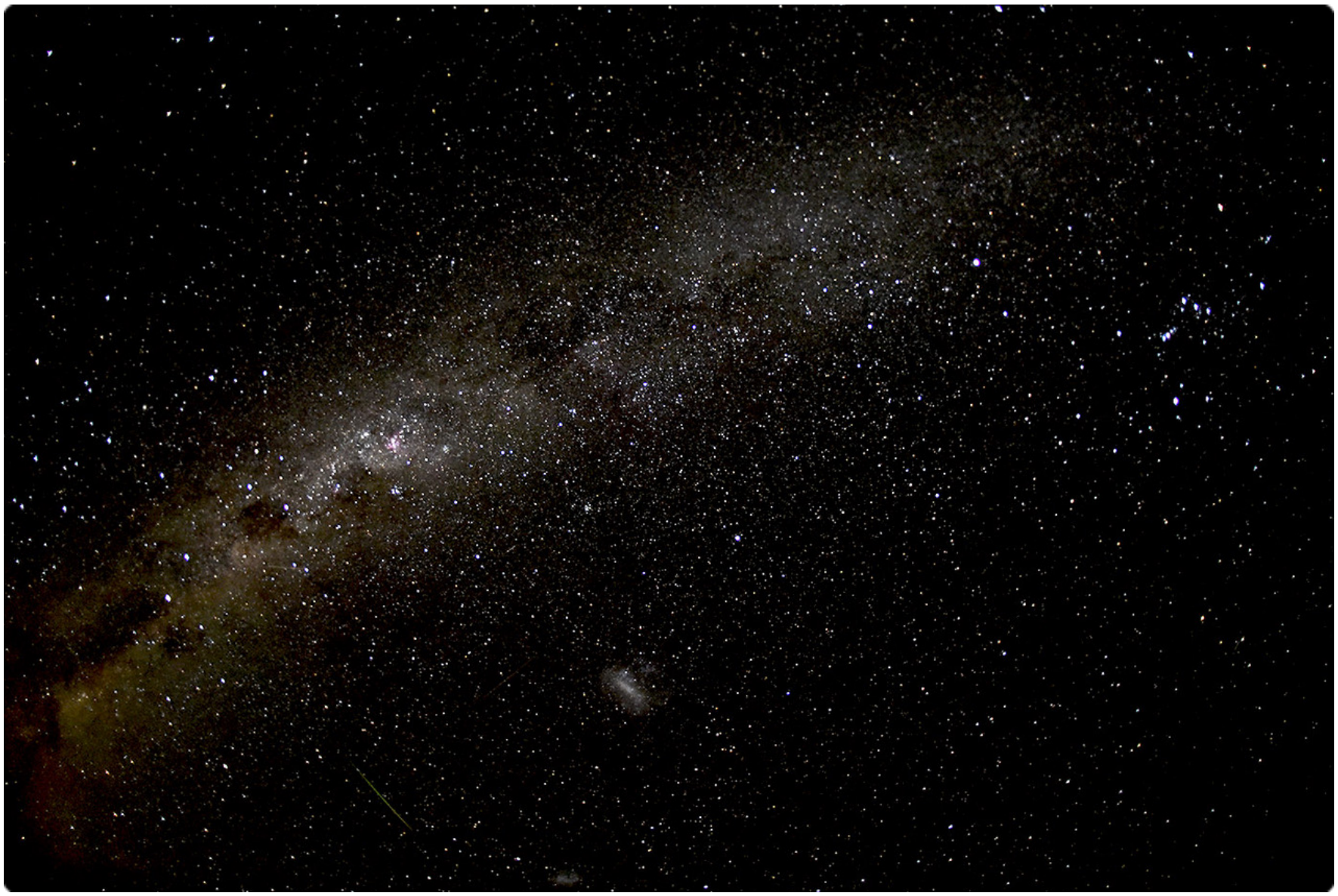
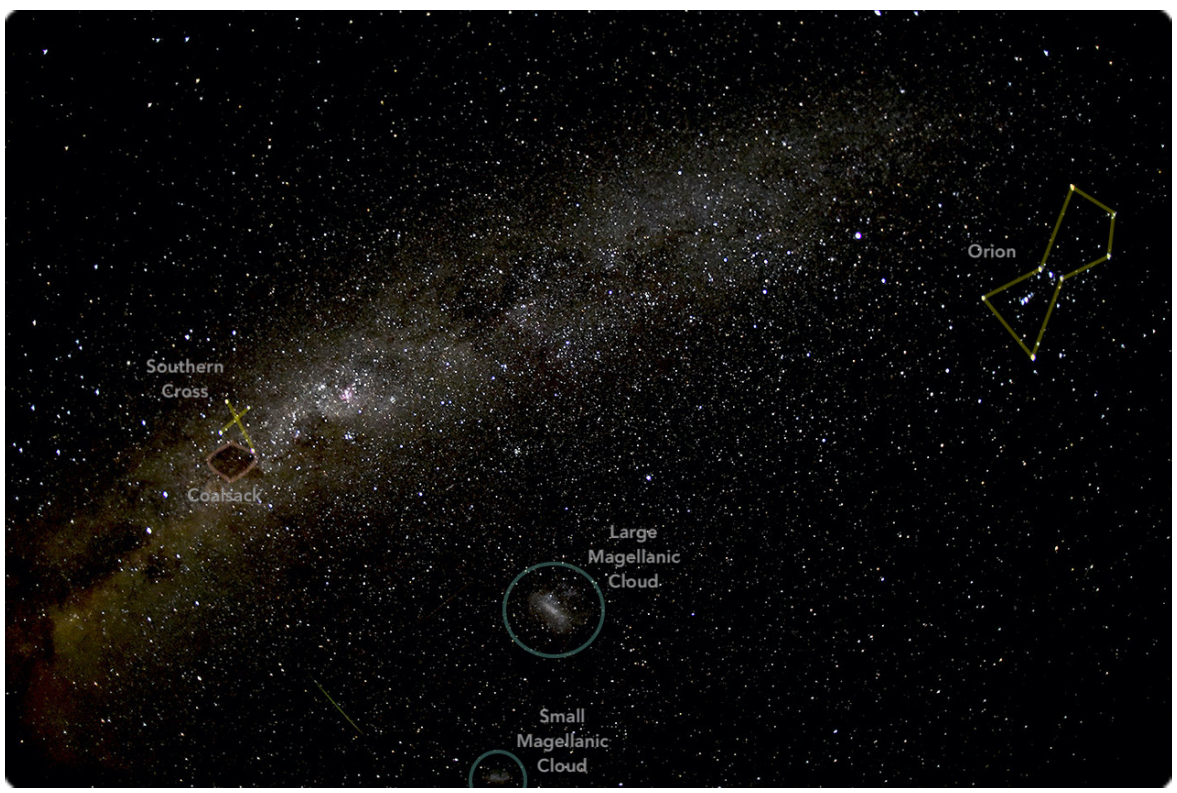


