The Bays Mountain Astronomy Club Newsletter

May 2025

Kingsport, TN

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Cosmic Reflections

Greg Penner - BMAC Chair

reetings BMACers!

May is here, and that means some special club activities are coming up! First is our annual Student Presentations at the May club meeting. This year we have two student presentations and one presentation about the history of a local observatory. Each presentation will be about 20 minutes, and we'll have time for some Q&A afterwards. So come to the meeting prepared to engage with these students and encourage them in their further studies. The presentations are:

From North Greene County High School

Michael Fox -" Photosynthetic Phenomenon: How Variations of Light Affect Brassica Oleracea, Brassicaceae, and Raphanus Sativa Micro-greens"

From King University

Christian Jones - “Exoplanet Transit Photometry with a 61mm Telescope”

Tom Rutherford – “History of the King University Observatory”

The next club activity in May is the annual Astronomy Day on May 17th. Once again, this event will be held in conjunction with “Kids at Bays Day” at the park. Tables will be set up throughout the park to teach about nature and the environment. Our club will have tables set up at the pavilion. Club members are encouraged to bring displays/demonstrations related to any aspect of astronomy, such as telescopes/optics, astronomical concepts, space exploration, etc. The possibilities are endless! Do your best to gear your displays/demonstrations to kids. The event will be from noon to 3pm. If you are planning to bring a display, please get to the park at 10:30am to begin the setup process. Remember that you will be carrying whatever you

bring from the parking lot down to the pavilion, so give yourself plenty of time and bring a cart or wagon if needed. Last year we had an HDTV set up with scrolling images of club members' photos. We will do that again this year, so please email images to Adam {AdamThanz@Kingsporttn.gov}. These don't have to be "professional quality" images, just your best efforts which will likely be better than the general public.

Image suggestions from Adam:

• Images can be photographs or art in any medium. Images can be a picture of a sculpture, etc. It can be simple or complex. It can be a sunset, a deep sky object, your impression of a black hole, you by your telescope, ...

• The TV will be 1080x1920 pixels set up in horizontal format. If your image is vertical in format, that is OK. Just understand that it will not look as large.

• You can send more than one! A few would be great. Ten may be too much from one person, though. :)

• E-mail me your images. Please include a title/short description of what each image is.

• Ex.: Your Name - Whirlpool Galaxy; Your Name - Sunset at Myrtle Beach

• The image can be any format, like jpg, tiff, etc. and hopefully at least 1080 tall or 1920 wide. If it is smaller, that's OK too.

• I must have all images by May 13 or before. Before is much better. I have a template and will add your name and description to the image and set up the slide show. It will loop during the whole event at the Pavilion.

Looking ahead to our June meeting, we are planning to stream a video in the Planetarium theater with the topic, “Getting Ready for the Next Galactic Supernova”. A couple of years ago, there was some excitement about the possibility of Betelgeuse going supernova. That didn’t happen, but it raised awareness of the possibility. This video will describe what happens when a star goes supernova and why it is important for the

astronomical community to be prepared. Even amateurs like you and me can help with the preparations by being part of an early warning system. So come to the June meeting to hear more about this exciting topic!

Looking forward to seeing everyone in May,

Clear Skies!

BMAC Notes

Moon and Pleiades

n the night of April 1st, M45 and the Moon were together up in the night sky for just a night. M45, also known as the Pleiades or the Seven Sisters or even, the Subaru logo is a bright open star cluster located in the constellation Taurus. As we move into our spring season, make sure to go out and view the Pleiades before it sets!

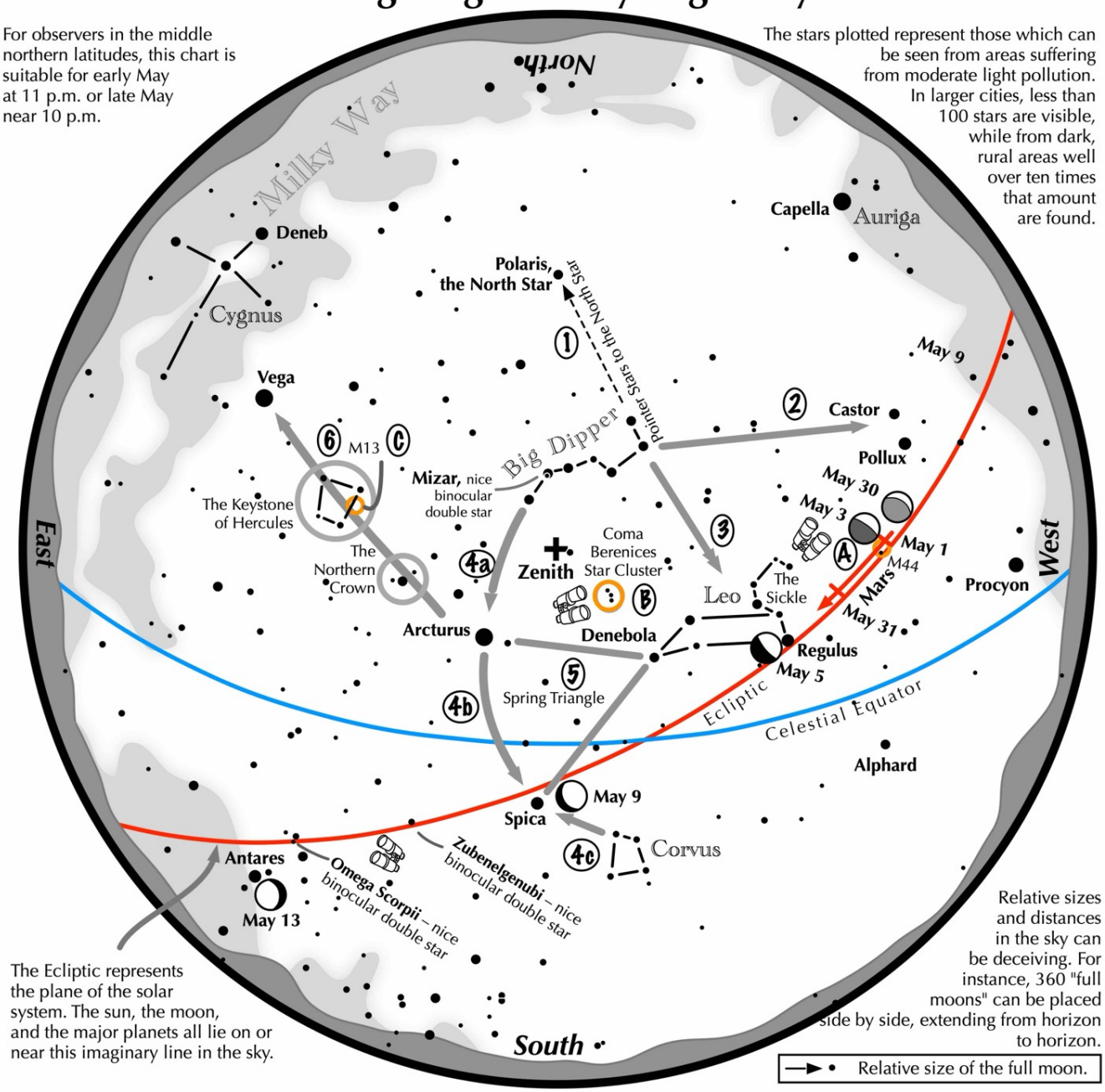
The Moon and the Pleiades on April 1st. Taken by BMACer Robin Byrne with handheld iPhone 15 Pro during dusk.

A close up of the Moon and the Pleiades on April 1st. Taken by BMACer Robin Byrne with handheld iPhone 15 Pro during dusk.

Sky News from the Astronomical League

he Astronomical League has a plethora of educational content to help you learn and enjoy the night sky more. The following inserts are just a tiny bit of what they provide.

Navigating the May Night Sky



Navigating the May night sky: Simply start with what you know or with what you can easily find.

