

The ECLIPSE

The Newsletter of the Barnard-Seyfert Astronomical Society



July 2024



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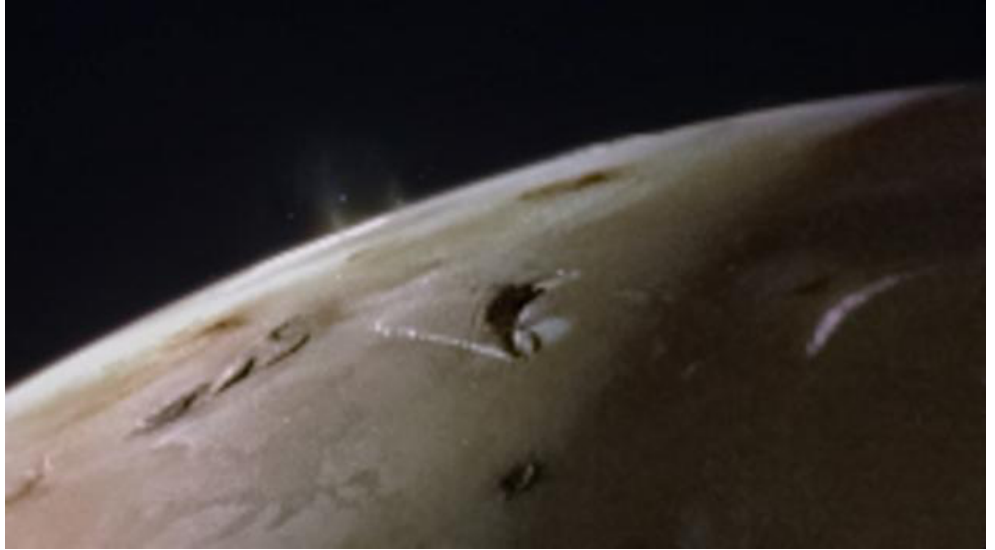
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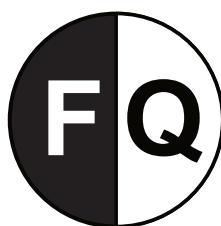
The JunoCam instrument aboard NASA's Juno spacecraft captured two volcanic plumes rising above the horizon of Jupiter's moon Io on Feb. 3, 2024. Mission scientists think the plumes were emitted either by two vents from one giant volcano, or two volcanoes near each other. The JunoCam instrument imaged the plumes from a distance of about 2,400 miles (3,800 kilometers). Citizen scientist Andrea Luck made this [image](#) from raw JunoCam data.

On the cover: The cosmos seems to come alive with a crackling explosion of pyrotechnics in this new image from NASA's James Webb Space Telescope. Taken with Webb's MIRI (Mid-Infrared Instrument), this fiery hourglass marks the scene of a very young object in the process of becoming a star. A central protostar grows in the neck of the hourglass, accumulating material from a thin protoplanetary disk, seen edge-on as a dark line.

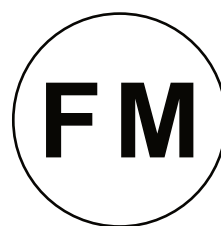
The protostar, a relatively young object of about 100,000 years, is still surrounded by its parent molecular cloud, or large region of gas and dust. Webb's previous observation of L1527, with NIRCam (Near-Infrared Camera), allowed us to peer into this region and revealed this molecular cloud and protostar in opaque, vibrant colors. Image credits: [NASA](#), [ESA](#), [CSA](#), [STScI](#)



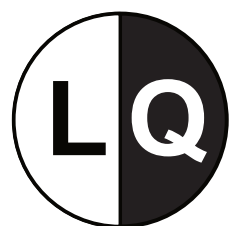
July 5
Aug 4



July 13
Aug 12



July 21
Aug 19



July 27
Aug 26

Happy Birthday Friedrich Bessel by Robin Byrne

This month, we look at the life of a man whose attention to detail led to a variety of discoveries. Friedrich Bessel was born July 22, 1784 in Minden, Westphalia (in what is now Germany). Bessel attended school in Minden, but did not appear to be a very talented student. After struggling with Latin, he chose to leave school at the age of fourteen.

