

The Bays Mountain Astronomy Club Newsletter

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Cosmic Reflections

William Troxel - BMAC Chair



reetings, fellow BMACer's. First, it was awesome to be with you at the Picnic.

Mother Nature worked with me this year and did not pour rain on our annual picnic, which was a first for me. Everyone seemed to have a good time, the food was very good and most important, just getting to be with everyone was very enjoyable. We had a few of the new members come out and be with us which was wonderful. Thank you goes out to Dan for opening his home for us to gather. As an interesting side note, two members shared that their GPS sent them to a different location, even when they entered the correct address!

Lots of information was shared requiring some new things that will be part of the meetings going forward. I wanted to talk a word about two of them. The first is the show and tell feature which we started during the Zoom meetings, which everyone really seemed to enjoy. I am going to continue that as one of the features. I enjoyed seeing all the new stuff, however I think it will be even more fun to actually get to see the item in real life, hold it, see how it works and hear more about how it came to be part of your hobby. The next new part of the meeting is going to be an interactive game / learning event. This will be in the form of a game that you will work as part of a team or maybe alone. It could be a puzzle, a problem or a quiz that you will need to recall information from one of the many astronomy resources we have. For August, you will need to review the June 2021 Reflector Magazine from the Astronomical League. This is a good time to ask if any of you would like to take the lead of this part of the meeting. I would welcome your willingness to lead this. Please consider this opportunity!

The August meeting, as you know, is for members only. The date, time and place will be sent directly to the club membership. Now that virus case numbers are rising, it is imperative to limit our attendance to just members. As is always the case, it is totally OK for you to wear a mask when we gather if you desire.

Before I close this month, I wanted to again thank you for supporting me with the honor to serve as your Chairman again. I'm also proud of the statement that Brandon made during the Picnic. Even with all the virtual Zoom meetings, our club stayed together and even increased its membership! This shows how strong the character is of the Bays Mountain

Astronomy Club! I am very proud of each of you for your willingness to continue to be a part of this wonderful hobby of amateur astronomy.

Until next time... Clear Skies!

BMAC Notes



BMAC Picnic



he BMAC Picnic went very well, especially since this was our first in-person meeting since Spring 2020!



Here are most of the attendees to the 2021 Picnic. Image by Robin Byrne.

Astrophotography by BMACer David Reagan



s you can see, David has excelled in his skills in astrophotography. And, captured in Johnson City, TN! Below is a subset of the second image. Look for the tiny image of the massive quasar!



An LRGB image of the Coma cluster (Abell 1656) with quasar HB89 1256+280. The quasar has a red shift of 2.66 representing a distance of about 10.3 to 12.3 billion light years!



An LRGB image of the Coma cluster (Abell 1656).



An SHO rendering (using the Hubble Space Telescope palette to represent the colors) of M16, the Eagle Nebula.

Celestial Happenings

Jason Dorfman





August holds some wonderful planetary views this year. We find Venus brightly as the "evening star" and Saturn and Jupiter reaching opposition. The Perseid meteors also occur with a favorable Moon position this year.

The Sun rises at 6:36 a.m. on the first of the month and sets at 8:35 p.m. As we move towards the Autumnal Equinox, the days will continue to shorten, which means more night viewing for us! As we reach the end of the month, the Sun will emerge at 7 a.m. and set a bit earlier at 7:59 p.m.

Planets

Venus dominates the early evening sky this month. Not long after the Sun has descended below the horizon, you should be able to spot our sister world shining brilliantly in the west at magnitude -3.9. This cloud-covered planet sits about 13° high due west a half hour after sunset. With the aid of a telescope, you'll find the planet spanning 12.7" and appearing very gibbous at 82% illumination. As Venus glides along the Ecliptic over the month, increasing its apparent distance from the Sun, it will appear at about the same altitude each night as it shifts its position towards the SW. By month's end, Venus will have brightened to magnitude -4 as it continues to swing around towards Earth in its orbit, growing slightly to 15" and shifting its phase to a smaller gibbous at 73% lit.