Photo of the Southern Milky Way taken with my 14mm f/2.8 fish eye lens about 15 seconds and approx. 128,000 ISO I think. Nikon full format (FX) D750 camera. There was a meteor shower and two traces can be seen. What may be of interest to you [being] in the Northern Hemisphere, is that you can see one of the Magellanic Clouds. Both were visible with the naked eye actually and I think the photo just clipped the edge of the second cloud. [Look just left of center on bottom edge.] [They are dwarf galaxies] named after Magellan who described them. Also, the dark patches are called "coal sacks."



Finder key.

Celestial Happenings

Jason Dorfman

Spring has arrived. The temperatures are beginning to warm and twilight is coming later and later. As April begins, the Sun will set just before 8 p.m. and rise at 7:15 a.m. Night comes a little bit later by the end of the month with the Sun setting about 8:15 p.m. The approach of the dawn twilight shifts a bit more with the Sun appearing at 6:37 a.m. by month's end.

Planets

Mars reigns king of the evening skies for April. The next planetary target will not appear until the early morning. At the start of the month you'll find the Red Planet about 50° high and almost due west an hour after sunset. It will move eastward through the horns of Taurus, passing midway between Tianguan and Elnath, the two stars marking the end of the horns, over the 12th and 13th. On the 24th, Mars crosses into Gemini.

Mars sets shortly after 1 a.m. as the month begins and will set about a half hour earlier by month's end. The views of the Red Planet will remain a bit unsatisfying, however, as the disk only spans about 5". Mars shines at magnitude +1.3 on the 1st and will dim to +1.5 by the 30th.

If you haven't yet checked out the images and audio recordings from the new Mars rover, **Perseverance**, be sure to take a look and listen the next time you have a few minutes. The mission team recently released an audio recording of the rover moving over the surface!