Upon leaving school, Bessel was hired as an apprentice for an import/export business. At first, he was not paid, but when his ability to manage the accounts of the firm became apparent, they granted him a small salary. Dealing with shipments to and from other countries sparked an interest in studying geography, English, and Spanish. The cargo ships used in the business inspired Bessel to use his mathematical skills to study methods of navigation. This led, naturally, to a study of astronomy to aid in the determination of longitude.

In 1804, Bessel used his new interest in astronomy, coupled with his mathematical abilities, to improve on the calculations used to determine the orbit of Halley's Comet. He published his results in the journal *Monatliche Correspondenz*. That's when the astronomer Heinrich Olbers took note of Bessel. Olbers gave Bessel an assignment to make additional observations, in order to further improve his calculations. Olbers had Bessel's work published, and Bessel devoted himself to astronomy from that point on.

In 1806, with his apprenticeship complete, and his interest in astronomy established, Bessel went to work as an assistant to Johann Schröter, who had a private observatory in Lilienthal. It meant a reduction in salary, but Bessel chose to follow his passion. At the observatory, Bessel made observations of Saturn, its moons, and rings. He also continued to apply his mathematical skills in the form of determining the orbits of comets that he also observed.

In 1807, Bessel began a project of reducing the observational data collected by James Bradley. Bradley was a British astronomer who had measured the positions of 3222 stars from Greenwich Observatory. Bessel took Bradley's observations and turned them into precise astronomical positions of right ascension and declination for each star.

Bessel's reputation quickly rose, leading to multiple job offers. He ultimately chose to accept the offer from King Frederick William III of Prussia (modern day Russia), the position of professor of astronomy and director of the, yet to be completed, Königsberg Observatory. Bessel was only 26 years old. However, there was one hitch: he didn't have a doctorate degree, which was a requirement for the professorship. Carl Friedrich Gauss was a friend of Bessel's, and with Gauss' recommendation, based on Bessel's published work, the University of Göttingen granted Bessel a PhD. So, on May 10, 1810, Bessel began his new job - one he would hold until his death. While the



observatory was under construction, he continued to work on Bradley's observational data, using the observations to create a table of atmospheric refraction values. This allowed astronomers to take into account the shifting of the apparent position of stars resulting from the light path being bent by Earth's atmosphere. This provided the ability to determine star positions to within 0.1 seconds of arc. For this achievement, Bessel was awarded the Lalande Prize from the French Academy of Sciences in 1811.

Bessel married Johanna Hagen the following year. Together, they had three daughters and two sons, though the youngest son died shortly after birth. The oldest son became an architect, but died unexpectedly at the age of 26. All three daughters went on to get married and have children.

In 1813, the observatory was complete, and Bessel began making his own observations. Despite less than favorable weather conditions at the site, Bessel had no desire to leave. He had been offered the position of director for the Berlin Observatory, but Bessel turned it down. He felt there would be more responsibilities involved, such as administrative duties, plus an added political element for which he had no interest. Bessel was much happier living his simple life in Königsberg.

Continuing to use Bradley's observations, along with observations made by the British Astronomer Royal Nevil Maskelyne, both of whom used the Greenwich Observatory, Bessel then began to pursue all the possible sources of error when determining stellar positions, beyond the atmospheric refraction he had already explored. Bessel took into account Earth's rotational and orbital motion, as well as the precession of Earth's axis, to establish even more precise positions of stars. In recognition of this work, the Berlin Academy awarded Bessel a prize in 1815. Bessel continued to study the same stars, next determining their proper motions, which is the progression of the stars across our line of sight due to the stars' motion as they move around the center of the Milky Way.