On the 1st, Mars can be found to the lower right of Venus. The Red Planet will be a more challenging target compared to Venus, as it sits lower in the sky and is a hundred times fainter. Mars will be slightly under 5° in altitude above the WNW horizon 45 minutes after sunset shining at magnitude +1.8.

As we reach the middle of August, and Mars continues its slow descent into the fading twilight, we'll find Mercury emerging from its trip around the far side of the Sun. On the 18th, the pair will be in conjunction separated by a mere 8', which is a little over a tenth of a degree. The two are only 5° high 20 minutes after sunset, so it will be a bit challenging without a good view towards the horizon. Look for Mercury first, which at magnitude -0.46 outshines Mars by more than two magnitudes. A telescope will reveal Mercury as a small

gibbous orb, illuminated by 87% and spanning 5.2". Look to the upper left of Mercury for fainter Mars.

Mercury will continue to increase its separation from the Sun as the month progresses. On the last day of the month, Mercury can be found 5° high just south of west a half hour after sunset. Its magnitude will have dimmed slightly to -0.06 as it now appears slightly less gibbous, appearing 74% illuminated.

As you're watching the inner planets dance among the fading twilight of the setting Sun, the two giants of the outer Solar System are rising in the east. Both Saturn and Jupiter will reach opposition this month providing the opportunity for some spectacular views of these gaseous worlds and their many moons.

As August begins, look to the SE an hour and a half after sunset for Saturn. The ringed-planet sits about 16° high shining brightly at magnitude +0.18. Saturn will climb to an altitude of 35° due south as it crosses the meridian shortly after 1:30 a.m. Saturn will reach opposition the following night. Over the course of the month, telescopic views will show the planet spanning about 18" with the ring-plane extending out to roughly 43".

Jupiter rises about an hour after Saturn. Look to the ESE around 10:30 p.m. on the 1st, about 2 hours after sunset, to find Jupiter sitting 12° in altitude and shining brilliantly at magnitude -2.8. Jupiter will reach opposition on the 19th. On that day, it will reach an altitude of 40° as it crosses the meridian a little after 1:30 a.m. The planet will span 49" on that day and roughly that same diameter throughout the month.

Luna

August begins with a waning crescent moving through Taurus and Gemini during the early morning twilight. New Moon is on the 8th. On the 10th, a two-day old Moon will sit about 5° to the right of Venus in the evening twilight hour. A First Quarter Moon will narrowly escape the pincers of Scorpius on the 15th. A nearly full Moon will pass south of Saturn and then Jupiter over the nights of the 20th and 21st culminating with the Full Moon on the 22nd. The month ends with a 3rd Quarter Moon back amongst the stars of the Bull and the Pleiades star cluster.

Meteor Showers

Once again, we can't have an article about the skies of August without mentioning the Perseids. The peak this year occurs on the night of the 11th/12th, though you'll still catch some on the nights surrounding this date. Prime observing for meteor showers is usually best around two in the morning when our position on Earth has us facing towards the radiant, in this case, the constellation Perseus. This year, the opportunity to glimpse some meteors racing across the sky is good with the crescent Moon setting about 10:30 p.m. on the peak night.

That's all for this month. Have fun observing!