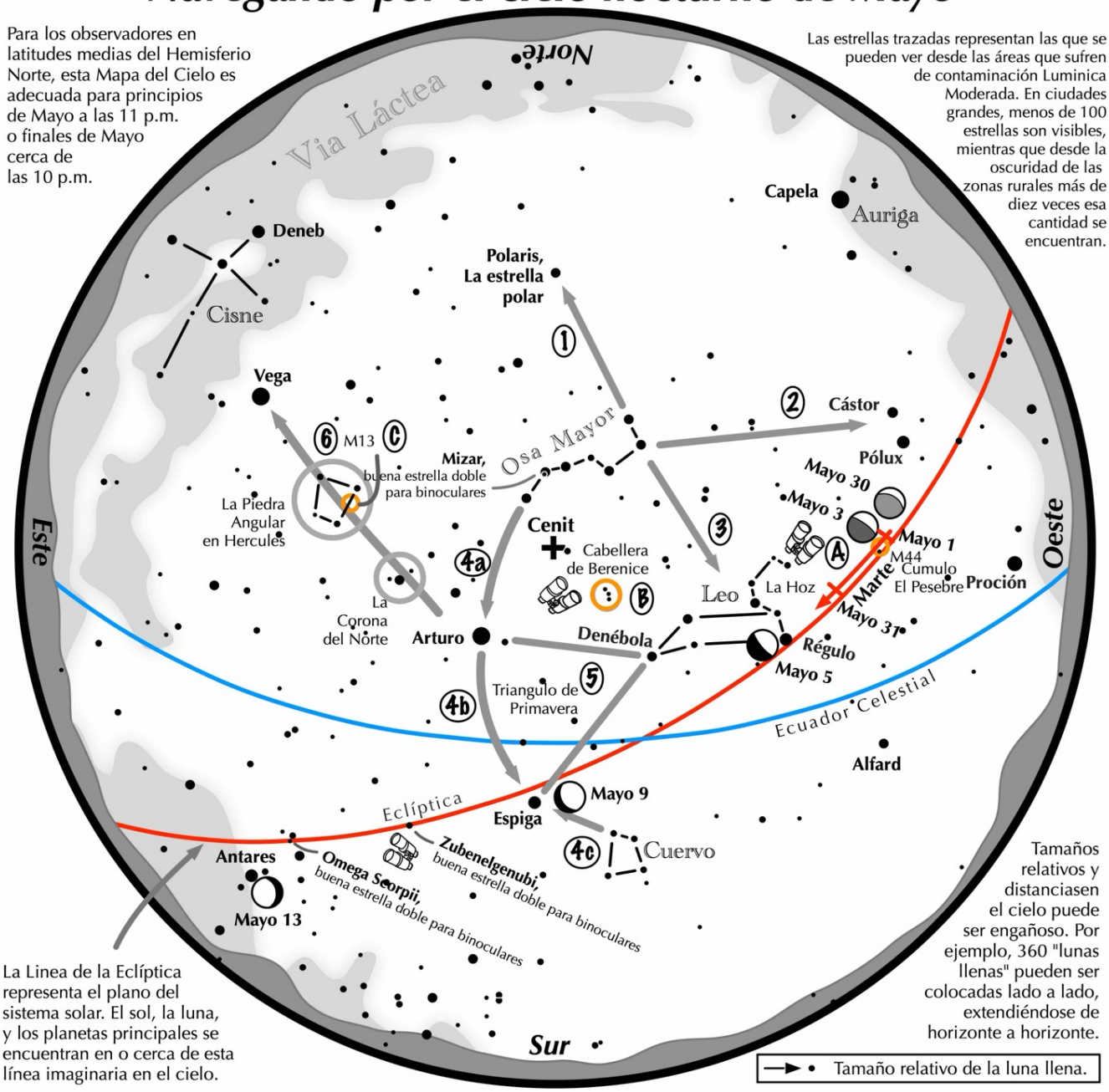
1. Extend a line northward from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
2. Through the two diagonal stars of the Dipper's bowl, draw a line pointing to the twin stars of Castor and Pollux in Gemini.
3. Directly below the Dipper's bowl reclines the constellation Leo with its primary star, Regulus.
4. Follow the arc of the Dipper's handle. It first intersects Arcturus, then continues to Spica. Confirm Spica by noting that two moderately bright stars just to its southwest form a straight line with it.
5. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
6. Draw a line from Arcturus to Vega. One-third of the way sits "The Northern Crown." Two-thirds of the way hides the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.

Binocular Highlights
A: M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux. **B:** Look near the zenith for the loose star cluster of Coma Berenices. **C:** M13, a round glow from a cluster of over 500,000 stars.

Navegando por el cielo nocturno de Mayo

Para los observadores en latitudes medias del Hemisferio Norte, esta Mapa del Cielo es adecuada para principios de Mayo a las 11 p.m. o finales de Mayo cerca de las 10 p.m.

Las estrellas trazadas representan las que se pueden ver desde las áreas que sufren de contaminación Luminica Moderada. En ciudades grandes, menos de 100 estrellas son visibles, mientras que desde la oscuridad de las zonas rurales más de diez veces esa cantidad se encuentran.



La Linea de la Eclíptica representa el plano del sistema solar. El sol, la luna, y los planetas principales se encuentran en o cerca de esta línea imaginaria en el cielo.

Tamaños relativos y distanciasen el cielo puede ser engañoso. Por ejemplo, 360 "lunas llenas" pueden ser colocadas lado a lado, extendiéndose de horizonte a horizonte.

Tamaño relativo de la luna llena.

Navegando por el cielo nocturno: simplemente comience con lo que sabe o con lo que puede encontrar fácilmente.

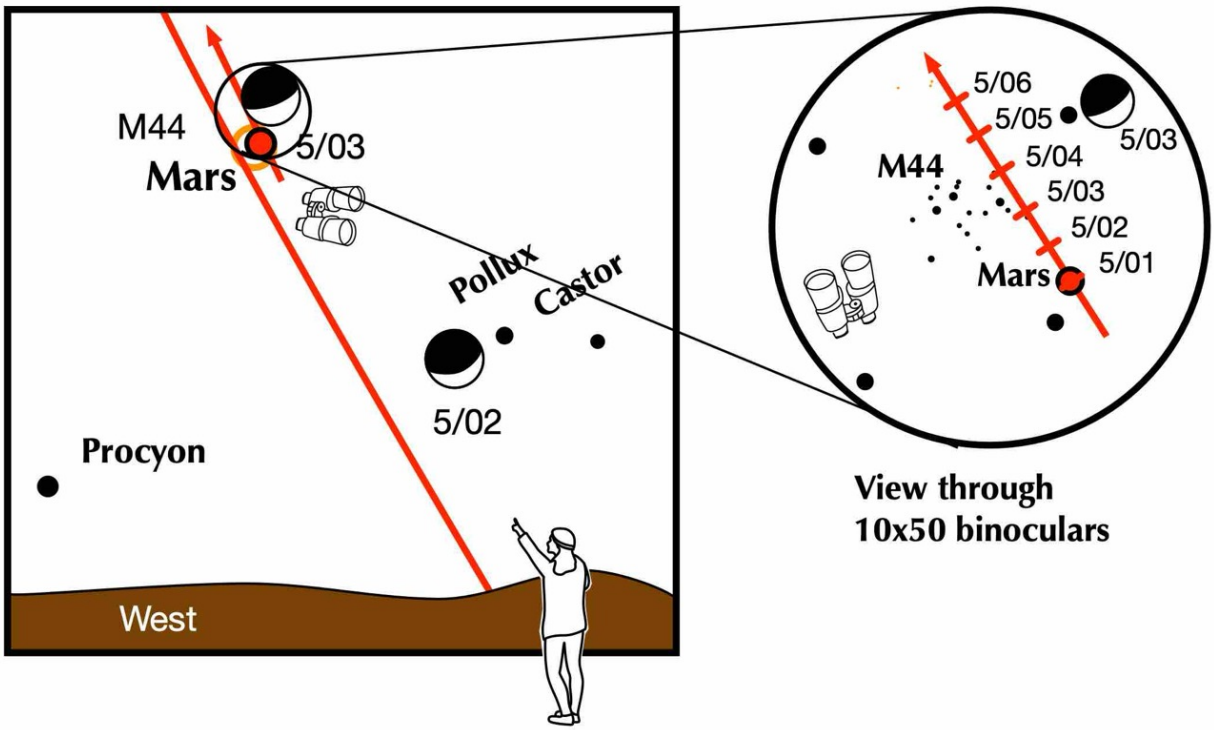
1. Haz una línea hacia el norte desde las dos estrellas en la punta de la Osa Mayor. Pasa por Polaris, la estrella polar.
2. A través de las dos estrellas diagonales de la Osa Mayor, dibuja una línea que apunta a las estrellas gemelas de Cástor y Pólux en Géminis.
3. Directamente debajo del tazón de la Osa Mayor se encuentra Leo con su estrella principal, Régulo.
4. Siga el arco del mango del tazón de la Osa Mayor. Primero cruza Arturo, luego continúa hacia Espiga, luego Cuervo.
5. Arturo, Espiga y Denébola forman el triángulo de primavera, un gran triángulo equilátero.
6. Dibuja una línea desde Arturo a Vega. Un tercio del camino se encuentra "La Corona del Norte". Dos tercios de esa distancia llevan a la "piedra angular de Hércules." Se necesita un cielo oscuro para ver estas dos configuraciones estelares tenues.

Puntos destacados con binoculares

A: M44 (Cumulo El Pesebre), un cúmulo de estrellas apenas perceptible a simple vista, se encuentra al sureste de Pólux. **B:** Mira alto en el este para ver el cúmulo de estrellas perdidas de Cabellera de Berenice. **C:** M13, un brillo redondo de un cumulo de más de 500,000 estrellas.

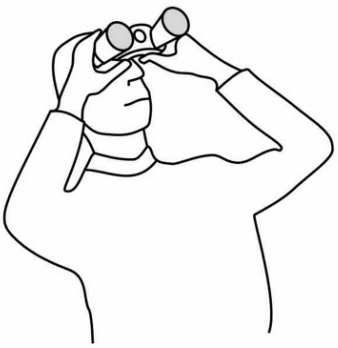
Traducción al español por Dr. Salvador Aguirre

If you can see only one celestial event this month, see this one.



Beginning on May 1, look to the west-northwest 90 minutes after sunset.

- The twin stars of Gemini, Castor and Pollux, will be found forming a horizontal bar low above the horizon.
- On the following evening, the crescent moon moves near Pollux, almost forming a straight line with it and Castor.