Bessel also put his mathematical skills to the study one example of a three-body problem, which is when there are three objects gravitationally bound together in one system. He developed what is now known as the Bessel function, which he used to study how the motions of planets are affected by other objects in the solar system.

In 1830, Bessel published tables of the positions of 36 stars originally dubbed "fundamental stars" by Maskelyne. The tables listed the apparent and mean positions for each star, spanning the years 1750-1850. In the process, Bessel noticed that both Sirius and Procyon had periodic changes in their proper motion. This led Bessel to suggest, in 1841, that both stars were actually part of their own binary systems. Twenty one years later, in 1862, Sirius B was observed. Procyon B was discovered in 1896.

While Bessel was undertaking the task of determining the proper motion and position of over 50,000 stars, his attention to precise stellar positions allowed him to make the first measurement of a star's parallax. Parallax occurs as Earth orbits the Sun. When looking at a nearby star from one side of the Sun versus the other side of the Sun, the star will slightly shift in position relative to the more distant stars. (You can get the same affect by holding a finger in front of your face, and switch between viewing with your right eye and then your left eye. The apparent motion back and forth by your finger is due to the parallax created by looking from eyes on either side of your face.) However, unlike your finger, stars are much, much farther away, and the amount of shift that occurs is insanely small. Bessel rightly assumed that stars with larger proper motions would likely be closer, and thus have larger, more easily observed parallax angles. In 1838, Bessel was able to accurately measure the insanely small shift of the star 61 Cygni. The parallax for 61 Cygni is a mere 0.314 arcseconds. For comparison, the full moon spans 30 arcseconds, so the parallax of 61 Cygni is roughly 95 times smaller than the width of the moon in the sky. With the known parallax angle, you can then quickly determine the distance, which placed 61 Cygni at a distance of 10.3 lightyears. The currently accepted distance is 11.4 lightyears, so Bessel was very close! This discovery was the first hint of how big the distances to stars actually were.

Despite declining health, in 1842, Bessel traveled to Manchester, England to attend the Congress of the British Association for the Advancement of Science. Bessel had the opportunity to meet a variety of important British scientists, including John Herschel, the son of William Herschel. At the Congress, Bessel gave a presentation on astronomical clocks. He left the conference inspired to finish and publish his remaining studies.

After an extended illness, Friedrich Bessel died on March 17, 1846 in Königsberg. It's not surprising that the name of someone who accomplished so much is still known. In addition to the Bessel function, Bessel's name lives on in the heavens. The largest lunar crater in Mare Serenitatis is named for Bessel. Also, an asteroid discovered in 1938, the 100-year anniversary of Bessel's parallax measurement, is named 1552 Bessel. Whether you're gazing at craters on the Moon, or maybe even more ambitiously attempting to make your own parallax measurement, take a moment to appreciate all the work accomplished by this month's honoree: Friedrich Bessel.

References:

[Wikipedia - Friedrich Wilhelm Bessel](#)

[MacTutor Math History - Friedrich Wilhelm Bessel](#)

[American Museum of Natural History; Friedrich Bessel and the Companion of Sirius, excerpt from Cosmic Horizons: Astronomy at the Cutting Edge edited by Steven Soter and Neil deGrasse Tyson.](#)

[Carnegie Institution for Science - 1838: Friedrich Bessel Measures Distance to a Star](#)

Next Membership Meeting:

