The Bays Mountain Astronomy Club Newsletter

February 2022

Kingsport, TN

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Cosmic Reflections

William Troxel - BMAC Chair

reetings fellow BMACer's! Here we are at February 2022. Time seems to be flying by. Spring will be here again. I hope my letter finds you well and getting settled in to 2022. I had hoped we would be back meeting in person at the park. As you know, that hope has not come true. More and more people seem to be getting sick with the Covid Omicron variant. Please continue to stay safe as we move forward into 2022.

I want to remind everyone I always welcome anyone that would like to lead a section, a game, a presentation, for any upcoming meetings. Please consider being part of the meetings. If you got a new piece of equipment or had an interesting find in the night sky and would like to do a presentation let me know I would love to have you do a presentation on what you found or learned. If you know of someone in the Astronomy field that has a project or writing a paper I will be happy to contact them and invite them to do a presentation.

I wanted to ask each of you what you would like to see the club do over the next few months. February is the time of year I always ask and every year I hope you the club members will share your thoughts. I have said that until future notice we will be meeting via Zoom. As of current writing, there is also no plan to have any public StarWatch or SunWatch.

Please keep watching the website and park site for updates. February's meeting will be on Zoom and I will send out the link in a few days.

Until next time.... Clear skies.

BMAC Notes

Update

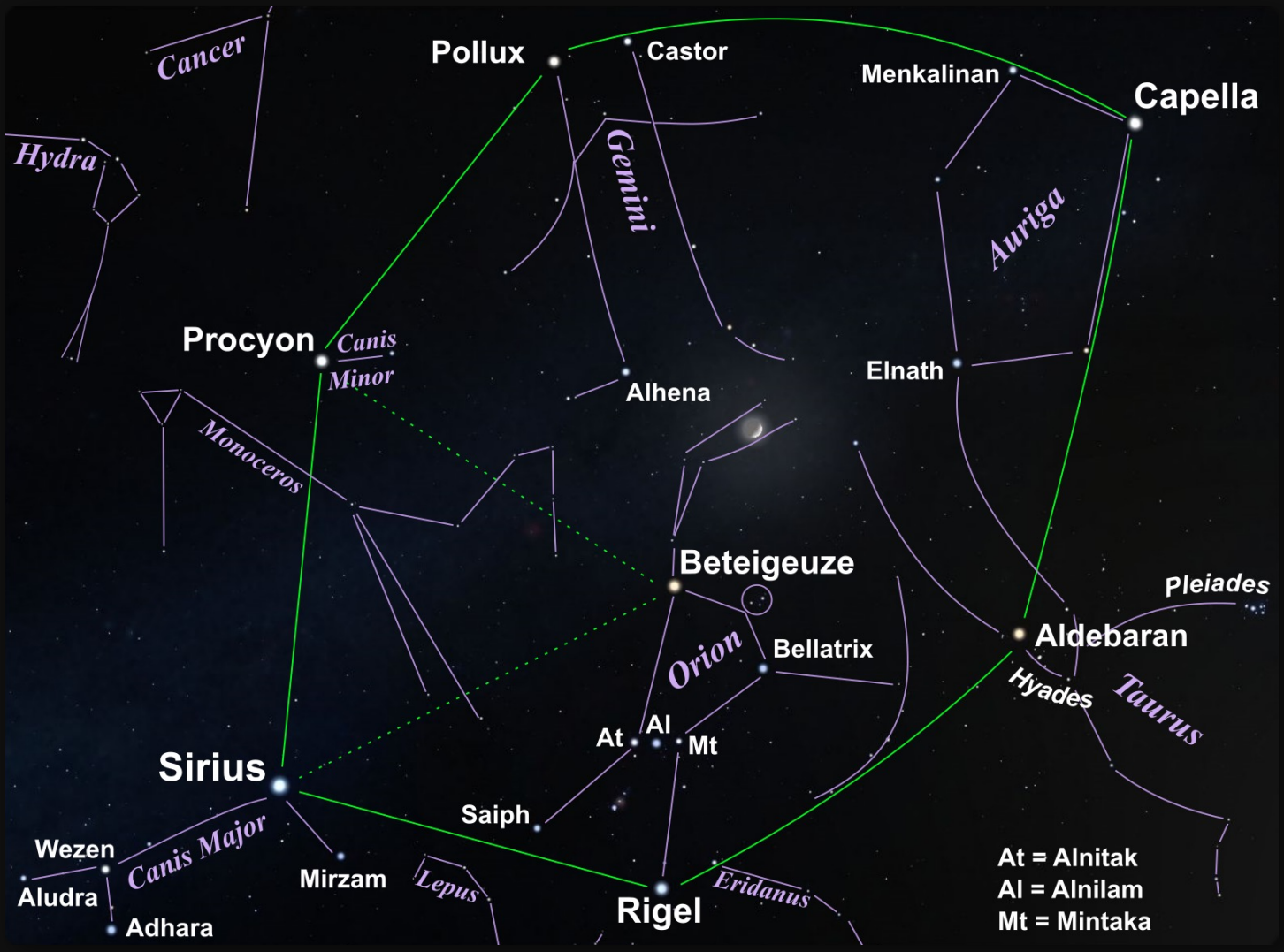
oBfest has been currently rescheduled for March 19, 2022. It will be at the originally-scheduled site, Catawba Science Center, West Wing. Mask mandates will be enforced. For more information, click **here**.

