The Bays Mountain Astronomy Club Newsletter

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Cosmic Reflections

William Troxel - BMAC Chair



reetings and hello, fellow BMACer's! Here we are in April. Time is really flying by, or it seems as if it is anyway. I hope this letter finds you and your family

and friends all well. I also hope that you have been able to get out and enjoy some of the clear night skies we've had. Here in East Tenn., we do not often get good weather to enjoy the night sky. I encourage you to get out when you can and enjoy. I would also like to encourage you to share your experience with the club members. Adam loves to feature photos from club members and their night sky adventures. Don't be shy!

I want to thank Brandon for sharing his journey with us last meeting with his astrophotography. I can recall when he first started out. Believe me, his growth in skills has been amazing. He always has a wonderful presentation and shares wonderful samples of his efforts. I encourage you to ask him questions should you be thinking about getting in astrophotography. He can be a wonderful resource for you. Again, thank you Brandon for a wonderful presentation. April's meeting will be interesting, but has not been finalized at this time. An e-mail notice will be sent out with the details.

Until Next time..., clear skies!

BMAC Notes

Images by Jim Williams



finally managed to get some better Sun pictures this past week and some decent pictures of the Orion, Running Man, Horsehead and Flame Nebulae in February 2022. Sun pictures were taken with a Lunt 60mm H-Alpha scope riding a Celestron CG-4 mount and ZWO planetary camera using SharpCap freeware. They were stacked in AutoStakkert!, sharpened in RegiStax 6 and stretched and colored in PhotoShop.

The Andromeda Galaxy picture was taken in January with an unmodified Canon 60D camera with a Rokinon 85mm lens controlled by an intervalometer on a stationary tripod. 400 images were stacked with DeepSkyStacker freeware along with 50, each, of bias, flat and dark calibration images. They were then stretched and processed in PhotoShop.

The nebulae were captured with the same unmodified Canon 60D camera but with a Rokinon 135mm lens controlled by an intervalometer and riding an iOptron SkyGuider Pro star tracker. 400 images were once again stacked with DeepSkyStacker freeware along with 50, each, of bias, flat and dark calibration images, then stretched and processed in PhotoShop.

To help get started in deep sky astrophotography with equipment you may already have and without using a motorized tracker, I highly recommend Nico Carver's excellent YouTube video at this <u>link</u>.



Canon 60D on SkyGuider Pro



Camera Setup



Andromeda Galaxy



Flame and Horsehead Nebulae



Orion Nebula



H-alpha view of the Sun

Astronomical League Event



Stellar Observations

Greg Penner

Wandering in Lynx

ast month, we focused on the Beehive Cluster, which is one of the nearest open star clusters to our Solar System at only about 600 light-years. This month we will go to the opposite extreme to find a very distant globular star cluster. Lynx is a fairly faint constellation with only 2 stars brighter than magnitude +4. Though it may be difficult to identify, Lynx's location at the zenith allows us to observe some nice deep sky objects through a minimum of light-polluted atmosphere. One particular object in Lynx is quite interesting as a contrast to the aforementioned nearby Beehive Cluster.



Lynx Location. Image from Stellarium.

NGC 2419 (also known as Caldwell 25) is famously known as the "Intergalactic Wanderer" and was discovered by William Herschel in 1788. At the time, Herschel described it as a nebula. In 1861, Lord Rosse observed it with his large refractor and suggested it was a globular cluster (although he did not clearly resolve it). In 1922 when C.O. Lampland photographed it at Lowell Observatory using a 42 inch reflector, NGC 2419 was finally confirmed to be a globular cluster. Most globular star clusters are located within a sphere 65,000 light-years in radius of the galactic center, but NGC 2419 is located about 300,000 light-years away (nearly twice as far as the Large Magellanic Cloud). Due to this great distance, the cluster's apparent brightness doesn't come close to the better known bright globular clusters such as M13 or M5, but NGC 2419 is intrinsically one of the brightest and most massive globular clusters of our galaxy with an absolute magnitude of -9.42.



NGC 2419 Location. Image from Stellarium.