Though Mars flies solo in the evening sky for most of April, the two inner planets will peak above the western horizon as the month ends. Venus crossed around the far side of the Sun at the end of March and is now slowly making its way into our evening skies this month. Mercury will reach Superior Conjunction on the 18th and then moves swiftly eastward towards an evening appearance. Look to the WNW a half hour after sundown on the 29th and 30th for a magnitude -1.1 Mercury sitting about 5° high. If you are able to discern it from the fading twilight, you'll find the disk spanning 5" and about 83% illuminated. Though Venus glimmers brilliantly at magnitude -3.9 and will easily outshine Mercury, it sits just 2° above the horizon directly below tiny Mercury, making it a bit more challenging to view.

The next planetary targets are for those who enjoy late night/early morning observing. Now that Venus has transitioned to the evening sky, the gas giants, Jupiter and Saturn, are now the highlight of the predawn hours. Saturn rises first at 4:40 a.m. in the ESE at the beginning of the month with Jupiter rising about 30 minutes later. An hour before sunup, Saturn sits about 16° high in the SE with Jupiter floating just above 10° to the left of Saturn. The two will be about 10° higher at the same time by the end of the month.

Both are in Capricornus. Saturn sits near the middle of the constellation about 3° west of 4th-magnitude Theta Cap. It will move slightly eastward over the month closing the gap with Theta Cap to just over a degree. Jupiter lies in the eastern edge of the constellation, about 2° northwest of Deneb Algedi (Delta Cap) and will cross into Aquarius on the 25th.

Saturn shines at magnitude +0.7 and Jupiter glows much more brilliantly at magnitude -2.0. The disk of Saturn spans about 16" over the month with the ring plane extending out to roughly 38". Jupiter's disk will grow slightly from 35" to 37" during April, as its magnitude brightens to -2.2.

Luna

We continue to find an almost Full Moon at the start of the month. The Third Quarter Moon occurs on the 4th. Two days later, a waning crescent will sit about 5° below and slightly right of Saturn in the predawn hours. The identical arrangement occurs with Jupiter on the following morning. The Moon will pass through New Moon on the 11th and reappear in our evening skies on the 13th. For a challenging observation, see if you can spot the two-day old Moon against the fading twilight in the west. An hour after sunset it will be about 6° above the western horizon and only 3.2% illuminated. On the 16th and 17th, the crescent Moon will appear about 6° to the west of Mars and then 5° to its east as it moves towards First Quarter on the 20th. And, continuing the pattern, we will end the month with a Full Moon on the 26th.

Clear Skies and Happy Observing!