Stellar Observations

Greg Penner

The Bright Stars of Winter

nyone who spends much time gazing at the stars has noticed that they seem significantly brighter in the (northern hemisphere) winter season compared to other times of the year. Usually the explanation I have heard is that the cool, dry, crisp air of winter makes the stars appear to burn more brightly. Less humidity in the air does create a clearer atmosphere, but what else leads to the impression of brighter stars in the winter? The majority of the brightest stars visible from northern latitudes ARE actually in the winter sky, and they are bunched up in an area known as the Winter Hexagon.

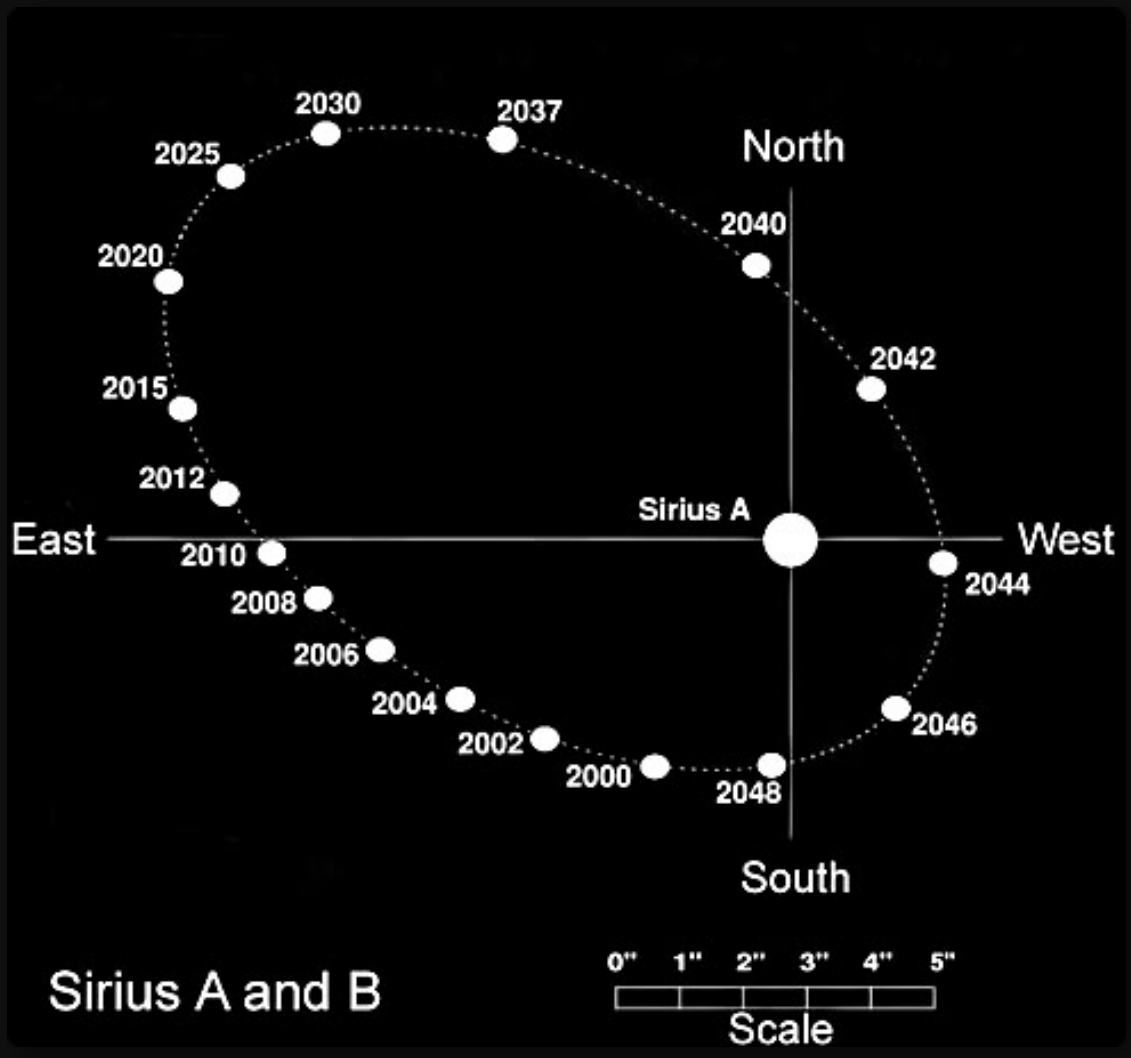


The Winter Hexagon and the Great Southern Triangle formed by Sirius, Procyon, Pollux, Capella, Aldebaran and Rigel with Betelgeuse and, incidentally, the Moon within. All stars of an apparent magnitude of at least 2 mag are labeled. Image from Elop using Stellarium.

The asterism known as the Winter Hexagon is an area bounded by the stars Sirius, Rigel, Aldebaran, Capella, Pollux and Procyon. Included within this hexagonal boundary are Castor, Betelgeuse, Bellatrix and the stars of Orion's Belt. All together, 20 stars of 2nd magnitude or brighter are in this part of the sky. The stars that form the hexagon are all parts of well-known constellations of Orion, Gemini, Taurus, Canis Major and Auriga. Two other well-known large open clusters, the Hyades and the Pleiades, are just outside the hexagon. No wonder we marvel at the bright stars of winter! The brightest of these jewels is Sirius, the brightest star in the night sky. Sirius is actually a double star that presents a good challenge for telescopic observers.