NGC 2419. Image from Adam Block / Mount Lemmon SkyCenter / University of Arizona, Caelum Observatory. 9/28/2011.

Even though NGC 2419 is so distant, it shines at about +10 magnitude and is within reach of 4"-6" telescopes. According to Walter Scott Houston, a 12" telescope may show a hint of individual stars around its edge. I plan to get my 12.5" reflector trained on this cluster in April to test this claim!

The other deep sky object I plan to track down in Lynx is NGC 2683, which was nicknamed the "UFO Galaxy" by the Astronaut Memorial Planetarium and Observatory. This galaxy was another discovery by William Herschel in 1788 and is a nearly edge-on spiral about 30 million light-years away with an apparent magnitude of about +9.5. Observing this galaxy will be a good warm-up to get ready for spring "galaxy season" as we wait for the Virgo-Coma Berenices cluster of galaxies to climb high for good viewing in late April and May.



NGC 2683 Location. Image from Stellarium.



NGC 2683. Image from Hubble Space Telescope Institute.

As I previewed in the January newsletter, on the morning of April 4th Saturn and Mars will have a very close approach less than 1/2 degree apart. They will rise around 5 a.m. and by 6 a.m. will be about 12 degrees above the horizon visible within the same telescopic view. The sky will be brightening quickly as the Sun rises by 7:11 a.m. So, get your equipment set up and ready to maximize your view while you have the chance!

The Queen Speaks

Robin Byrne

Happy Perihelion Anniversary, Comet Hale-Bopp

his month we celebrate the closest approach to the Sun of one of the best comets in recent history. Our story begins with the discovery of the comet. On July 23, 1995, both Alan Hale and Thomas Bopp independently observed an object in the sky, appearing near the globular cluster, M70. Alan Hale realized it was something he hadn't seen in the same part of the sky a few days prior, and after revisiting M70 a couple hours later, saw that the object had slightly moved. After a check of known comets showed nothing in the region, he emailed the Central Bureau for Astronomical Telegrams with his discovery. Meanwhile, Thomas Bopp didn't have a telescope of his own, and was observing with a friend. Through the friend's telescope he spotted the object, and found nothing on his star charts that could be in the observed location. He took the Central Bureau for Astronomical Telegrams' name literally, and sent them a telegram. Brian Marsden had been over the Bureau since 1968, and was amused by receiving a telegram, saying, "Nobody sends telegrams anymore. I mean, by the time that telegram got here, Alan Hale had already e-mailed us three times with updated coordinates." The next day, it was confirmed to be a new comet, and was designated C/1995 O1.

At the time of discovery, Hale-Bopp was 7.2 Astronomical Units from the Sun (an Astronomical Unit is the average distance between the Earth and Sun). This was farther than any other comet discovered by an amateur. Located between the orbits of Jupiter and Saturn, Hale-Bopp already showed signs of having a coma, which is unusual for such a large distance from the Sun. It was later determined that the comet's nucleus is about 60 kilometers across (about 36 miles), which makes it roughly 6 times larger than Halley's Comet. Being so large and bright, while still far from the Sun, created the hope that it would be a good comet to observe. However, comets are notorious for disappointing observers, so the optimism was cautious. Like David Levy once said, "Comets are like cats: they have tails, and they do precisely what they want."



Image of comet C/1995 O1 (Hale-Bopp), taken on 1997 April 04, with a 225mm f/2.0 Schmidt Camera (focal length 450mm) on Kodak Panther 400 color slide film with an exposure time of 10 minutes. The field shown is about 6.5°x6.5°. At full resolution, the stars in the image appear slightly elongated, as the camera tracked the comet during the exposure. Author: E. Kolmhofer, H. Raab; Johannes-Kepler-Observatory, Linz, Austria (<u>http://</u> <u>www.sternwarte.at</u>) 4/4/97. Less than a year after discovery, in May 1996, Hale-Bopp was bright enough to be viewed without a telescope or binoculars, and by January 1997, it was bright enough to be seen easily, even in large, light-polluted cities. With the growth of the internet, web pages devoted to Hale-Bopp were overwhelmed by the number of views, and this helped create a huge interest in the comet by the general public. The closer Hale-Bopp got to the Sun, the brighter it became, as well as developing its tail. In February of 1997, the tail became easily visible, and was clearly divided into two components: the dust tail and the ion tail.