- Red Mars slides toward M44, aka the Beehive Star cluster. Use binoculars to find Mars inching closer to the many stellar bees.
- On May 3, the thick crescent moon joins Mars sitting to the upper left of the red planet and above the bees.
- Over the next few evenings, the Red Planet moves past M44, leaving it on May 5.

Mare Orientale

... this most astounding impact basin is only partially seen

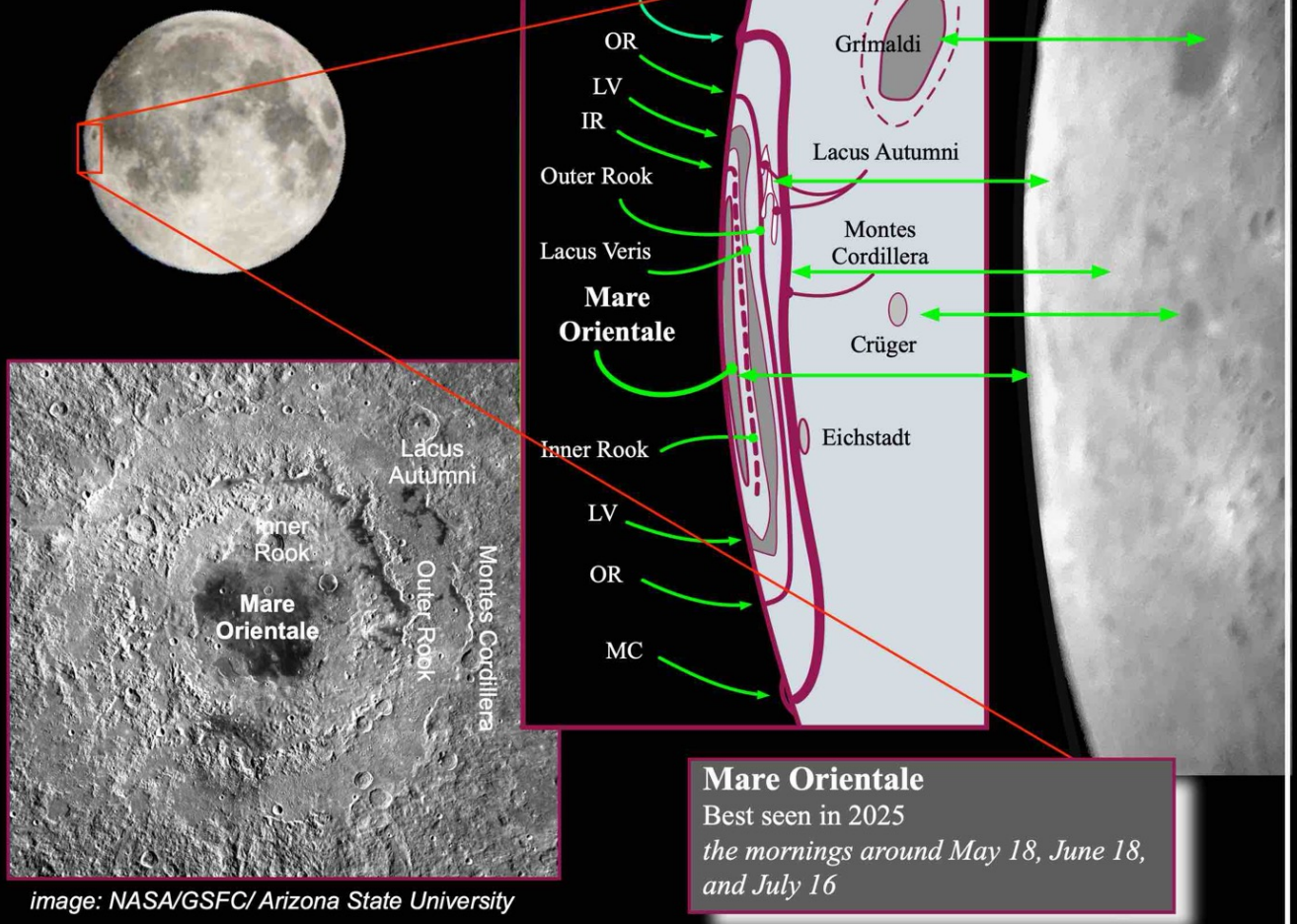


image: NASA/GSFC/ Arizona State University

Mare Orientale
Best seen in 2025
the mornings around May 18, June 18, and July 16

A good viewing of Mare Orientale requires that the Moon be at or near maximum western libration. This happens on three, four, or five days in some, but not all months. Of course, it should not hide in the lunar night, which immediately eliminates fifteen days each month. The three mornings leading up to new Moon are also poor times because the waning thin crescent lies too close to the horizon to give a sharp enough image for a clear, meaningful view.

As a result, opportunities for studying Mare Orientale are infrequent, occurring on fewer than twenty days each year. Generally, four months running present three, four, or five good opportunities each, followed by a string of nine or ten months that present no suitable occasions for viewing it. And then there is the weather!

Identifying Orientale's fascinating features demands steady seeing and moderate magnification.

2504

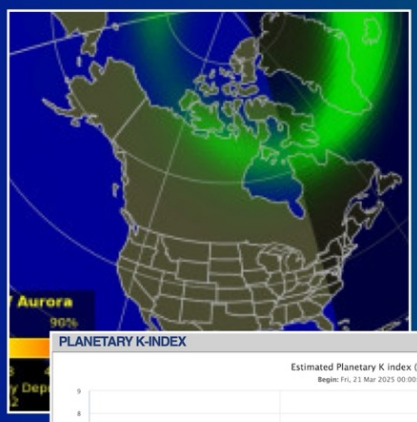
Space Weather Observing Program

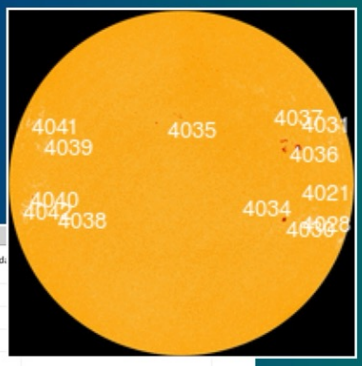
The solar wind greatly affects Earth's magnetic field and those effects can be measured using an inexpensive home-made magnetometer.

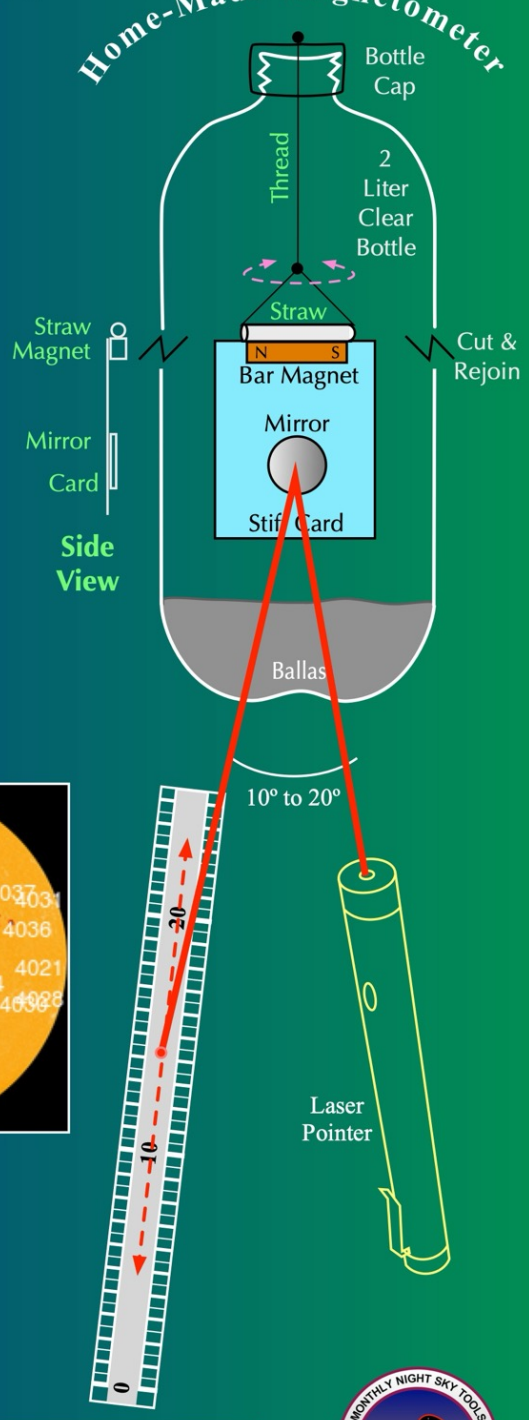
Space Weather Observing Program

- Construct and use your own magnetometer.
- Do a minimum of 100 observations on at least 100 different days.
- Note the location on the meter (or yard) stick where the reflected laser spot is located.
- The 2 liter magnetometer, the laser, and the measuring stick must be located where they will not be disturbed during the program.

- Compare your data with NASA's Planetary K-Index.
- Note sunspot activity as found on Spaceweather.com.
- Note auroral activity as found on Spaceweather.com.