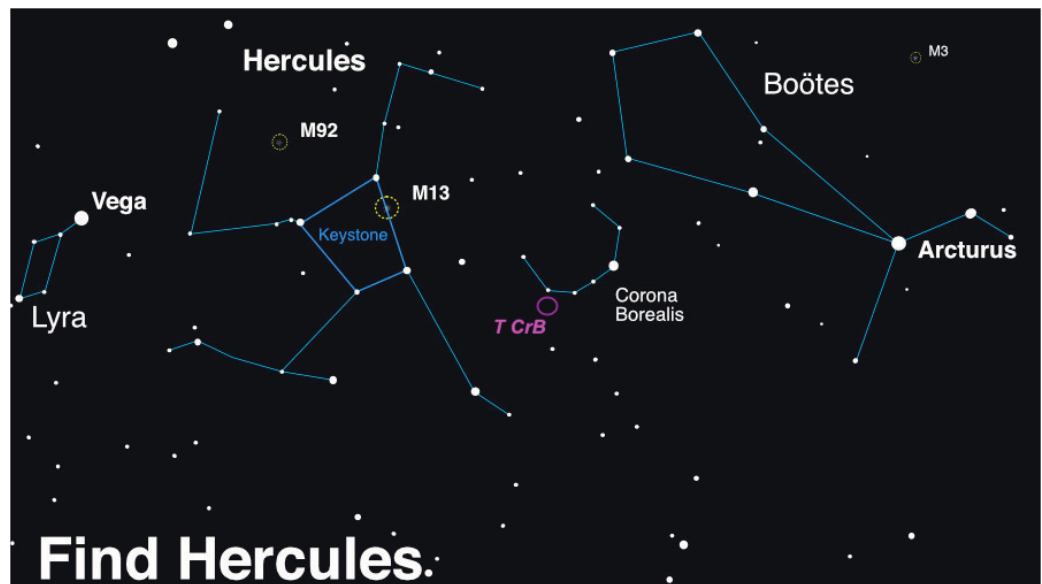
Wednesday, July 17 at 7:30 pm

Dyer Observatory
1000 Oman Drive
Brentwood TN 37027

A Hero, a Crown, and Possibly a Nova! By Vivian White

High in the summer sky, the constellation Hercules acts as a centerpiece for late-night stargazers. At the center of Hercules is the “Keystone,” a near-perfect square shape between the bright stars Vega and Arcturus that is easy to recognize and can serve as a guidepost for some amazing sights. While not the brightest stars, the shape of the hero’s torso, like a smaller Orion, is nearly directly overhead after sunset. Along the edge of this square, you can find a most magnificent jewel - the Great Globular Cluster of Hercules, also known as [Messier 13](#).

Globular clusters are a tight ball of very old stars, closer together than stars near us. These clusters orbit the center of our Milky Way like tight swarms of bees. One of the most famous short stories, *Nightfall* by Isaac Asimov, imagines a civilization living on a planet within one of these star clusters. They are surrounded by so many stars so near that it is always daytime except for once every millennium, when a special alignment (including a solar eclipse) occurs, plunging their planet into darkness momentarily. The sudden night reveals so many stars that it drives the inhabitants mad.