The Queen Speaks

Robin Byrne

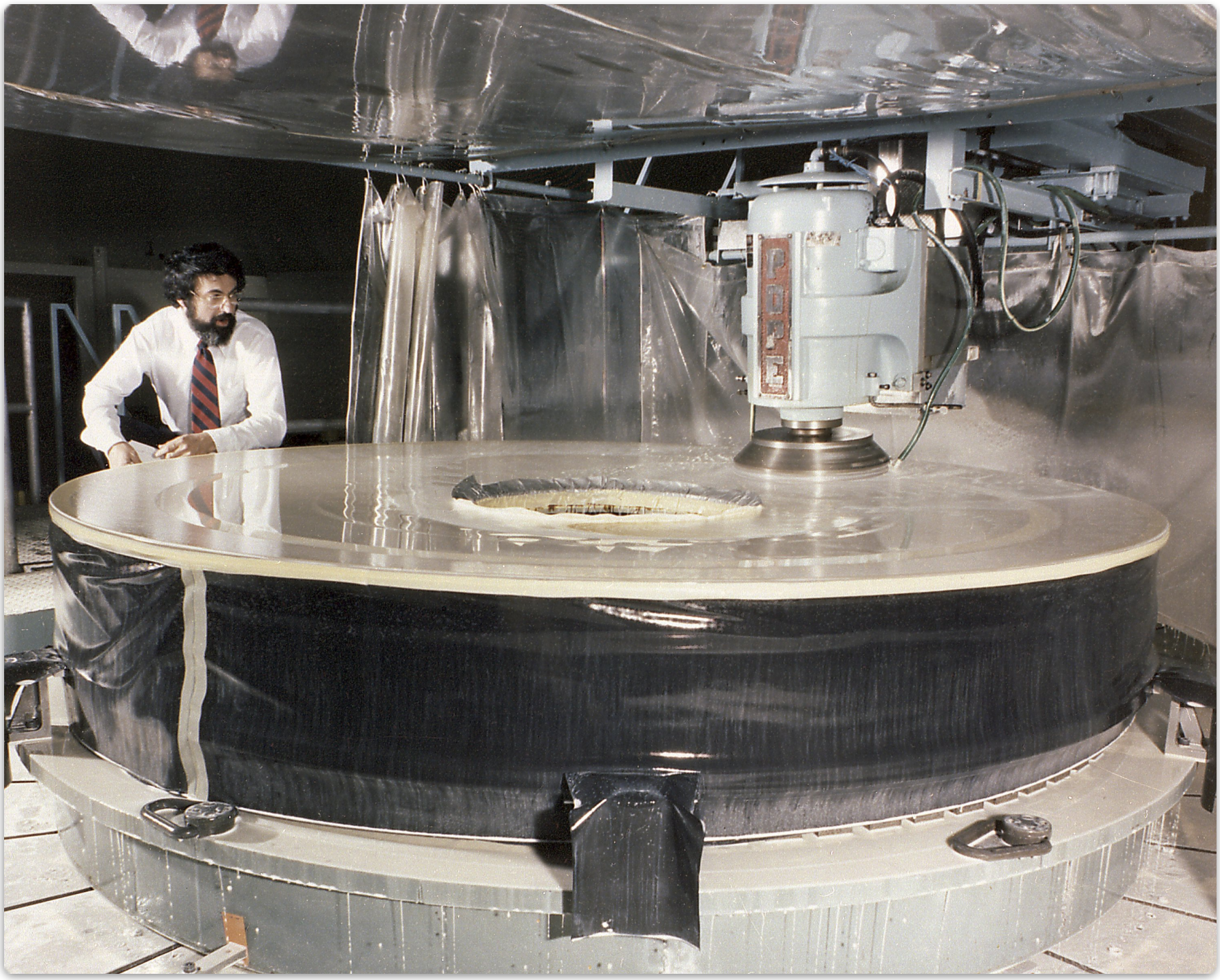
Happy Birthday Hubble Space Telescope

This month we celebrate the life of one of the most significant pieces of equipment ever to, literally, grace the skies. The idea of an orbiting telescope is not a new one. In 1923, Herman Oberth, the German rocket engineer, proposed putting a telescope in orbit to avoid the distorting effects of Earth's atmosphere. Lyman Spitzer was also a strong proponent of a space telescope, and spent nearly 30 years trying to make it a reality. By the 1970's, NASA and the European Space Agency began to seriously consider such an undertaking. Funding was established in 1977 for a 2.4 meter telescope. By 1981, the grinding of the primary mirror was complete. A launch aboard the Space Shuttle was scheduled for 1986, but was delayed due to the grounding of the shuttle fleet after the Challenger explosion. The Hubble Space Telescope was finally carried to orbit on April 25, 1990 aboard the shuttle Discovery.