For complete details on this fascinating program:
https://www.astroleague.org/space-weather-observing-program/

2503

Astronomy Day

Saturday, May 17, 2025

MACers, if you are wanting to help share your passion about astronomy, then this is your chance. We'll have tables set up at the Pavilion for demos, displays, activities, etc. The fun of what is set up is from your creativity in what you bring. The public will attend noon to 3p. If you have items to set up, plan on arriving by 11a or even 10:30a. You cannot drive to the Pavilion, so you'll need a cart to transport your items.

The BMAC is part of the Bays Mountain Park Association, so we'll be joining them in their annual Kids to Bays Event. They will have tables set up throughout the park to teach about nature and the environment. All geared to kids and families.

Ideas could be to display/demonstrate your optics, help illustrate an astronomical concept to make it understandable to

a young one, an activity, etc. The possibilities are stellar and astronomical :).

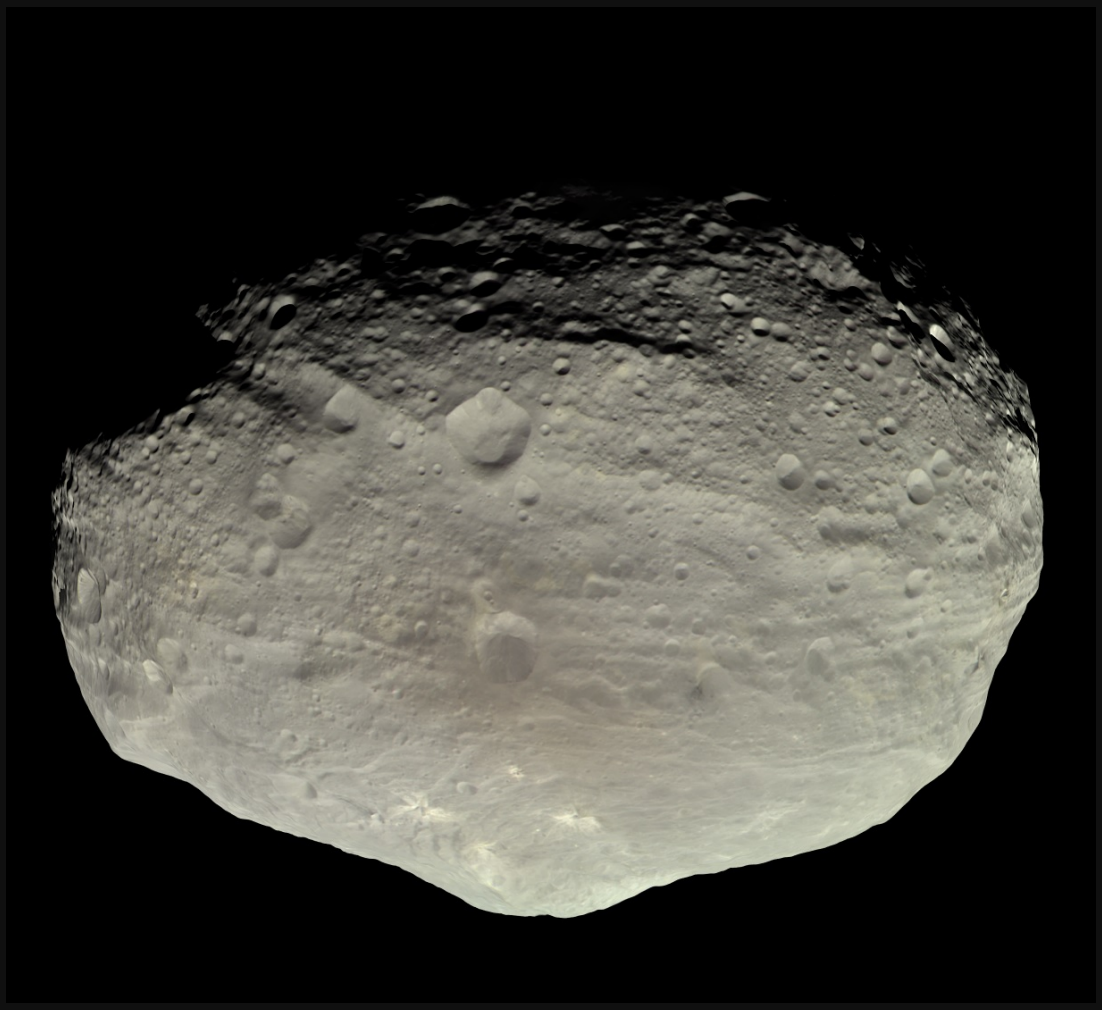
Stellar Observations

Greg Penner

Visit Vesta!

On May 2nd, the asteroid Vesta will reach opposition and also perigee. The second largest asteroid in the solar system, Vesta has a mean diameter of 326 miles and contains 9% of the total mass of all the asteroids. NASA's Dawn spacecraft visited Vesta from July 16th, 2011 until September 5th, 2012 adding much to the body of knowledge about this large, nearly spherical asteroid.

Vesta in May 2025 - image from Stellarium



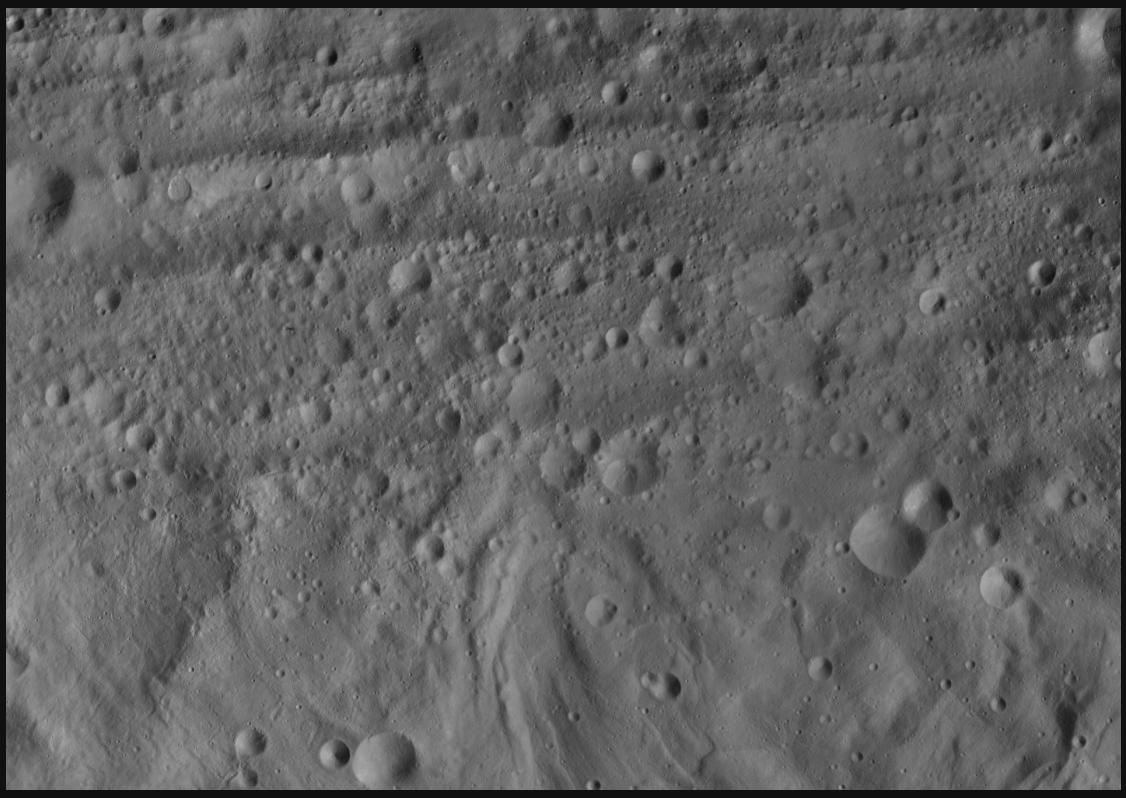
Vesta by Dawn Spacecraft - image from NASA

A unique aspect of Vesta is that it has separated into crust, mantle, and core (a process known as differentiation). One of the main objectives of the Dawn mission was to discover why this occurred. According to the NASA Dawn mission website, “The answer turned out to be that Vesta formed early, within 1 to 2 million years of the birth of the solar system. Short-lived radioactive material that was incorporated into bodies that

formed during this epoch heated them to the point where—in cases like Vesta—the objects melted, allowing the denser materials to sink to the asteroid's core and the lower density materials to rise." Some other discoveries made by the Dawn mission were:

About 300 dark asteroids with diameters between 1 to 10km hit Vesta in the last 3.5 billion years, which would have been enough to wrap Vesta in a blanket of material 3 to 7 feet thick.