The Queen Speaks

Robin Byrne



Book Review: *The Very First Light*



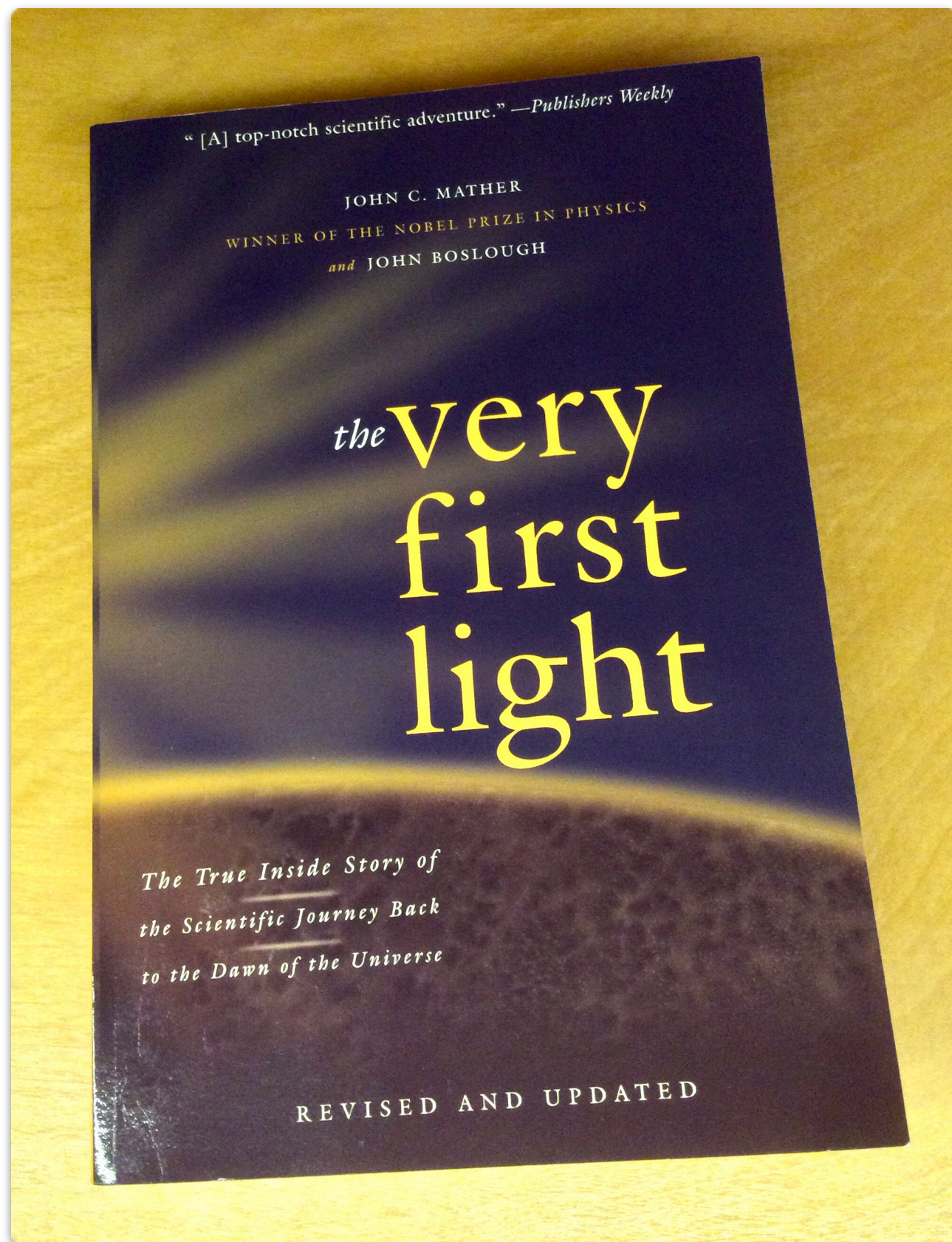
Summer is my chance to read more books, so this month I have another book review for you. *The Very First Light: The True Inside Story of the Scientific Journey Back to the Dawn of the Universe* by John C. Mather and John Boslough is a fascinating account of the various observations of the Cosmic Background Radiation (CBR), culminating with the Cosmic Background Explorer (COBE) telescope.

The book follows a fairly chronological accounting of the scientific investigations relating to the CBR. For me, I already knew a good portion of this material, but it was still enjoyable to revisit. Some of the stories about the individuals involved were new to me, and I was a little surprised by the number of times people's work was overlooked, often for petty reasons. The authors make an attempt to rectify this by giving credit to the unsung heroes in the scientific community.

The portion of the book that I found most riveting, though, was when the idea of placing a telescope in orbit to observe the CBR started to take shape. It began in the early-1970's with a proposal to include microwave detectors on the Infrared Astronomical Satellite (IRAS). That proposal eventually was cut from the IRAS mission, but enough people were interested in pursuing the idea of placing CBR detectors in orbit that a group was established to develop a stand-alone mission. I probably shouldn't have been, but was amazed by the amount of bureaucracy involved in proposing such a mission to NASA. It is an incredible team effort that involves bringing together scientists, engineers and NASA insiders to develop not only a workable design, but also present it in a way that will garner support from the committee charged with evaluating proposals, while keeping everything within a budget.