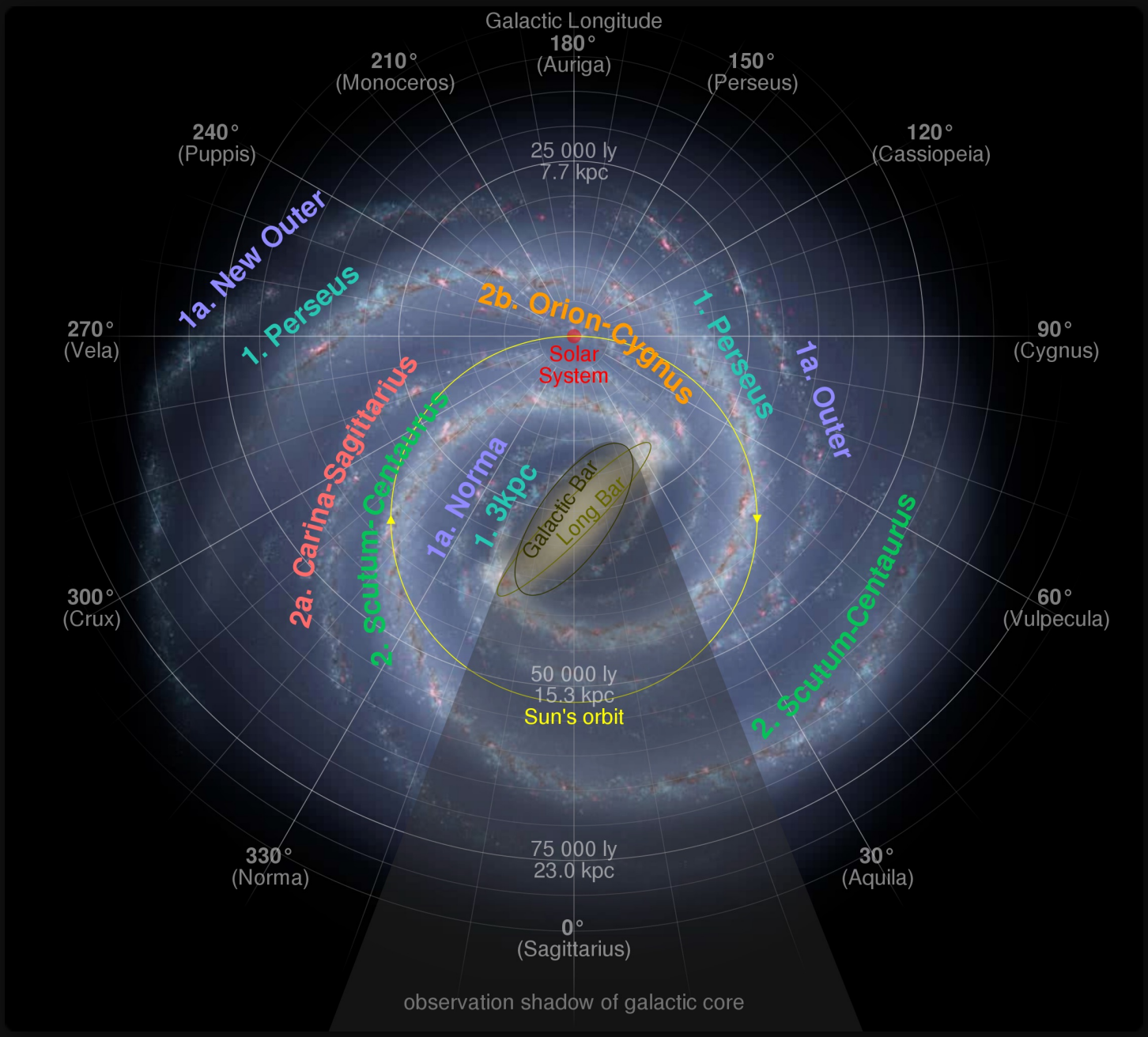
The separation between Sirius A and B varies between 3 - 11 arc seconds over a period of 50 years. They are currently nearing their maximum separation which will occur in 2023. However, Sirius A has an apparent magnitude of -1.46 while Sirius B has an apparent magnitude of +8.44, which means Sirius A is many thousands of times brighter, making B difficult to see as it is lost in the glare. Click on this link to a great article on the website

"EarthSky" which gives some excellent tips on how to split this challenging double star. As the article states, you will need excellent seeing conditions, patience, and perhaps multiple attempts to see Sirius B. So you might want to have some other targets on your viewing list on the night of your attempt. Fortunately, the winter Milky Way is located in the same part of the sky and offers some nice deep sky objects to view.



Sirius B orbit. Image from EarthSky.