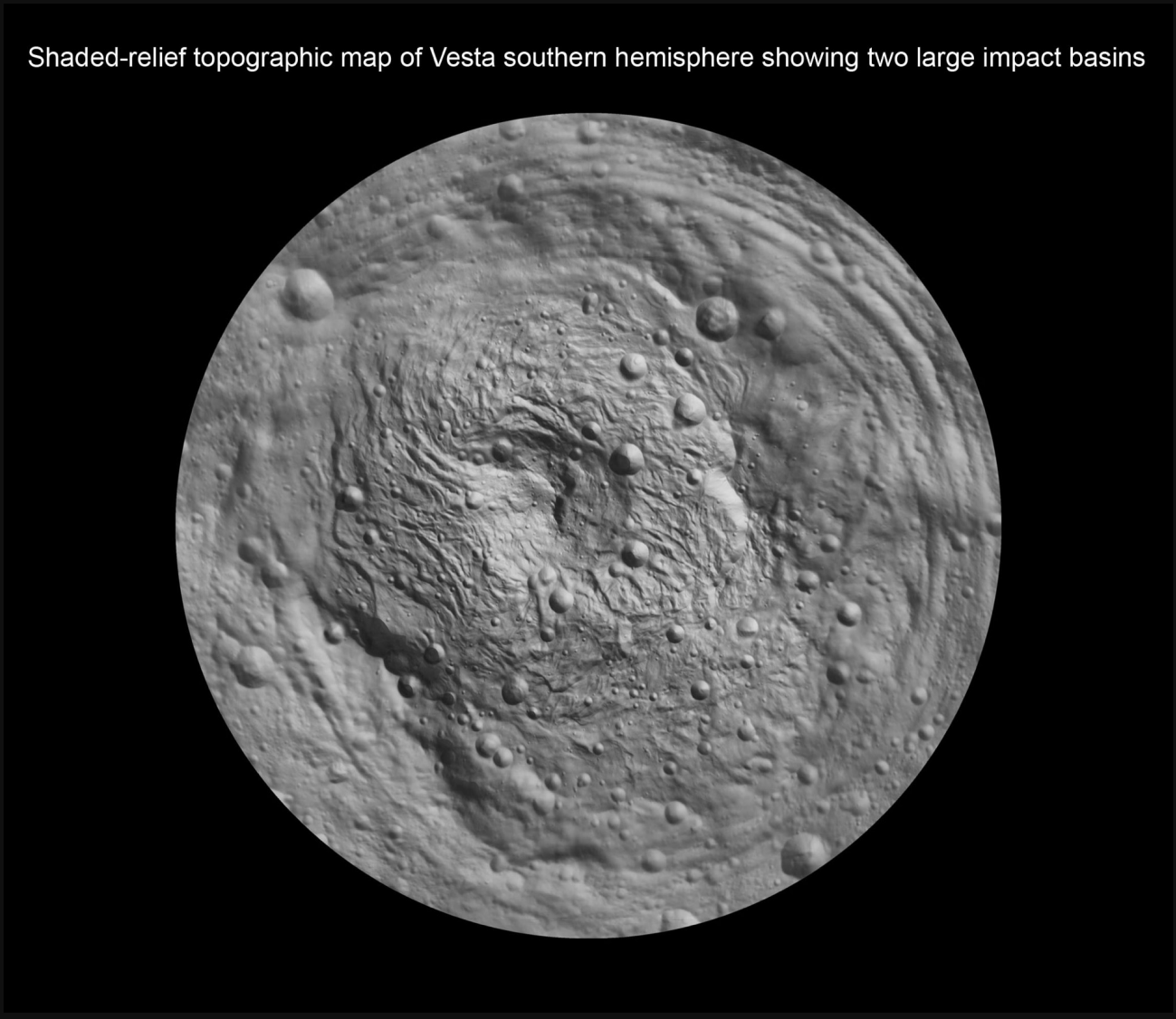
An extensive system of troughs encircles Vesta's equatorial region. The largest, named Divalia Fossa, is bigger than the Grand Canyon.



Section of Divalia Fossa on Vesta - image by NASA Dawn Spacecraft

Vesta appears to be the source of many groups of meteorites that have been found on Earth. These help scientists understand the “Lunar Cataclysm” or “Late Heavy Bombardment” hypotheses in which re-positioning of the gas giant planets destabilized the asteroid belt and caused a solar system-wide bombardment.

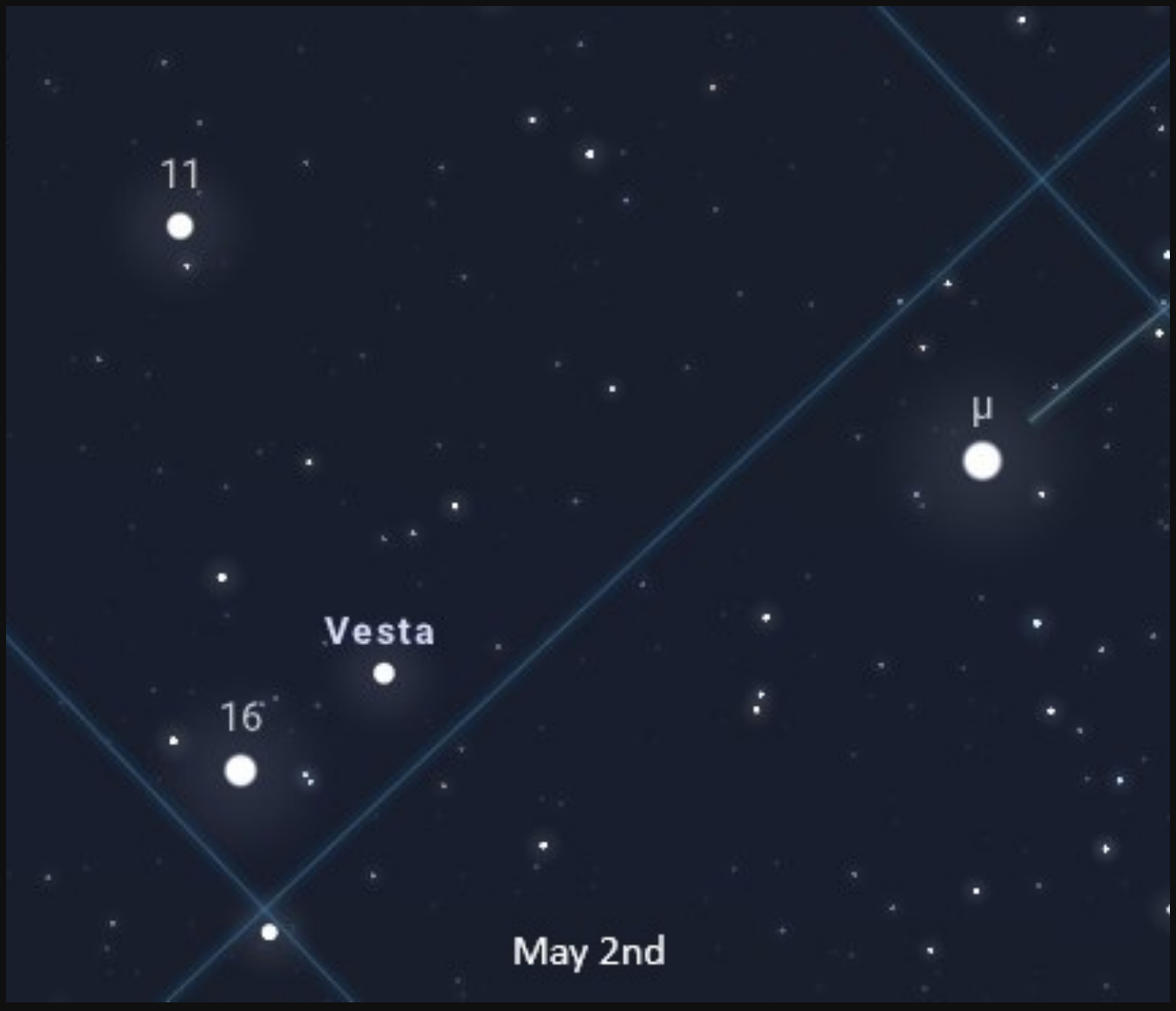
Vesta is believed to have lost about one percent of its mass less than a billion years ago in a massive collision responsible for the Rheasilvia crater, which is about 310 miles wide (95 percent of the asteroid's diameter). The Vesta family of asteroids is likely debris from this collision.



Rheasilvia Impact Basin on Vesta - image by NASA Dawn Spacecraft

With Vesta being at opposition and perigee it is at its closest and brightest, perfectly placed for observations. During the first week of May, Vesta will be around magnitude 5.6, making it potentially visible to the naked eye from a dark sky location. From May 1st through May 10th, Vesta will be conveniently traversing through a triangle of 4th and 5th magnitude stars composed of Mu Virginis, 11 Librae, and 16 Librae on the border of the constellations Virgo and Libra (see charts). Asteroids like Vesta are so far away that even through a telescope they still look like a point source, like a star. Identifying Vesta can be done by watching its movement against the background stars over multiple nights. Watching Vesta on multiple nights will be a great way to work on your observation and data recording skills. Whether you are using binoculars or a telescope, you can easily find the triangle of stars in Virgo/Libra and either make a sketch or photograph of that starfield. On successive nights, you can make observations and record the position of Vesta as accurately as possible in relation to the background stars. At magnitude 5.6, Vesta will