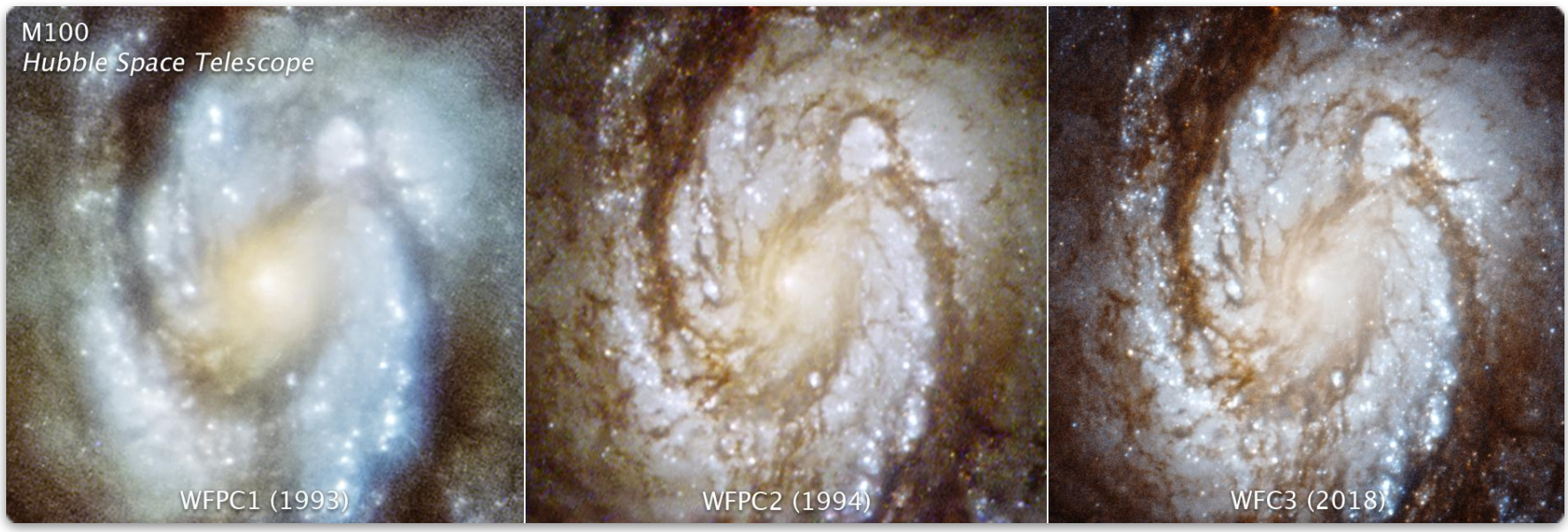
Mission patch for STS-31

Named for Edwin Hubble, the astronomer responsible for discovering that galaxies exist beyond the Milky Way and the expansion of the Universe, the Hubble Space Telescope is roughly the size of a school bus and weighs over 20,000 pounds. Orbiting at an altitude of over 300 miles, Hubble circles the Earth once every 97 minutes. Hubble is equipped with CCD detectors able to observe from the near ultraviolet part of the spectrum, through all optical wavelengths, and partly into the infrared. Using gyroscopes to point and steady the entire system, Hubble has a pointing accuracy of 7/1000th of an arcsecond.

The Hubble Space Telescope has a primary mirror 2.4 meters wide, and a secondary that is 12 inches wide. The grinding of the mirrors was intended to be so accurate that if the mirror were scaled up to the size of Earth, the largest bump would only be 6 inches tall. However, within 2 months of launch, it was realized that there was a flaw in the primary mirror: by less than the width of a human hair, the edges were too flat. Initial images were computer manipulated to allow astronomers to still achieve superb results. In December of 1993, during the first repair mission carried out by astronauts, corrective optics were installed to allow Hubble to perform at its maximum capabilities. With servicing missions always intended for Hubble, a total of 5 missions have been performed, allowing periodic replacements of the vital pointing gyroscopes and installation of improved detectors.



Hubble Space Telescope Primary Mirror: This photograph shows the Hubble Space Telescope's (HST's) Primary Mirror being ground at the Perkin-Elmer Corporation's large optics fabrication facility. After the 8-foot diameter mirror was ground to shape and polished, the glass surface was coated with a reflective layer of aluminum and a protective layer of magnesium fluoride, 0.1- and 0.025-micrometers thick, respectively. The purpose of the HST, the most complex and sensitive optical telescope ever made, is to study the cosmos from a low-Earth orbit. By placing the telescope in space, astronomers are able to collect data that is free of the Earth's atmosphere. The Marshall Space Flight Center had responsibility for design, development, and construction of the HST and the Perkin-Elmer Corporation, in Danbury, Connecticut, developed the optical system and guidance sensors.
Image 1 March 1979; NASA Marshall Space Flight Center