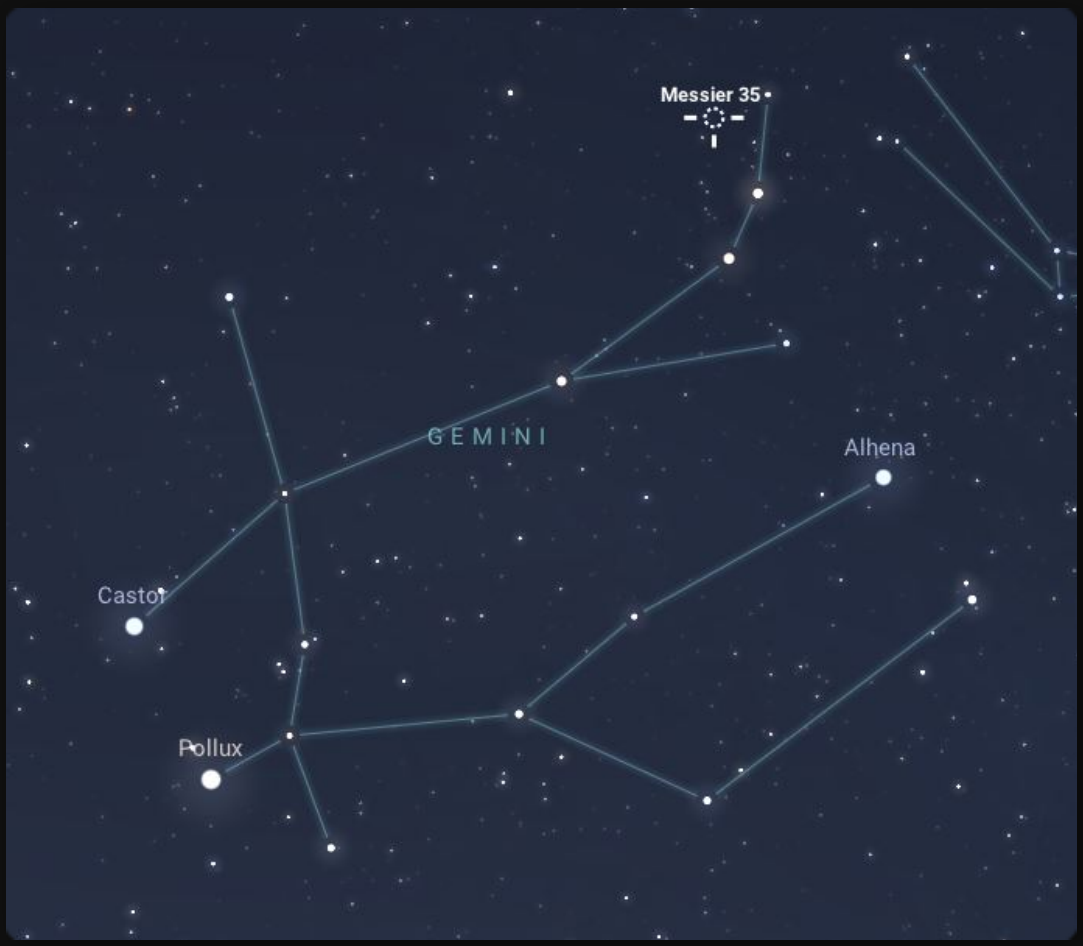
Our Solar System is located in the Orion-Cygnus arm of our home Milky Way Galaxy. The part of the Milky Way we view in our summer is in the direction of the galaxy's core and is very densely packed with stars and dust. As Earth travels in its orbit around to the other side of the Sun in our winter, we are viewing the Perseus arm of the Milky Way that is outward from our location. So, what we are seeing on these cold, clear winter nights is the bright stars mentioned above that are part of our local Orion-Cygnus arm in the foreground, and in the background is the somewhat faint Perseus arm of the Milky Way. Numerous open star clusters populate this part of the sky, providing some beautiful targets for any size telescope.



Artist's conception of the Milky Way Galaxy as seen from far Galactic North (in Coma Berenices) by NASA/JPL-Caltech/R. Hurt annotated with arms (color-coded according to Milky Way article) as well as distances from the Solar System and galactic longitude with corresponding constellation. Image by NASA/JPL-Caltech/ESO/R. Hurt.

In the constellation Auriga, you will find M36, M37 and M38, and in nearby Gemini is M35. These star clusters are all in the range of 3,500 - 4,500 light years from Earth and shine at an apparent magnitude in the +5 to +6 range. I have always found that M35 is the brightest and most appealing of these star clusters. Another star cluster, NGC 2158, lies just to the southwest of M35, so both clusters could be visible in a low power eyepiece. All of these celestial beauties are nicely placed for viewing in the month of February, but the glare of the bright Moon will be interfering mid-month. So if you can brave the cold temperatures then get out and enjoy the sights around the Winter Hexagon early or late in the month!

Map of M36, M37 & M38 in Auriga from Stellarium.



Map of Gemini and M35 from Stellarium.

The Queen Speaks

Robin Byrne

Happy Birthday Heinrich Hertz

This month we celebrate the life of a man who contributed so much in a very short amount of time. Heinrich Rudolf Hertz was born in Hamburg, Germany on February 22, 1857. He was the first of five children born to Anna and Gustov, who was an attorney who later became a senator. Heinrich's paternal grandfather was raised Jewish, but converted to Lutheranism when he married. Heinrich's parents, though officially Lutheran, were more focused on giving Heinrich a solid education, with his religious identity being secondary.

In 1863, at the age of 6, Heinrich began attending a private boys' school. It was highly competitive, but Heinrich consistently ranked near the top of his class. Even at a very young age, Heinrich knew he wanted to study something related to the sciences, first planning to pursue engineering. The school he attended had a strong focus on science, so his parents felt it was a good choice. When he was 15, Heinrich

switched to being educated at home to better prepare for college, in particular focusing on languages not taught at the school, including Greek, Latin, some Arabic, and even Sanskrit. With the help of a private tutor, Heinrich also developed his skill at building and using scientific instruments, such as operating a lathe. He even built his own spectroscope, which was used to conduct experiments. In 1874, at the age of 17, Heinrich returned to the private school for one more year to be fully prepared for the college entrance exams.