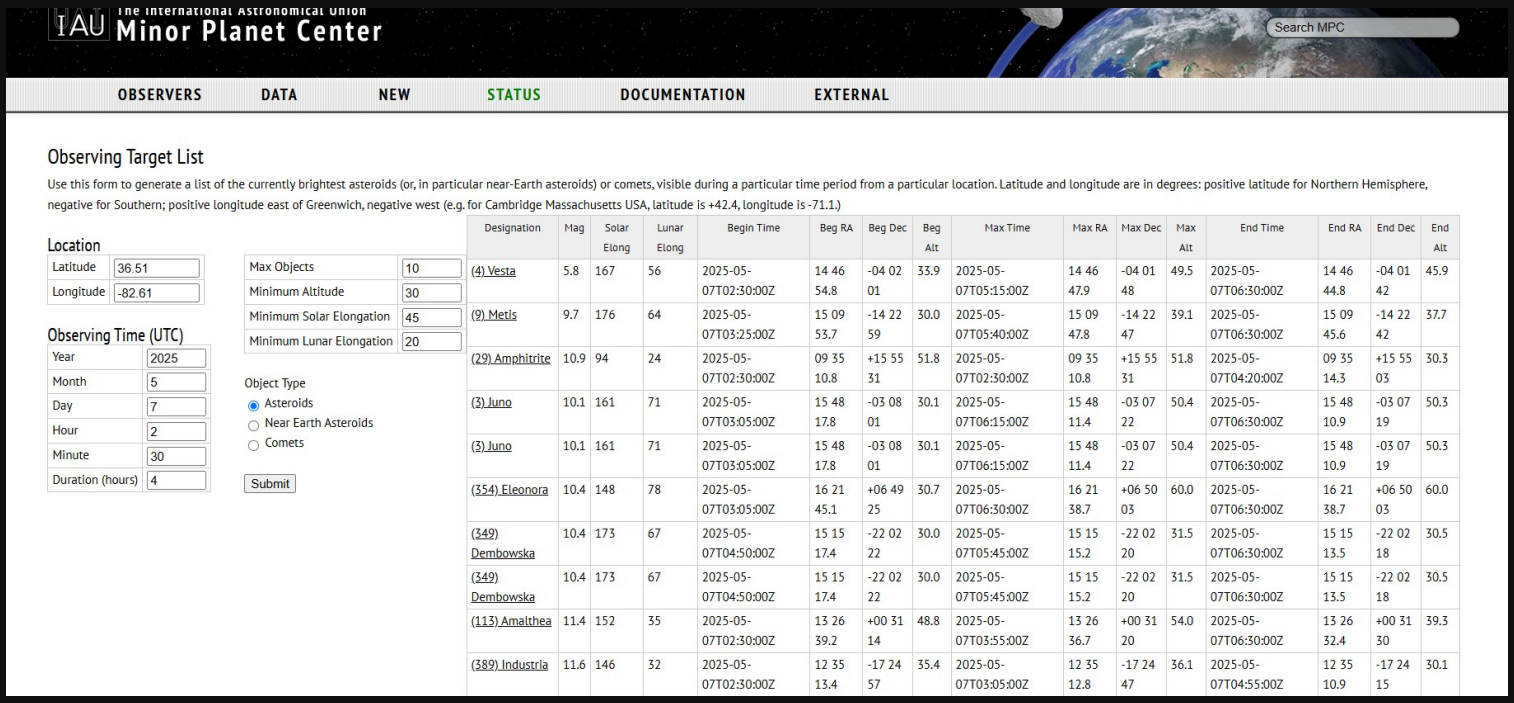
be about ½ magnitude dimmer than 11 Librae but much brighter than any of the field stars within the triangle.



Vesta on May 2nd amidst triangle of stars - image from Stellarium

Vesta on May 10th amidst triangle of stars - image from Stellarium

If you really enjoy the challenge of tracking asteroids, the Astronomical League has an Asteroid Observing Program. A certificate can be earned by observing 25 asteroids and recording your observations according to the program rules. Another source for observing asteroids is the website of the Minor Planet Center, where you can make a Target List based on your observing location and time.



Minor Planet Center Target List Tool

Amongst all the more popular astronomical objects such as nebulae, galaxies, and planets, remember the abundant asteroids that are close by in our celestial neighborhood. Observing and tracking these rocky bodies can be a rewarding experience and help you improve your observation skills!

The Queen Speaks

Robin Byrne

Happy Birthday Nancy Grace Roman

This month, we celebrate the life of a woman known as the “Mother of Hubble,” but who contributed so much more. Nancy Grace Roman was born in Nashville, Tennessee May 16, 1925. Her mother, Georgia, was a music teacher, while her father, Irwin, was a physicist. When she was only 3 months old, Nancy’s family moved to Oklahoma, where her father took a job with an oil company. That was the first of several moves in Nancy’s early life, living in Texas, New Jersey, Michigan, Nevada, and finally settling in Baltimore, Maryland when Nancy was 12 years old.

Dr. Nancy Grace Roman, NASA's first Chief of Astronomy, is shown at NASA's Goddard Space Flight Center in Greenbelt, Maryland, around 1972. Image by NASA and the ESA.

It was at about the same time that Nancy's interest in astronomy solidified, even founding an astronomy club with some of her classmates. It was Nancy's mother who was responsible for this interest, though inadvertently. Nancy's mother loved nature and would take her for walks to share its beauty. While the focus was on plants and animals, she also pointed out some constellations and the occasional aurora display. The plants and animals didn't make nearly as strong an impression as the night

sky. Nancy was determined to pursue astronomy as a career, so in high school, she tried to take courses that would prepare her for a science major. When she asked her high school guidance counselor if she could take a second year of algebra, instead of Latin, the counselor asked, “What kind of lady would take mathematics instead of Latin?” Apparently, the kind who would go on to make a great success for herself.

After finishing high school in only 3 years, 17-year old Nancy enrolled at Swarthmore College, determined to major in astronomy in the face of both the dean of women and the dean of astronomy, both of whom were completely unsupportive of this plan. But Roman persevered, taking astronomy classes while learning observational techniques with two student telescopes that had fallen into disrepair, and which she had made functional. By her sophomore year, Roman was working in the campus observatory, processing photographic plates. In her junior year, Roman got what might have been the first true words of encouragement, and they were from one of her physics

professors, who said, “You know, I usually try to talk women out of going into physics. But I think maybe – you might make it.”

When Roman graduated from Swarthmore in 1946, the dean of astronomy suggested the University of Chicago for her graduate work. Roman was more interested in observational astronomy over theoretical work, and requested from multiple professors the opportunity to work on an observing program. Using the 12-inch telescope at Kenwood Astrophysical Observatory, Roman studied the motion of the stars in the Ursa Major Moving Group, basing her dissertation on the project. Nancy Grace Roman graduated with a PhD in astronomy in 1949.

After graduation, she moved to Wisconsin for the next six years as a research associate and assistant professor at Yerkes Observatory. Here, her research was primarily related to stellar spectroscopy, looking at high-velocity stars. She found that the motions of stars composed only of hydrogen and helium move in our galaxy in a different way than stars that also have heavier

elements. This was early evidence for the two stellar populations we now know exist in the Milky Way.

When it became clear that women had little chance of receiving tenure at a university (only one woman had a tenured astronomy faculty position in the entire country at the time), Roman decided to take a job at the Naval Research Laboratory (NRL). It was at NRL that Roman became involved in the relatively new field of radio astronomy. As one of the few people in the program who had actually studied astronomy, Roman became the go-to person for all things astronomical, including the Vanguard satellite program. While not that interested in rocketry, Roman saw potential for pursuing astronomical observations from space. Roman was invited to speak in Armenia (then part of the Soviet Union) at the dedication of a new observatory there, becoming the first civilian to travel to that country during the Cold War. This trip led to invitations to give public lectures about visiting the USSR, as well as speaking about astronomy.

In 1959, shortly after the formation of the National Aeronautics and Space Administration (NASA), Roman attended a lecture there and was asked if she knew of anyone who would be interested in creating a space astronomy program for NASA. She knew exactly who to suggest - herself! Roman later said, “I knew that taking on this responsibility would mean that I could no longer do research, but the challenge of formulating a program from scratch that I believed would influence astronomy for decades to come was too great to resist.” In February 1959, Nancy Grace Roman officially was named Head of Observational Astronomy, with the title changing to Chief of Astronomy the following year. In addition to being the first person to hold this position, she was also the first woman to hold any executive role at NASA.

Initially, much of her job involved figuring out what her office would actually do. She travelled around the country, visiting astronomy departments to let them know about NASA’s commitment to astronomy, and soliciting ideas about what kinds of programs they should be pursuing. She was effectively

laying the groundwork for space-based astronomical observations. Early on, the decision was made that the data obtained through NASA-run projects would be made available to the entire astronomical community, not the sole property of the researchers initiating the observations. At first, Roman was the sole person responsible for deciding which projects were approved. It wasn't until the 1970s that outside peer review became the standard.

In 1959, Roman published a paper outlining a technique that could be used to detect planets around other stars. The idea was to use a space-based telescope, with a mask covering the bright star, in order to photograph the region around the star. This method was used much later by the Hubble Space Telescope to image Fomalhaut B.

As part of her duties, Roman was in charge of the Orbiting Astronomical Observatories program (OAO). The first successful OAO was launched in 1968, which was the Copernicus Ultraviolet Telescope. Other orbiting telescopes she oversaw

included: the Uhuru X-ray telescope, the Small Astronomy Satellite 2 gamma-ray telescope, and the Small Astronomy Satellite 3 X-ray telescope. Additionally, she spearheaded the development of programs conducting astronomy from high altitude aircraft, including the Kuiper Airborne Observatory. Other orbiting telescopes that were developed later, during her time at NASA, included the Cosmic Background Explorer, the Infrared Astronomy Satellite, and the International Ultraviolet Explorer.