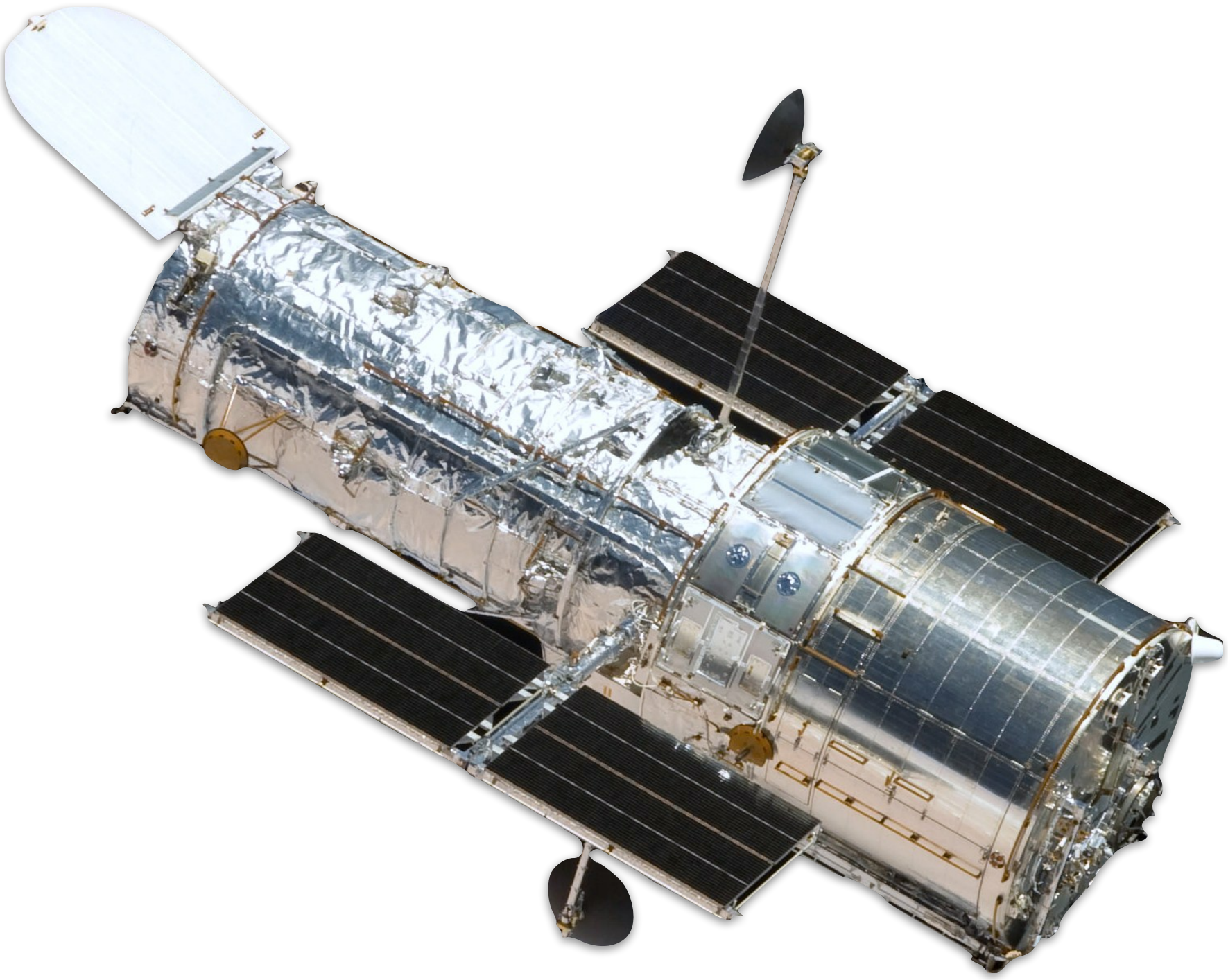
PIA22913: M100 Through 3 Cameras - Hubble Space Telescope.
These three images are of the central region of the spiral galaxy M100, taken with three generations of cameras that were sequentially swapped out aboard the Hubble Space Telescope, and document the consistently improving capability of the observatory. The image on the left was taken with the Wide Field and Planetary Camera 1 in 1993. The photo is blurry due to a flaw (called spherical aberration) in Hubble's primary mirror. Celestial images could not be brought into a single focus. The middle image was taken in late 1993 with Wide Field and Planetary Camera 2 that was installed during the December 2 - 13 space shuttle servicing mission (SM1, STS-61). The camera contained corrective optics to compensate for the mirror flaw, and so the galaxy snapped into sharp focus when photographed. The image on the right was taken with a newer instrument, Wide Field Camera 3, that was installed on Hubble during the space shuttle servicing mission 4 (SM4) in May, 2009.
Image 4 December 2018; NASA, ESA, STScI and Judy Schmidt

Hubble's primary mission was to carry-on in the footsteps of its namesake by measuring the age and size of our Universe, observe the evolution of galaxies and to study all objects in our Solar System and beyond with an unprecedented degree of detail. Among the major achievements of Hubble are: two Hubble Deep Field images, proof that quasars are inside of galaxies, measurement of the expansion of the Universe and proof that gamma ray bursts originate in galaxies.

Another repair mission of Hubble was planned for 2006, which would have prolonged the telescope's life even farther. However, in the wake of the Columbia accident, things changed. The new safety protocols required some way of saving astronauts, should the shuttle be damaged. A mission to Hubble would be unable to reach the International Space Station (which would be able to safely return crew members to Earth with their emergency Soyuz capsule). The only other option would be to have a second shuttle prepared to launch a rescue mission and to develop a wide new range of emergency

procedures. The decision was made that this would cost too much, especially with the retirement of the shuttle fleet planned to occur once the International Space Station construction was complete.