After passing the exams, Heinrich them decided that instead of college, he would study as an apprentice to an architect. For a year, he lived in Frankfurt working as an apprentice, while still studying physics and ancient Greek literature in his spare time.

In 1876, Heinrich decided to go to college to study engineering, after all, so he moved to Dresden. After only a few months, he was drafted for his one-year compulsory service in the army. Heinrich liked the discipline of the military, but found the work very boring.

Once his service was complete, Heinrich returned to college, but this time in Munich, still with the plan to study engineering. However, he soon discovered that his heart belonged to physics. A year later, he transferred to the University of Berlin, because they had a better physics laboratory, and two of the most prominent physicists of the time were there: Gustav Kirchoff and Hermann Helmholtz.

Helmholtz recognized Hertz's talent, and thought that he could be the one to solve one particular problem: does electric current have mass? The university's Philosophy department even was offering a prize to anyone who could answer this question. Hertz performed a variety of experiments, and found that, if current has mass, it would be so incredibly small that the instruments of the time would not be able to measure it. He won the prize. It wasn't for another 18 years before J. J. Thomson would discover electrons and find that they do have a minuscule mass.

Heinrich Hertz, 1915. Image from Wikipedia.

Next, Helmholtz wanted Heinrich to try for another prize, this time offered by the Berlin Academy, to prove Maxwell's theory of electromagnetism. James Clerk Maxwell had proposed in 1864 that light was a wave comprised of both electricity and magnetism. Helmholtz thought this would make a good doctoral research project. Hertz thought it would be too difficult to build the equipment necessary to test this. Instead, Hertz studied electromagnetic induction for his thesis.

Heinrich graduated with his Ph.D. in physics in 1880 and remained at the University of Berlin for the next 3 years, working as a post-doctoral student with Helmholtz. From 1883 - 1885, Hertz was a lecturer at the University of Kiel, before becoming a full professor at the University of Karlsruhe in 1885. In 1886, Hertz married Elisabeth Doll. They would eventually have two daughters: Johanna and Mathilde, who would become a noted biologist.

In 1886, Hertz was showing his students some electrical sparks. He began to wonder how those sparks would affect an electric

current. After performing a variety of experiments, he found that the sparks caused vibrations in the wires they jumped between. The vibrations were at a much faster rate than anything previously observed (about 100 million vibrations per second). Because the vibrating wires contained electric charges that were accelerating, by Maxwell's theory, they should generate electromagnetic waves. Hertz set up a loop of copper wire about 5 feet away. The loop had a small gap in it. If electromagnetic waves existed and travelled through the air, they should create a current in the loop, which would spark across the gap. Hertz saw that it did indeed have a spark! Hertz had produced and detected what we now call Radio Waves. Over the next 3 years, Hertz showed that these waves behaved just like optical light - experiencing reflection and refraction, and producing interference patterns and standing waves. He also was able to measure the speed of the waves, and they travelled at the speed of light, as predicted. Radio waves and visible light were shown to be part of one big family - the electromagnetic spectrum. While appreciating the theoretical

value of this discovery, Hertz didn't think radio waves had any practical use, saying, "It's of no use whatsoever... this is just an experiment that proves Maestro Maxwell was right—we just have these mysterious electromagnetic waves that we cannot see with the naked eye. But they are there." Within the next decade, Guglielmo Marconi, among others, would prove Hertz's statement to be very wrong.

In 1887, Hertz performed an experiment that involved shining ultraviolet light on a piece of electrically charged metal. He found that the metal lost its charge faster when being lit by the UV light than without. While he had no conclusion about what caused this phenomenon, his discovery was then used by J. J. Thomson to eventually realize that the light was providing the necessary energy for the electrons to break free from the metal. That led Einstein to propose that light came in bundles of energy, called photons. What is now known as the photoelectric effect, as well as Einstein's Nobel Prize in Physics, can trace their roots to Hertz's observations and experimentation.

In 1889, Hertz moved to Bonn to assume the role of Director of Physics at the Institute there. He would hold this position until his death. Here, Hertz concentrated his studies in the area of theoretical mechanics, and wrote a book about his findings, titled “The Principles of Mechanics Presented in a New Form.”

In 1892, after suffering from several migraines, Hertz was diagnosed with an infection. For over a year, several operations were performed in an attempt to treat his illness, with no success. On January 1, 1894, Heinrich Hertz died at the age of 36.

In 1930, the International Electrotechnical Commission officially changed the name of the unit for frequency from “cycles per second” to “Hertz” (Hz) in honor of Heinrich’s contributions to the field.

Despite being Lutheran, because of his Jewish ancestry, when the Nazis came to power, they removed the portrait of Hertz from the Hamburg City Hall and tried to undermine his

reputation. After World War II, the portrait was returned back to where it belonged.

For such a short life, Heinrich Hertz leaves an amazing legacy. Proving that all electromagnetic waves are a form of light certainly has impacted the astronomical world. The recently launched JWST will be taking advantage of the infrared part of that very spectrum. As Hertz, himself, said, “We perceive electricity in a thousand places where we had no proof of its existence before. In every flame, in every luminous particle, we see an electric process. Even if a body is not luminous, provided it radiates heat, it is a center of electric disturbances. Thus the domain of electricity extends over the whole of nature.”