One thing you may have noticed about those instruments is that they were all devoted to wavelengths outside of the visible spectrum. From the start of the OAO, putting a large optical telescope into Earth orbit was a goal, but Roman approached it cautiously, starting with smaller telescopes, while also taking advantage of the space environment to observe at wavelengths not visible through Earth's atmosphere. Once the technology was proven to be successful, as early as 1969, Roman began to champion the idea of a space-based optical telescope. Originally called the Large Space Telescope, this program

became her pet project. For several years, Roman devoted her time to leading planning committees comprised of engineers and astronomers, while also lobbying politicians. Over the next decade, the program took shape, including such milestones as deciding this would be the first major telescope that would use a CCD detector, plus creating a separate entity, the Space Telescope Science Institute (STScI), to manage operations of the observatory. Probably the toughest part of the entire endeavor was convincing congress to fund it. Countless trips to Washington, and endless meetings became Roman's regular routine. When Senator William Proxmire asked her why the average American would want to pay for such an expensive piece of equipment, Roman replied, "For the price of one night at the movies, each American would receive 15 years of exciting discoveries." In actuality, she undersold it - we're now in the 35th year of Hubble's contributions to science.

Nancy Roman retired from NASA in 1979 to take care of her mother. For the first year of her "retirement," she continued working as a consultant to help in establishing the STScI.

Meanwhile, she learned to program in FORTRAN, leading to a consultation job supporting research in geodesy and creating astronomical catalogs - ironically, two areas of research she was involved in at the very start of her career.

Despite moving on from NASA, Roman kept up-to-date on what was happening with the Hubble Space Telescope. She was even in attendance (knitting in the back of the room) when NASA made their announcement for the first repair mission. And her semi-retirement was interrupted when Roman became the head of the Astronomical Data Center at Goddard Space Flight Center from 1995 - 1997, followed by three years teaching science teachers and advanced junior and senior high school students. And even then, she wasn’t done. From 2000 to 2010, Nancy Roman worked for an organization called Reading for the Blind and Dyslexic, recording astronomical textbooks.

In 2017, Nancy Roman was included in the Women of NASA LEGO Set, which she described as being “by far the most fun” of all the honors she had received during her lifetime. On Christmas Day, 2018, at the age of 93, Nancy Grace Roman passed away after a long illness. Part of her estate included a large bequest to the American Association of University Women, an organization she had been active in during most of her career. The money was earmarked to encourage young women to pursue careers in the sciences, especially in engineering and the physical sciences.

In May of 2020, NASA announced one more honor for Nancy Roman. The next major space telescope would be named the Nancy Grace Roman Space Telescope. This infrared telescope, scheduled to launch in 2027, will, among other things, search for extrasolar planets using the very technique Roman had proposed in 1959.

While dubbed the “Mother of Hubble,” clearly Nancy Grace Roman contributed so much more to astronomy and NASA. This woman blazed a trail as an astronomer, an administrator, and as a visionary. As we await the launch of her namesake telescope, we owe it to Nancy Grace Roman to not only remember and honor her, but to also continue to encourage and support all women who pursue careers in the sciences. I believe that legacy would please Nancy Roman most of all.

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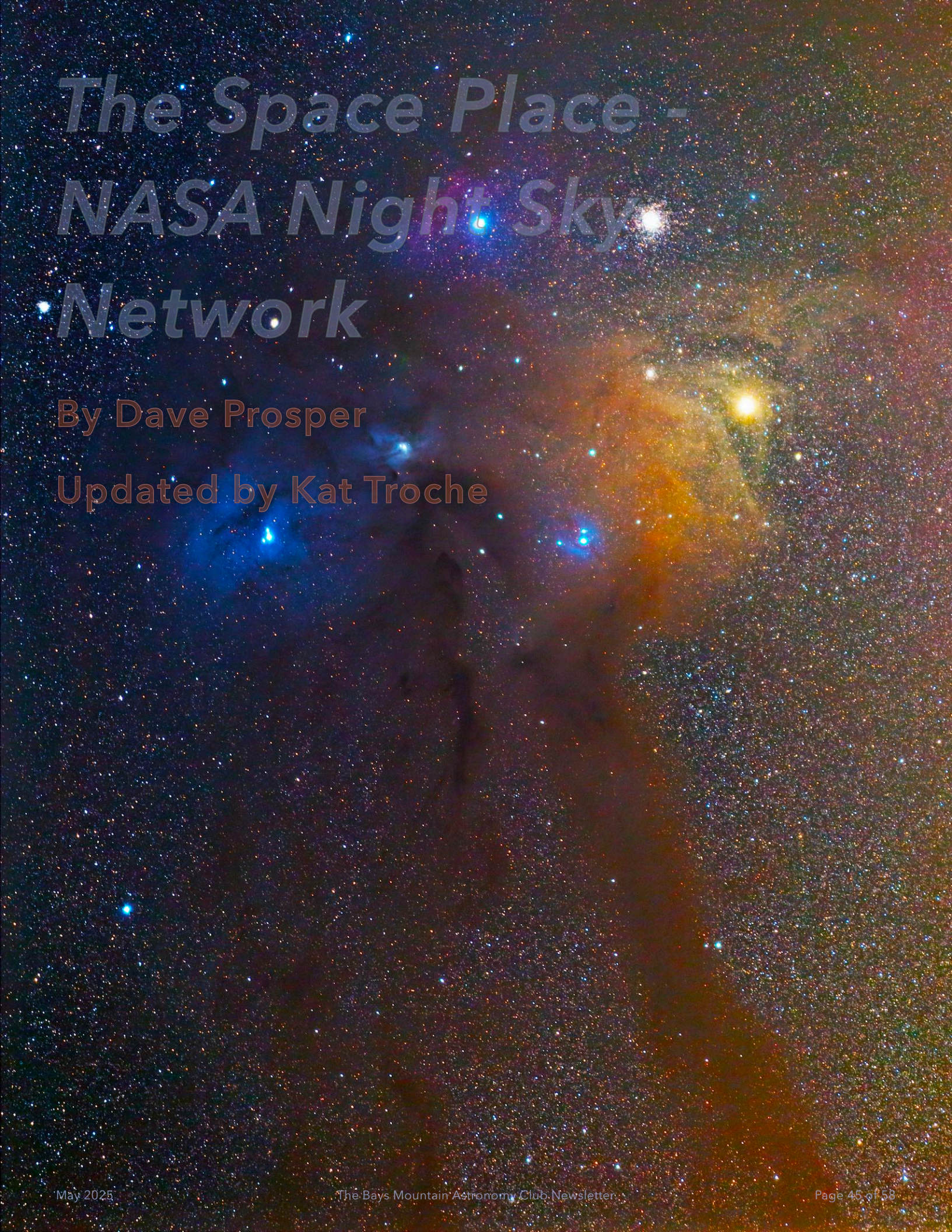
https://science.nasa.gov/people/nancy-roman/

Nancy Grace Roman: The Life and Legacy of a NASA Star - American Association of University Women

https://www.aauw.org/resources/faces-of-aauw/nancy-grace-roman-the-life-and-legacy-of-a-nasa-star/

Image of Nancy Grace Roman:

https://commons.wikimedia.org/wiki/



The Space Place - NASA Night Sky Network

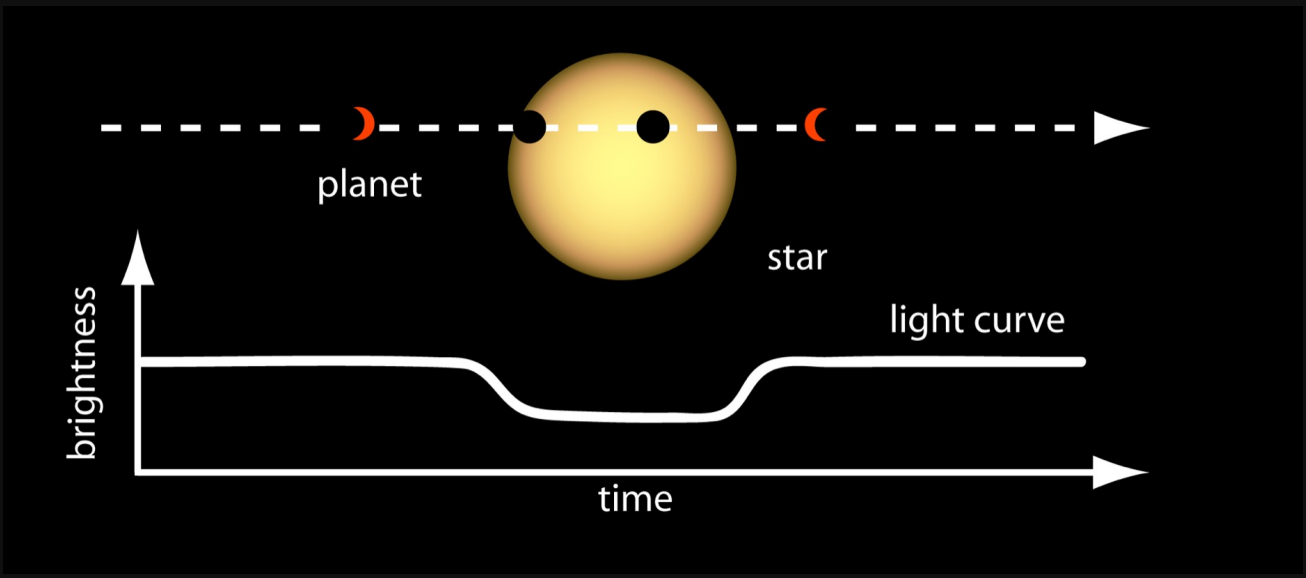
By Dave Prosper

Updated by Kat Troche

How Do We Find Exoplanets?