The hope and expectation was that Hale-Bopp would reach its brightest when it was closest to the Sun on April 1, 1997. For a change, this comet not only met, but exceeded expectations, reaching magnitude -1.8 during perihelion. The only star brighter than that is Sirius. The tail extended over 40 degrees in length. For observers in the Northern Hemisphere, Hale-Bopp was placed in the sky where it could be observed all night long during its perihelion passage, providing spectacular views. After perihelion, Hale-Bopp moved to the Southern Hemisphere skies, but quickly faded, so the views were not as impressive. By December of 1997, the comet was no longer visible to the unaided eye. In total, Hale-Bopp had naked-eye visibility for over 18 months, breaking the record set by the Great Comet of 1811, which was "only" visible to the naked eye for 9 months. Telescopic observations by professional astronomers continued through 2012, when it was 33.2 AU from the Sun.



Orbital diagram for Comet Hale-Bopp. The positions of the comet and the planets are as in April 1, 1997 (at the perihelion). Based on ephemeris data from **horizons** by NASA. Author: Random astronomer (talk) 11/29/08.

Hale-Bopp is considered to have a long-period orbit, meaning it takes over 200 years to orbit once around the Sun. That places its original home in the Oort Cloud. Hale-Bopp's orbital period has changed, due to interactions with the larger planets in the Solar System, especially Jupiter. From analysis of its orbital path, astronomers estimate that Hale-Bopp last visited Earth's skies in the year 2215 BC, which implies an orbital period of over 4000 years. That passage brought it close to Jupiter, which affected its orbital path, and it was further altered by the 1996-1997 visit, with another close encounter with Jupiter. Hale-Bopp's orbit will now take a little over 2500 years before returning to our skies.

Professional astronomers had a fantastic opportunity to learn more about comets from Hale-Bopp during its passage. One surprise was finding that, in addition to the dust and ion tails, Hale-Bopp had a sodium tail. While not visible optically, the tail did appear when the proper filters were used. Sodium had been detected in the coma of other comets, but this was the first time it was found to extend out into its own tail. Another discovery was a much higher than expected abundance of heavy water (water made from deuterium instead of hydrogen). The expectation was based on the amount of heavy water found on Earth, since it's thought that comets were the main source of water on Earth. However, if Hale-Bopp is a typical example of comets, then at least some of Earth's water had to originate someplace other than comets. Based on some of the elements detected in Hale-Bopp, it is estimated that the nucleus had only experienced temperatures in the range of 20- 40 Kelvin. This implies that it formed in the Kuiper Belt, but migrated outward to the Oort Cloud.

Definitely one of the most bizarre and sad associations with Hale-Bopp is the connection to the Heaven's Gate cult. It all began with an amateur astronomer's picture of the comet that showed a fuzzy oval next to Hale-Bopp, which led to various people thinking he captured a UFO following the comet. Many professionals pointed out that the object was a known, faint star (SAO141894), but that didn't deter the UFO enthusiasts. Among the enthusiasts were members of the Heaven's Gate cult, who believed they would, upon death, leave their physical bodies, enter the spaceship, and then pass through Heaven's Gate, which would take them to a higher level of existence. In March 1997, 39 members of Heaven's Gate committed suicide by drinking poison.

Comet Hale-Bopp was likely the most-observed comet of all time. With so many months of visibility, combined with the publicity it received in the media and internet, everyone knew about it and could easily see it. It is estimated that almost 70% of Americans had observed the comet by the time it reached perihelion. I clearly remember observing this comet for many months. It was such a beautiful sight in the night sky. Being visible to the naked eye for so long, it became an old friend to either briefly glance at, or spend a longer time visiting with a telescope or binoculars. Comet Hale-Bopp very rightly deserves the nickname as The Great Comet of 1997.