Once a mission gets preliminary approval, then the process becomes even more involved. In the case of COBE, there were three different detectors on board, each designed to study a unique aspect of the CBR. For each detector there was a lead scientist, instrument designer, a team of instrument engineers and a team of software engineers. Many of the parts that would be used had to be specially built, so manufacturers needed to be

contracted to meet the design specifications. In the book's appendix, it lists all of the people involved with COBE, which includes: 20 on the science team, 25 on the Engineering and Managing team and almost another 1,200 people listed as Contributors to COBE. It's easy to see how the budgets for orbiting observatories become so large just from salaries alone!



The Very First Light: The True Inside Story of the Scientific Journey Back to the Dawn of the Universe by John C. Mather and John Boslough. Image by Adam Thanz.

Then there's the insanely slow process of actually getting it built, functional and eventually launched. Much of the construction took place at Goddard Spaceflight Center by the staff engineers, but because they weren't specifically on the COBE team, the spacecraft wasn't always their top priority, leading to many delays. Once each part was built, it had to go through a myriad of tests. Typically, nothing works the first time, and that was true for every single part built for COBE. So, each part had to be re-evaluated to modify the design, get rebuilt, and tested once more. A very similar process took place on the software side of the project, and not just de-bugging computer code. Because each instrument had its own software team, they worked independently of one another, which led to issues when they got to the point of needing all the parts to be able to communicate to a centralized system that would send the data back to Earth.

Getting COBE into space met its own hurdles. From the beginning, the plan was to launch it from the Space Shuttle, but from a polar orbit. At the time COBE was first being designed, two launch facilities for the Shuttle were going to be built: the one in Florida, plus one in California designed for a polar path. Eventually, the decision was made to scrap the plans for a California launch site, so the first round of redesign for this portion of the mission began. The telescope would still be launched from the Shuttle, but would now be equipped with a way to maneuver into the necessary polar orbit. But, COBE was not fated for a Shuttle launch. The Challenger explosion during launch in 1986 put the Shuttle program on hold just when COBE was getting close to being ready for launch. After many alternate launch vehicles were explored, it came down to using a Delta rocket. Fortunately, very little of the spacecraft would need to be altered to fit inside the new launch vehicle, plus the Delta could be launched from California into a polar orbit. After 15 years of effort, COBE finally launched on November 18, 1989.

COBE's discoveries were ground-breaking, and the book details each of the significant findings made by the instruments on board. This is another section where, if you already know about the scientific findings, it will be familiar ground, but still fun to revisit the excitement when the discoveries were revealed. What many will not be aware of were the conflicts between members of the science team and the egos involved. Not everyone on the COBE team comes across in a good light.

The book ends with the awarding of the Nobel Prize in Physics to two members of the COBE team, one of whom was the book's co-author, John C. Mather. This part included a glimpse of what it's like to win a Nobel prize, from the notification of being an award recipient, to the press conferences, to all of the pomp and celebrations that occur surrounding the award ceremony. It is quite an event.

Originally written in 1996, and then revised and updated in 2008, *The Very First Light* is a comprehensive and fascinating retelling of all aspects of the COBE mission. I highly recommend this book to anyone interested, not only in the cosmology of our Universe's origin, but also interested in the astounding effort involved in creating and operating a space-based observatory. If you've ever asked, "Why is the James Webb Space Telescope taking so long to launch?" this book will help you to appreciate the long, complicated road to putting a ground-breaking telescope in space.

References:

The Very First Light: The True Inside Story of the Scientific Journey Back to the Dawn of the Universe by John C. Mather and John Boslough, 1996, 2008, Basic Books.