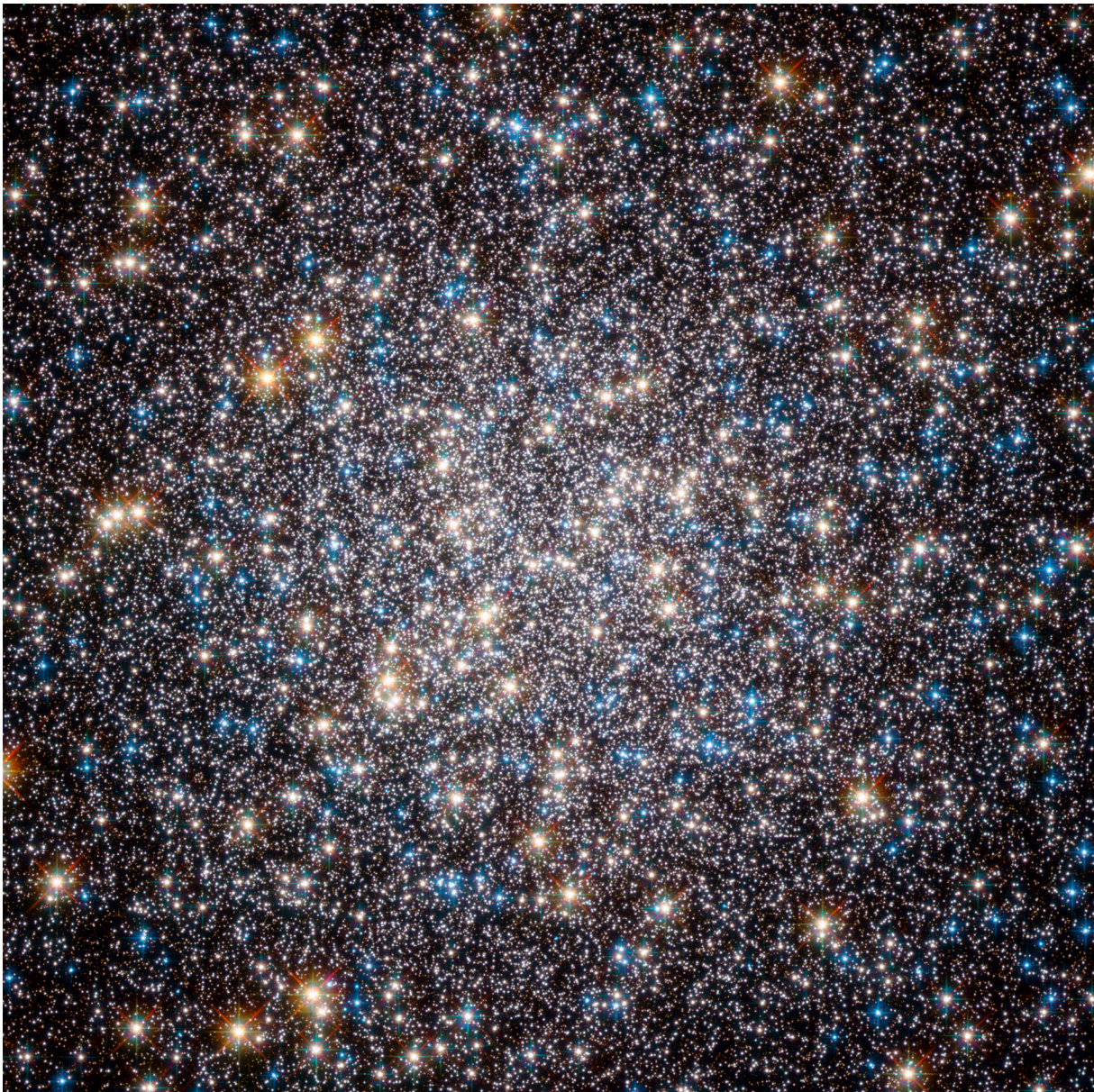
Back here on our home planet Earth, we are lucky enough to experience [skies full of stars](#), a beautiful [Moon](#), and regular [eclipses](#). On a clear night this summer, take time to look up into the Keystone of Hercules and follow this sky chart to the Great Globular Cluster of Hercules. A pair of binoculars will show a faint, fuzzy patch, while a small telescope will resolve some of the stars in this globular cluster.

Bonus! Between Hercules and the ice-cream-cone-shaped Boötes constellation, you’ll find the small constellation Corona Borealis, shaped like the letter “C.” Astronomers around the world are watching T Coronae Borealis, also known as the “Blaze Star” in this constellation closely because it is [predicted to go nova](#) sometime this summer. There are only 5 known nova stars in the whole galaxy. It is a rare observable event and you can take part in the fun! The Astronomical



League has issued a [Special Observing Challenge](#) that anyone can participate in. Just make a sketch of the constellation now (you won't be able to see the nova) and then make another sketch once it goes nova.

Tune into our mid-month article on the Night Sky Network page, as we prepare for the Perseids! Keep looking up!