References:

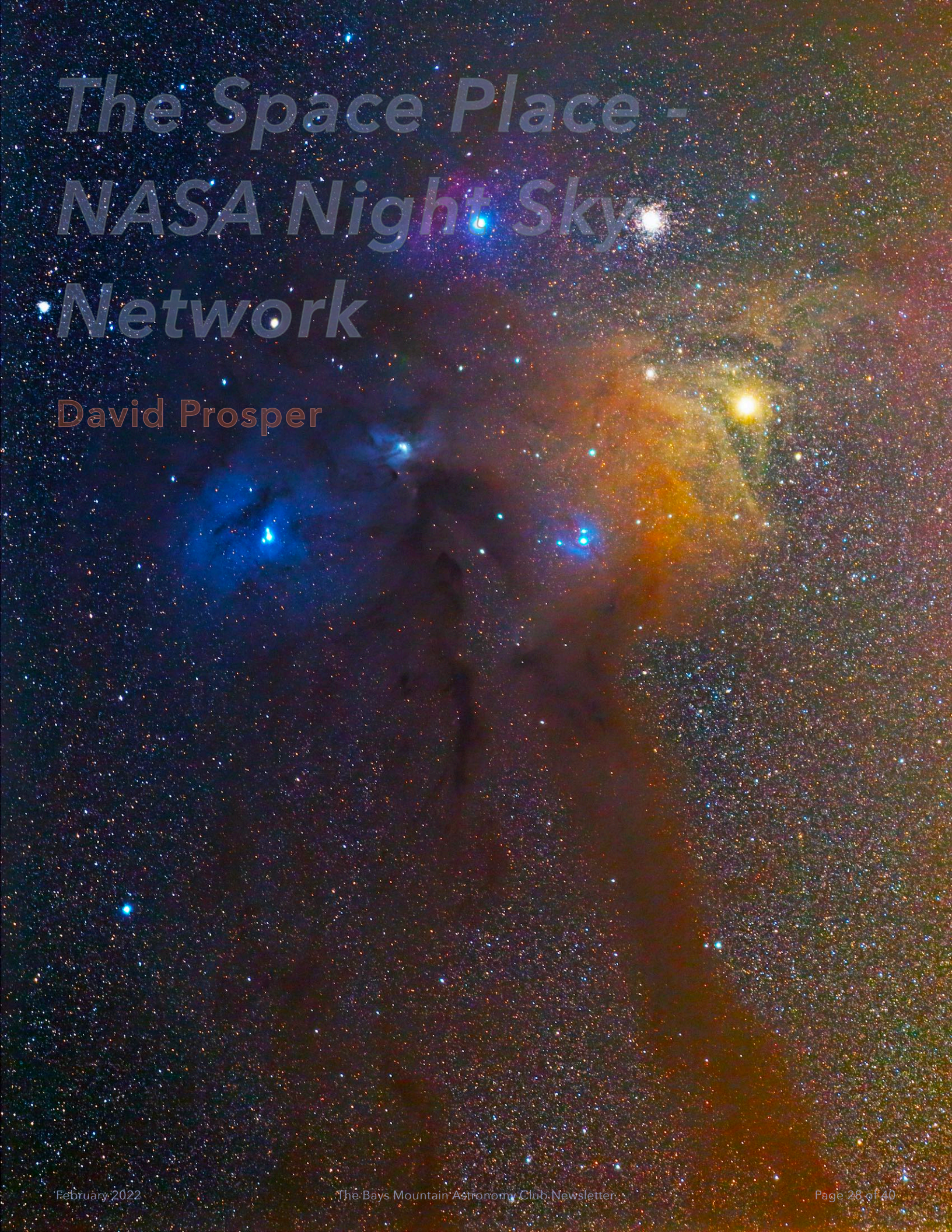
Heinrich Hertz - Wikipedia

Heinrich Hertz and electromagnetic radiation by Steven A. Edwards, Ph.D.; 2012

"Heinrich Hertz." Famous Scientists. famousscientists.org. 23 Nov. 2015. Web. 1/9/2022