The Space Place - NASA Night Sky Network

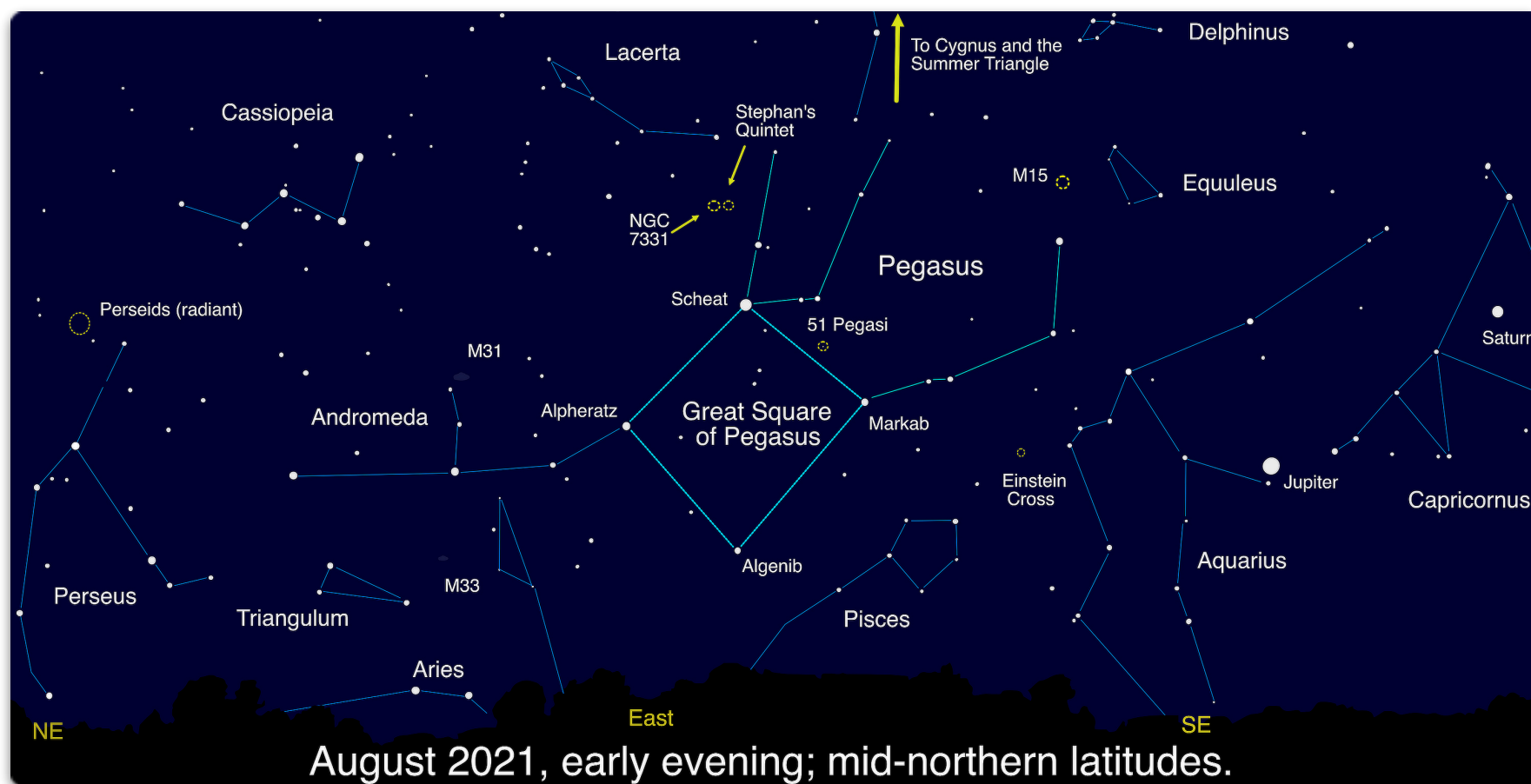
David Prosper

Corner the Great Square of Pegasus



The Summer Triangle may be the most famous seasonal star pattern, but during early August evenings another geometrically-inclined asterism rises: the Great Square of Pegasus. This asterism's name is a bit misleading: while three of its stars - Scheat, Markab, and Algenib - are indeed found in the constellation of the winged horse Pegasus, its fourth star, Alpheratz, actually sits in the constellation Andromeda, and is that constellation's brightest star!