References:

Wikipedia - Comet Hale-Bopp

Comet Hale-Bopp: Facts About the Bright and Tragic Comet, by

Elizabeth Howell and Daisy Dobrijevic, February 9, 2022

The Space Place MASA Night

Metwork

David Prosper

The Bays Mountain Astronomy Club Newsletter

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Advanced Catspotting: Lynx and Leo Minor

any constellations are bright, big, and fairly easy to spot. Others can be surprisingly small and faint, but with practice even these challenging star patterns become easier to discern. A couple of fun fainter constellations can be found in between the brighter stars of Ursa Major, Leo, and Gemini: Lynx and Leo Minor, two wild cats hunting among the menagerie of animal-themed northern star patterns!



Map of the sky around Lynx and Leo Minor. Notice the prevalence of animal-themed constellations in this area, making it a sort of celestial menagerie. If you are having difficulty locating the fainter stars of Leo Minor and Lynx, don't fret; they are indeed a challenge. Hevelius even named the constellation as reference to the quality of eyesight one needs in order to discern these faint stars, since supposedly one would need eyes as sharp as a Lynx to see it! Darker skies will indeed make your search easier; light pollution, even a relatively bright Moon, will overwhelm the faint stars for both of these celestial wildcats. While you will be able to see NGC 2419 with a backyard telescope, Hanny's Voorwerp is far too faint, but its location is still marked. A few fainter constellation labels and diagrams in this region have been omitted for clarity. Image created with assistance from Stellarium.

Lynx, named for the species of wild cat, is seen as a faint zigzag pattern found between Ursa Major, Gemini, and Auriga. Grab a telescope and try to spot the remote starry orb of globular cluster NGC 2419. As it is so distant compared to other globular clusters - 300,000 light years from both our Solar System and the center of the Milky Way - it was thought that this cluster may be the remnants of a dwarf galaxy consumed by our own. Additional studies have muddied the waters concerning its possible origins, revealing two distinct populations of stars residing in NGC 2419, which is unusual for normallyhomogenous globular clusters and marks it as a fascinating object for further research.

Leo Minor is a faint and diminutive set of stars. Its "triangle" is most noticeable, tucked in between Leo and Ursa Major. Leo Minor is the cub of Leo the Lion, similar to Ursa Minor being the cub to the Great Bear of Ursa Major. While home to some interesting galaxies that can be observed from large amateur scopes under dark skies, perhaps the most intriguing object found within Leo Minor's borders is Hanny's Voorwerp. This unusual deep-space object is thought to be a possible "light echo" of a quasar in neighboring galaxy IC 2497 that has recently "switched off." It was found by Hanny van Arkel, a Dutch schoolteacher, via her participation in the Galaxy Zoo citizen science project. Since then a few more intriguing objects similar to Hanny's discovery have been found, called "Voorwerpjes." [Ed.: Voorwerp means "object" in Dutch.]



Hanny's Voorwerp and the neighboring galaxy IC 2497, as imaged by the Hubble Space Telescope. Credits: NASA, ESA, W. Keel (University of Alabama) and the Galaxy Zoo Team. <u>Source</u>

Lynx and Leo Minor are relatively "new" constellations, as they were both created by the legendarily sharp-eyed European astronomer Johannes Hevelius in the late 1600s. A few other constellations originated by Hevelius are still in official use: Canes Venatici, Lacerta, Scutum, Sextans and Vulpecula. What if your eyes aren't quite as sharp as Johannes Hevelius - or if your weather and light pollution make searching for fainter stars more difficult than enjoyable? See if you can spot the next Voorwerp by participating in one of the many citizen science programs offered by NASA! And of course, you can find the latest updates and observations of even more dim and distant objects at <u>NASA</u>.

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:

- BMAC meetings will be held on Zoom until further notice.
- Friday, April 1, 2022 7p Details 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.



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

- 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.



• 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 astronomythemed 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.
- <u>StarFest Link</u>

Regular Contributors:



William Troxel



Greg Penner



Robin Byrne



Adam Thanz



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).

reg Penner is a semi-retired architect living in the Tri-Cities area since 2018. He G 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.



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 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 email 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.