The Space Place - NASA Night Sky Network

David Prosper



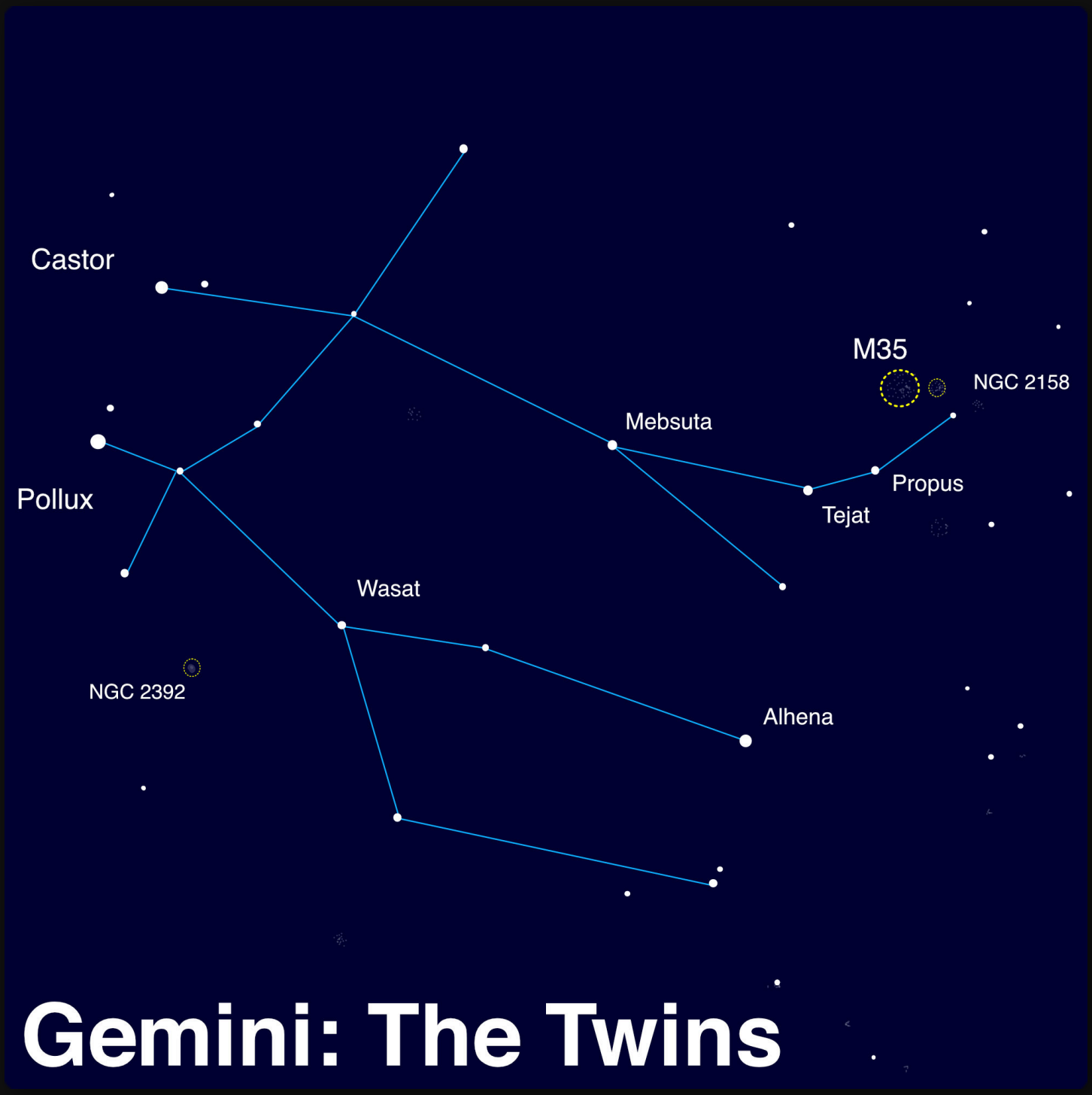
Hang Out with the Twins of Gemini

The night skies of February are filled with beautiful star patterns, and so this month we take a closer look at another famous constellation, now rising high in the east after sunset: Gemini, the Twins!

If you're observing Orion, as discussed in last month's article, then Gemini is easy to find: just look above Orion's "head" to find Gemini's "feet." Or, make a line from brilliant blue-white Rigel in the foot of Orion, through its distinct "Belt," and then on through orange Betelgeuse. Keep going and you will end up in between the bright stars Castor and Pollux, the "heads" of the Gemini Twins. While not actually related – these stars aren't bound to each other, and are almost a magnitude apart in brightness – they do pair up nicely when compared to their surrounding stars. Take note: more than one stargazer has confused Gemini with its next-door neighbor constellation, Auriga. The stars of Auriga rise before Gemini's, and its brightest star, Capella, doesn't pair up as strikingly with its

second most brilliant star as Castor and Pollux do. Star-hop to Gemini from Orion using the trick above if you aren't sure which constellation you're looking at.

Pollux is the brighter of Gemini's two "head" stars - imagine it has the head of the "left twin" - and located about 34 light-years away from our Solar System. Pollux even possesses a planet, Pollux b, over twice the mass of Jupiter. Castor - the head of the "right twin" - by contrast, lies about 51 light-years distant and is slightly dimmer. While no planets have been detected, there is still plenty of company as Castor is actually a six-star system! There are several great deep-sky objects to observe as well. You may be able to spot one with your unaided eyes, if you have dark skies and sharp eyes: M35, a large open cluster near the "right foot" of Gemini, about 3,870 light-years away. It's almost the size of a full Moon in our skies! Optical aid like binoculars or a telescope reveals the cluster's brilliant member stars. Once you spot M35, look around to see if you can spot another open cluster, NGC 2158, much smaller and more distant than M35 at 9,000 light-years away. Another



Castor and Pollux are Gemini's most prominent stars, and often referred to as the "heads" of the eponymous twins from Greek myth. In Chinese astronomy, these stars make up two separate patterns: the Vermillion Bird of the South and the White Tiger of the North. What do you see? The Night Sky Network's "Legends in the Sky" activity includes ***downloadable*** *"Create Your Own Constellation" handouts so you can draw your own star stories.*
Image created with assistance from Stellarium.

notable object is NGC 2392, a planetary nebula created from the remains of a dying star, located about 6,500 light-years distant. You'll want to use a telescope to find this intriguing faint fuzzy, located near the "left hip" star Wasat.