On March 7 of this year, Hubble Space Telescope was placed in “safe mode” due to a software error. Fortunately, engineers were able to fix the problem, and Hubble went back into operation on March 12.



The Hubble Space Telescope as seen from the departing Space Shuttle Atlantis, flying STS-125, HST Servicing Mission 4. Image 19 May 2009; NASA

For 31 years, Hubble has provided some of the most beautiful and scientifically rich images ever seen. No one knows how much longer we will have this workhorse of the astronomical community available. Once the gyroscopes begin to fail, Hubble will be de-orbited in such away that it will mostly burn up in our atmosphere, and whatever pieces survive reentry, will land in one of the oceans. With the launch of the James Webb Telescope planned for later this year, astronomers are fortunate to be able to make use of both telescopes to gain a richer understanding of the Universe. However long Hubble survives, its contributions to science have more than paid for themselves, and we have been fortunate to live in the era of the Hubble Space Telescope.

References:

- **HubbleSite**

- **ESA Science & Technology**

- NASA Cancels Shuttle Mission to Service Hubble by Robert Roy Britt and Brian Berger for **space.com**.

- Hubble Space Telescope in Safe Mode After Software Glitch by Mike Wall for **space.com**

The Space Place - NASA Night Sky Network

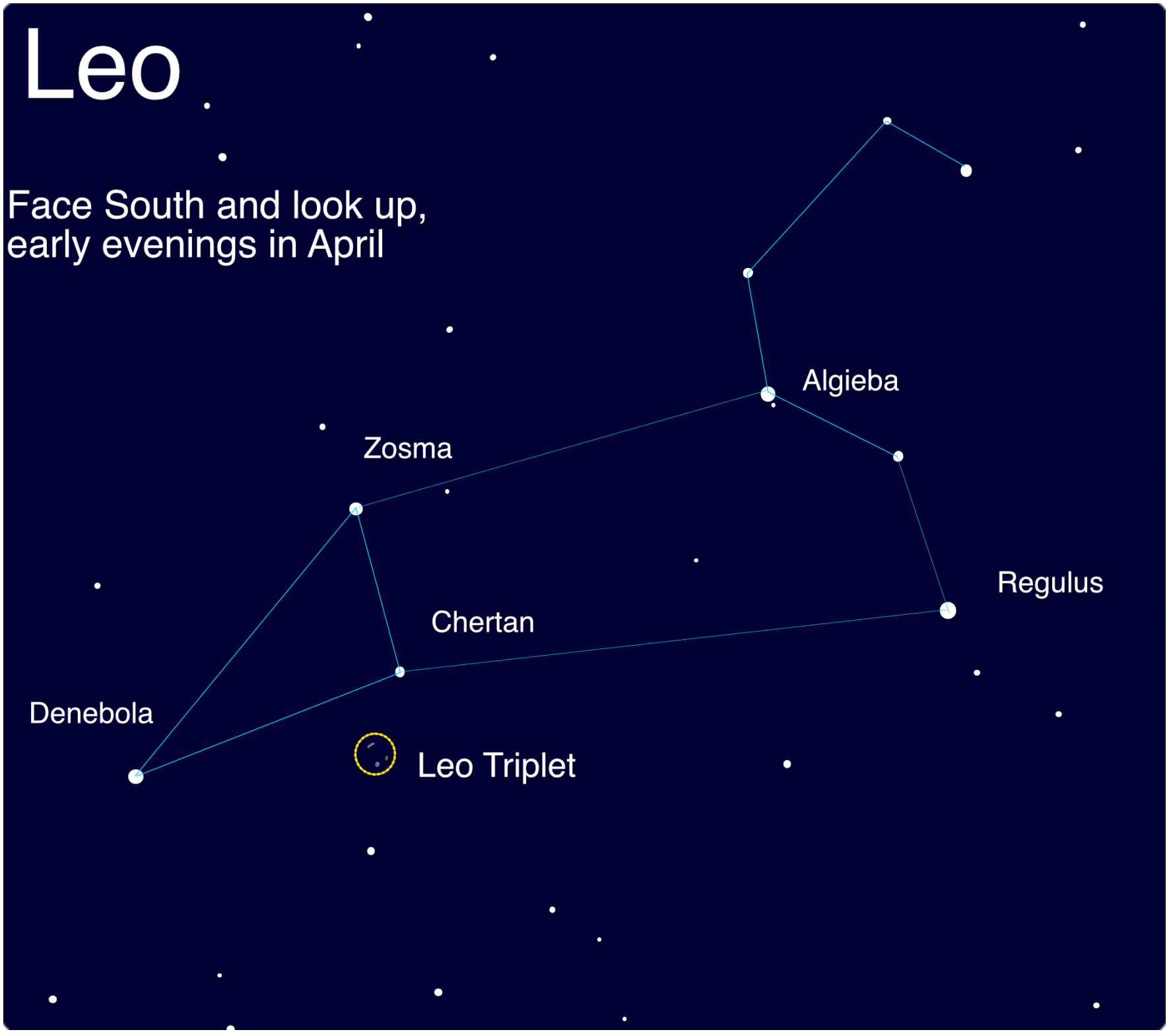
David Prosper

Watch the Lion: Celestial Wonders in Leo

Leo is a prominent sight for stargazers in April. Its famous sickle, punctuated by the bright star Regulus, draws many a beginning stargazer's eyes, inviting deeper looks into some of Leo's celestial delights, including a great double star and a famous galactic trio.

Leo's distinctive forward sickle, or "reverse question mark," is easy to spot as it climbs the skies in the southeast after sunset. If you are having a difficult time spotting the sickle, look for bright Sirius and Procyon - featured in last month's article – and complete a triangle by drawing two lines to the east, joining at the bright star Regulus, the "period" in the reverse question mark. Trailing them is a trio of bright stars forming an isosceles triangle, the brightest star in that formation is named Denebola. Connecting these two patterns together forms the constellation of Leo the Lion, with the forward-facing sickle being the lion's head and mane, and the rear triangle its hindquarters. Can you see this mighty feline? It might help to imagine Leo proudly sitting up and staring straight ahead, like a celestial Sphinx.

If you peer deeper into Leo with a small telescope or binoculars, you'll find a notable double star! Look in the sickle of Leo for its second-brightest star, Algieba - also called Gamma Leonis. This star splits into two bright, yellow stars with even small magnification - you can make this "split" with binoculars, but it's more apparent with a telescope. Compare the color and intensity of these two stars - do you notice any differences? There are other multiple star systems in Leo – spend a few minutes scanning with your instrument of choice, and see what you discover.