Astronomers have been trying to discover evidence that worlds exist around stars other than our Sun since the 19th century. By the mid-1990s, technology finally caught up with the desire for discovery and led to the first discovery of a planet orbiting another sun-like star, Pegasi 51b. Why did it take so long to discover these distant worlds, and what techniques do astronomers use to find them?

The Transit Method

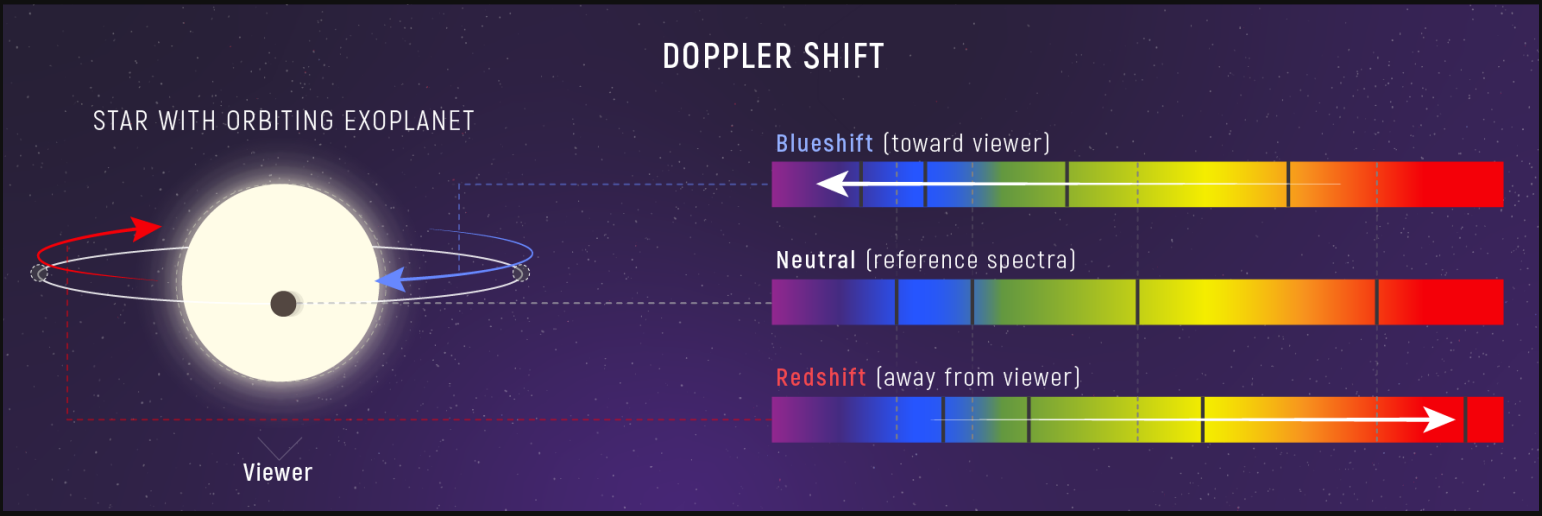


A planet passing in front of its parent star creates a drop in the star's apparent brightness, called a transit. Exoplanet Watch participants can look for transits in data from ground-based telescopes, helping scientists refine measurements of the length of a planet's orbit around its star. Credit: NASA's Ames Research Center

One of the most famous exoplanet detection methods is the **transit method**, used by Kepler and other observatories. When a planet crosses in front of its host star, the light from the star dips slightly in brightness. Scientists can confirm a planet orbits its host star by repeatedly detecting these incredibly tiny dips in brightness using sensitive instruments. If you can imagine trying to detect the dip in light from a massive searchlight when an ant crosses in front of it, at a distance of tens of miles away, you can begin to see how difficult it can be to spot a planet from light-years away! Another drawback to the transit method is that the distant solar system must be at a favorable angle to our point of view here on Earth – if the distant system's angle is just slightly askew, there will be no transits. Even in our solar system, a transit is very rare. For example, there were two transits of Venus visible across our Sun from Earth in this century. But the next time Venus transits the Sun as seen from Earth will be in the year 2117 – more than a century from now, even though Venus will have completed nearly 150 orbits around the Sun by then!

The Wobble Method

Spotting the Doppler shift of a star's spectra was used to find



As a planet orbits a star, the star wobbles. This causes a change in the appearance of the star's spectrum called Doppler shift. Because the change in wavelength is directly related to relative speed, astronomers can use Doppler shift to calculate exactly how fast an object is moving toward or away from us. Astronomers can also track the Doppler shift of a star over time to estimate the mass of the planet orbiting it. Credit: NASA, ESA, CSA, Leah Hustak (STScI)

Pegasi 51b, the first planet detected around a Sun-like star. This technique is called the **radial velocity or "wobble" method.** Astronomers split up the visible light emitted by a star into a rainbow. These spectra, and gaps between the normally smooth bands of light, help determine the elements that make up the star. However, if there is a planet orbiting the star, it causes the star to wobble ever so slightly back and forth. This

will, in turn, cause the lines within the spectra to shift ever so slightly towards the blue and red ends of the spectrum as the star wobbles slightly away and towards us. This is caused by the blue and red shifts of the planet's light. By carefully measuring the amount of shift in the star's spectra, astronomers can determine the size of the object pulling on the host star and if the companion is indeed a planet. By tracking the variation in this periodic shift of the spectra, they can also determine the time it takes the planet to orbit its parent star.

Direct Imaging

Finally, exoplanets can be revealed by **directly imaging** them, such as this image of four planets found orbiting the star HR 8799! Space telescopes use instruments called **coronagraphs** to block the bright light from the host star and capture the dim light from planets. The Hubble Space Telescope has captured images of giant planets orbiting a few nearby systems, and the James Webb Space Telescope has only improved on these observations by uncovering more details,

such as the colors and spectra of exoplanet atmospheres, temperatures, detecting potential exomoons, and even scanning atmospheres for potential biosignatures!

Image taken by the James Webb Space Telescope of four exoplanets orbiting HR 8799. Credit: NASA, ESA, CSA, STScI, Laurent Pueyo (STScI), William Balmer (JHU), Marshall Perrin (STScI)

You can find more information and activities on NASA's Exoplanets page, such as the Eyes on Exoplanets browser-based program, The Exoplaneteers, and some of the latest exoplanet news. Lastly, you can find more resources in our News & Resources section, including a clever demo on how astronomers use the wobble method to detect planets!

The future of exoplanet discovery is only just beginning, promising rich rewards in humanity's understanding of our place in the Universe, where we are from, and if there is life elsewhere in our cosmos.

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, May 2, 2025 - 7p - Topic: Student Presentations
- Friday, June 6, 2025 - 7p - Topic: “Getting Ready for the Next Galactic Supernova.”
- Friday, August 1, 2025 - 7p - Topic TBA.
- Friday, September 5, 2025 - 7p - Topic TBA.
- Friday, October 3, 2025 - 7p - Topic TBA.
- Friday, December 5, 2025 - 7p - Topic TBA.
- Friday, February 6, 2026 - 7p - Topic TBA.
- Friday, March 6, 2026 - 7p - Topic TBA.
- Friday, April 3, 2026 - 7p - Topic TBA
- Friday, May 1, 2026 - 7p - Topic: TBA

SunWatch:

- Every clear Saturday & Sunday - 3p-3:30p - March-October - By the Dam
  - View the Sun safely with a white-light 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:

- Every Saturday in October and November - By the observatory
  - 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:

- **Astronomy Day - May 17th, 2025 - 12p-3p**
  - Come help share the fun of astronomy with the public. There will be tables with different themed topics.
- **Annual Club Picnic - July 2025**
  - Date and 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.
- **StarFest 2025 - November 7-9, 2025**
  - Our 40th 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. 16, 2025 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."**
  - **Link for all the StarFest info including registration and hotel reservation links.**
- **BMAC Dinner - January 2026**
  - This event is for members and their families. Look for an e-mail in January with all the information.

Regular Contributors:

Greg Penner

Robin Byrne

Mackenzie Henley

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.

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).

Mackenzie Henley is our new head editor of the Bays Mountain Astronomy Club newsletter. She is an undergraduate student at the University of Tennessee Knoxville.

Connection:

Bays Mountain Astronomy Club:

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

Dues:

- Dues are highly 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 Member (which incurs a separate, additional fee), then a 50% reduction in BMAC dues are applied.
- Dues can be paid in many ways. The easiest way is to pay via the CivicRec online portal. If you are a current member, please log in with your e-mail address and reset your password if you have not already done so. You can then update your membership. Here's the direct **link**. If you want to add family members, then add them via the internal link. You can also pay at the gift shop, by mail or over the phone.

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.*
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