Gemini's stars are referenced quite often in cultures around the world, and even in the history of space exploration. NASA's famed Gemini program took its name from these stars, as do the appropriately named twin Gemini North and South Observatories in Hawaii and Chile. You can discover more about Gemini's namesakes along with the latest observations of its stars and related celestial objects at **NASA**.

Montage of Gemini North, located on Mauna Kea in Hawaii, and Gemini South, located on Cerro Pachón in Chile. These "twin" telescopes work together as the Gemini Observatory to observe the entire sky.
Image Credit: ***NOIRLab Source***

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit **nightsky** to find local clubs, events, and more!

BMAC Calendar & More

Calendar:

MAC Meetings:

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

SunWatch:

- **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.

StarWatch:

•Cancelled until further notice.

- March 5 & 12, 2022 - 7p
- March 19 & 26, 2022 - 8p
- April 2, 9, 16, 23 & 30, 2022 - 8:30p
- October 1 & 8, 2022 - 7:30p
- October 15, 22, 29 & November 5, 2022 - 7p
- November 12, 19 & 26, 2022 - 6p
  - View the night sky with large telescopes at the observatories. If poor weather, an alternate live tour of the night sky will be held in the planetarium theater.; Free.
  - You must have completed the Park Volunteer Program in order to help with the public program. If you have, and have been trained, please show up at least 30 minutes prior to the official start time.

Special Events:

- All special events are cancelled until further notice.
- **Astronomy Day - May 7, 2022 - 1p-4p; 8:30p-9:30p**
  - Come help share the fun of astronomy with the public. There will be tables with different themed topics plus solar and night viewing.
- **Annual Club Picnic - July 2022 - Day TBD - 6p?**
  - Site location will be sent directly to full BMAC members. BMACers and their families are welcome to enjoy an evening of astronomy-themed games and activities along with a potluck dinner and observing.
  - Please bring a dish to share and bring your own chair.
- **StarFest 2022 - November 4, 5 & 6, 2022**
  - Our 37th annual astronomy convention / star gathering for the Southeast United States. Three days of astronomy fun, 5 meals, 4 keynote speakers, unique T-shirt, and more!
  - Pre-registration by Oct. 14, 2022 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."
  - MeadowView Marriott special hotel rate.
  - StarFest Link

Regular Contributors:

William Troxel

Robin Byrne

Greg Penner

Adam Thanz

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

Robin Byrne has been writing the science history column since 1992 and was chair in 1997. She is an Associate Professor of Astronomy & Physics at Northeast State Community College (NSCC).

Greg Penner is a semi-retired architect living in the Tri-Cities area since 2018. He has enjoyed astronomy since childhood when he received a “department store telescope” and viewed Saturn for the first time. He has been a member since 2018.

Adam Thanz has been the BMAC Newsletter Editor for all but a small number of issues since 1992. He is the Planetarium Director at Bays Mountain Park and an astronomy adjunct instructor at NSCC since 2000.

Connection:

Bays Mountain Astronomy Club:

- 853 Bays Mountain Park Road; Kingsport, TN 37650
- (423) 229-9447 - **Park Site** - **Club Site**
- Newsletter edited by **Adam Thanz**

Dues:

- Dues are supplemented by the Bays Mountain Park Association and volunteerism by the club. As such, our dues are kept at an extremely low cost.
- $16 / person / year
- $6 / each additional family member
- Note: if you are a Park Association member (which incurs a separate, additional fee), then a 50% reduction in BMAC dues are applied.
- Dues can be paid in many ways. For renewals, you will be sent an e-mail with an invoice and a direct link to pay online. You can also pay by mail, over the phone or in person at the gift shop.

Chapter Background Image Credits:

- **Cover image of Southern Milky Way by Adam Thanz.**
  - *Sony A7ii with Zeiss Batis 2.8/18 lens, f/2.8, 8 sec., ISO 6,400, August 9, 2020.*
- **Table of Contents image of Comet NEOWISE (C/2020 F3) by Adam Thanz**
  - *Sony A7ii with Sony FE 2.8/90 Macro G OSS lens, f/2.8, 8 sec., ISO 4,000, July 15, 2020.*
- **Cosmic Reflections image of the Summer Triangle area of the Milky Way by William Troxel.**
  - *Image captured July 23, 2016.*
- **BMAC Notes painting of the Moon with moon glow by Christa Cartwright.**
  - *Painting based on a photograph of the Moon Christa captured July 2020.*
- **Stellar Observations image of Crescent Nebula by David Reagan.**
  - *This image was taken with a 140mm refractor in his suburban backyard using an AstroPhysics 900 mount, 8.7 hours of 5 minute Ha and OIII subexposures, combined in AstroPixelProcessor as an HOO image and processed in Lightroom and Photoshop. Image captured in 2022.*
- **The Queen Speaks image of a solar halo by Robin Byrne.**
  - *iPhone 7, June 8, 2020.*
- **The Space Place - NASA Night Sky Network image of the Rho Ophiuchi cloud complex by Brandon Stroupe.**
  - *Canon 6D with Canon 2.8/70-200mm lens, f/2.8 @200mm, 20 x 120 sec. exposures, ISO 1,000, stacked in Deepsky Stacker, processed in Adobe Photoshop CC, Skywatcher Star Adventure mount, September 19, 2015.*
- **BMAC Calendar & More image of the Moon by Greg Penner.**
  - *iPhone shooting through a 9mm eyepiece and 12.5" Truss Tube Dobsonian @212x.*
- **All background images used with permission by their authors.**