Sky Map of the Eastern Horizon in Mid-August 2021



While the stars of the Great Square of Pegasus are not as bright as those of the Summer Triangle, they still stand out compared to their neighbors, and make a great foundation for exploring this area of the night sky. Note that the brightness of the stars near the horizon is exaggerated in this picture.

August evenings are a great time to start looking for the Great Square, as it will be rising or will have already risen in the east after sunset. If it's not obvious at first, wait for this star pattern to rise a bit above the murky air, and remember that depending on your point of view, it may appear more like a diamond to you than a square. Look for it below the Summer Triangle at this time, or to the southeast of nearby Cassiopeia. As the Square rises in prominence during autumn evenings, it becomes a handy guidepost to finding more constellations, including some of the dimmer members of the Zodiac: Aries, Pisces, Aquarius and Capricornus. Like the Summer Triangle, the Great Square of Pegasus is also huge, but Pegasus itself is even larger; Out of the 88 constellations, Pegasus is 7th in size, and it feels even larger as the stars in its neighboring constellations are much dimmer.

Stephan's Quintet



*Stephan's Quintet is one of the most famous deep-sky objects in Pegasus. First discovered in 1877, it contains the first galaxy group discovered (which includes 4 of the 5 galaxies making up the Quintet) and has been studied extensively ever since. One day this group will merge into one supergalaxy! While famous, these galaxies are hard to spot in all but the largest backyard telescopes but are a favorite target of astrophotographers. Take a **virtual flyby** of these galaxies with a tour created from Hubble data.*

Credit: NASA, ESA, and G. Bacon, J. DePasquale, F. Summers, and Z. Levay (STScI)

There are many notable deep-sky objects found within the stars of Pegasus - ranging from easily spotted to expert level targets - making it a great constellation to revisit as your observing skills improve. Notable objects include the densely-packed stars of globular cluster M15, a great first target. The potential Milky Way look-alike galaxy NGC 7331 is a fun target for more advanced observers and expert observers can hop nearby to try to tease out the much dimmer interacting galaxies of Stephan's Quintet. A fascinating (but extremely difficult to observe) object is a gravitationally-lensed quasar famously known as the Einstein Cross. Pegasus has quite a storied history in the field of exoplanet research: 51 Pegasi was the first Sun-like star discovered to be host to a planet outside our Solar System, now officially named Dimidium.

While observing Pegasus and its surroundings, keep your eyes relaxed and ready to catch some Perseids, too! August 2021 promises an excellent showing of this annual meteor shower. The crescent Moon sets early on the evening of the shower's peak on August 11-12, but you can spot stray Perseids most of the month. If you trace the path of these meteors, you'll find they originate from one point in Perseus - their radiant. Giant planets Jupiter and Saturn will be up all evening as well. Look south - they easily stand out as the brightest objects in the faint constellations Aquarius and Capricornus.

Pegasus truly holds some fantastic astronomical treasures! Continue your exploration of the stars of Pegasus and beyond 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:

- August, 2021 - BMAC members only. TBA directly to BMAC members.
- Friday, September 3, 2021 - 7p - Possible meeting at BMP. Topic TBA.
- Friday, October 1, 2021 - 7p - Possible meeting at BMP. Topic TBA.
- Friday, November 5, 2021 - 7p - Possible meeting at BMP. Topic TBA.
- Friday, December 3, 2021 - 7p - Possible meeting at BMP. 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.**
- 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.



Special Events:

- **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**
- Currently, we are planning on having StarFest. Please note that StarFest can be cancelled depending on the pandemic or low attendance.

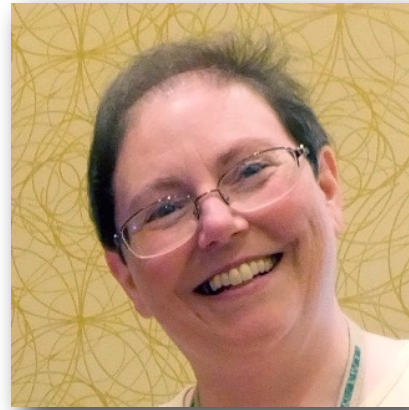
- **Astronomy Day - May 7, 2022 - 1p-4p; 8:30p-9:30p**

- 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.**