The stars of Leo: note that you may see more or less stars, depending on your sky quality. The brightness of the Leo Triplet has been exaggerated for the purposes of the illustration - you can't see them with your unaided eye.

One of the most famous sights in Leo is the “Leo Triplet:” three galaxies that appear to be close together. They are indeed gravitationally bound to one another, around 30 million light years away! You’ll need a telescope to spot them, and use an eyepiece with a wide field of view to see all three galaxies at once! Look below the star Chertan to find these galaxies. Compare and contrast the appearance of each galaxy – while they are all spiral galaxies, each one is tilted at different angles to our point of view! Do they all look like spiral galaxies to you?

Your view of the three galaxies in the Leo Triplet won’t look as amazing as this image taken by the VLT Survey Telescope, unless you have a telescope with a mirror 8 feet or more in diameter! Still, even a small telescope will help your eyes pick up these three galaxies as “faint fuzzies”: objects that seem blurry against a background of pinpoint stars. Let your eyes relax and experiment with observing these galaxies by looking slightly away from them, instead of looking directly at them; this is called averted vision, a handy technique that can help you see details in fainter, more nebulous objects.
Image Credit: ESO, INAF-VST, OmegaCAM; Acknowledgement: OmegaCen, Astro-WISE, Kapteyn I.

April is Citizen Science Month, and there are some fun, Leo-related activities you can participate in! If you enjoy comparing the Triplets, the **"Galaxy Zoo" project** could use your eyes to help classify different galaxies from sky survey data! Looking at Leo itself can even help measure light pollution: the **Globe at Night project** uses Leo as their target constellation for sky quality observations from the Northern Hemisphere for their April campaign, running from April 3-12. Find and participate in many more **NASA community science programs**. Happy observing!

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:

- Friday, April 2, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Topic: “Getting to Know You,” BMAC Member Benefits Overview and Game Night.
- Friday, May 7, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Topic TBA.
- Friday, June 4, 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.

tarWatch:

- **Cancelled until further notice.**
- April 3, 10, 17 & 24, 2021 - 8:30p
- 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, please show up at least 30 minutes prior to the official start time.

Special Events:

- **All special events are cancelled until further notice.**
- **Astronomy Day - May 15, 2021 - 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 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**

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.**