This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Barnard-Seyfert Astronomical Society Minutes of a Regular Meeting of the Board of Directors Held on Wednesday, June 5, 2024

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held June 5, 2024, online, Dr. Tom Beckermann presiding. Logged in were Tom Beckermann, Stef Brake, Chip Crossman, Tony Drinkwine, Bud Hamblen, Steve Hughes and Andy Reeves.

The minutes of the board meeting of April 3, 2024, as printed in the May 2024, edition of the Eclipse, were adopted without discussion.

Membership report: 192 members.

Social media: Thanks to Donna for her efforts on Facebook.

Star parties and outreach: About 40 people attended the public night at Bowie Nature Park on May 19. It was noted that instructions on where to park are not clear. Stef mentioned the upcoming telescope night at Dyer on June 7.

Upcoming meetings: Presenters have been scheduled for June 26, July 24, August 21, September 18 and November 20. October and December are still open. Stef mentioned space policy as a possible topic.

Eclipse glasses: Tom is collecting eclipse glasses for astronomers without borders.

Telescope lending: The 60mm H-alpha solar telescope is still missing. The 40mm Coronado PST needs a new 25mm eyepiece. There was discussion on how to improve the telescope loan program.

News: At least one additional Tennessee state park is interested in becoming dark sky certified.

There being no further business, the meeting adjourned at 9 PM.

Respectfully submitted,

Bud Hamblen
Secretary

Barnard-Seyfert Astronomical Society Minutes of the Monthly Membership Meeting Held on Wednesday, June 26, 2024

The Barnard-Seyfert Astronomical Society met at Vanderbilt's Dyer Observatory and on-line by Zoom on Wednesday, June 26, 2024, Tom Beckermann presiding.

Dr. Charles Kuehn, University of Northern Colorado, presented "Cepheids – Why the North Star Isn't Constant After All" by Zoom, and took questions.

Treasurer's report: Truist bank balance is \$9,274.85 (\$4,574.87 in the equipment fund and \$4,699.98 in the general fund). The PayPal balance 346.02. \$78.00 were received for solar glasses. Expenses were \$17.47 for the Zoom account and \$232.00 for the post office box rental. Updated brochures from Vistaprint would be \$237.99 for 500 or \$313.99 for 1000. The quantity is to be decided.

Membership report: There are 193 members.

Social media report: The Facebook page had 2.3K "likes" and 2.5K followers. "X" has 235 followers. Thanks to Donna for keeping Facebook updated and to Steve for keeping Instagram updated.

Previous star parties: May 19 at Bowie Nature Park, Fairview. Despite the last minute change of date owing to weather, the event was successful. June 15 at Bells Bend Outdoor Center. The weather cooperated for this one, too.

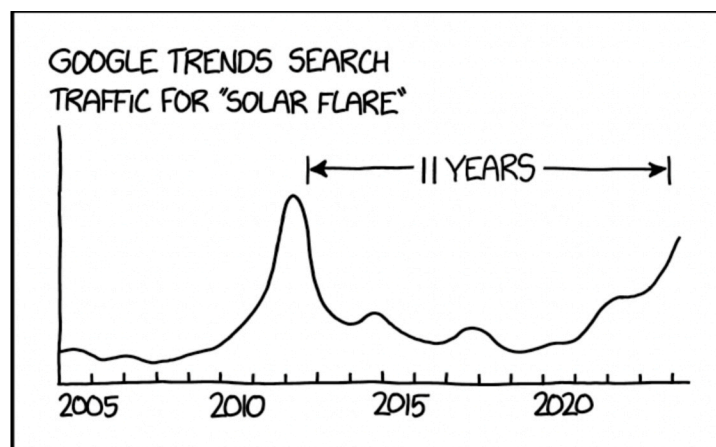
Upcoming meetings: The next board meeting will be July 10. The July meeting will be on 24, 2024, a week later than usual.

Upcoming star parties: July 13 at Cornelia Fort Air Park. July 22 at Montgomery Bell State Park. August 10 at Edwin Warner Park.

Respectfully submitted,

Bud Hamblen
Secretary

xkcd

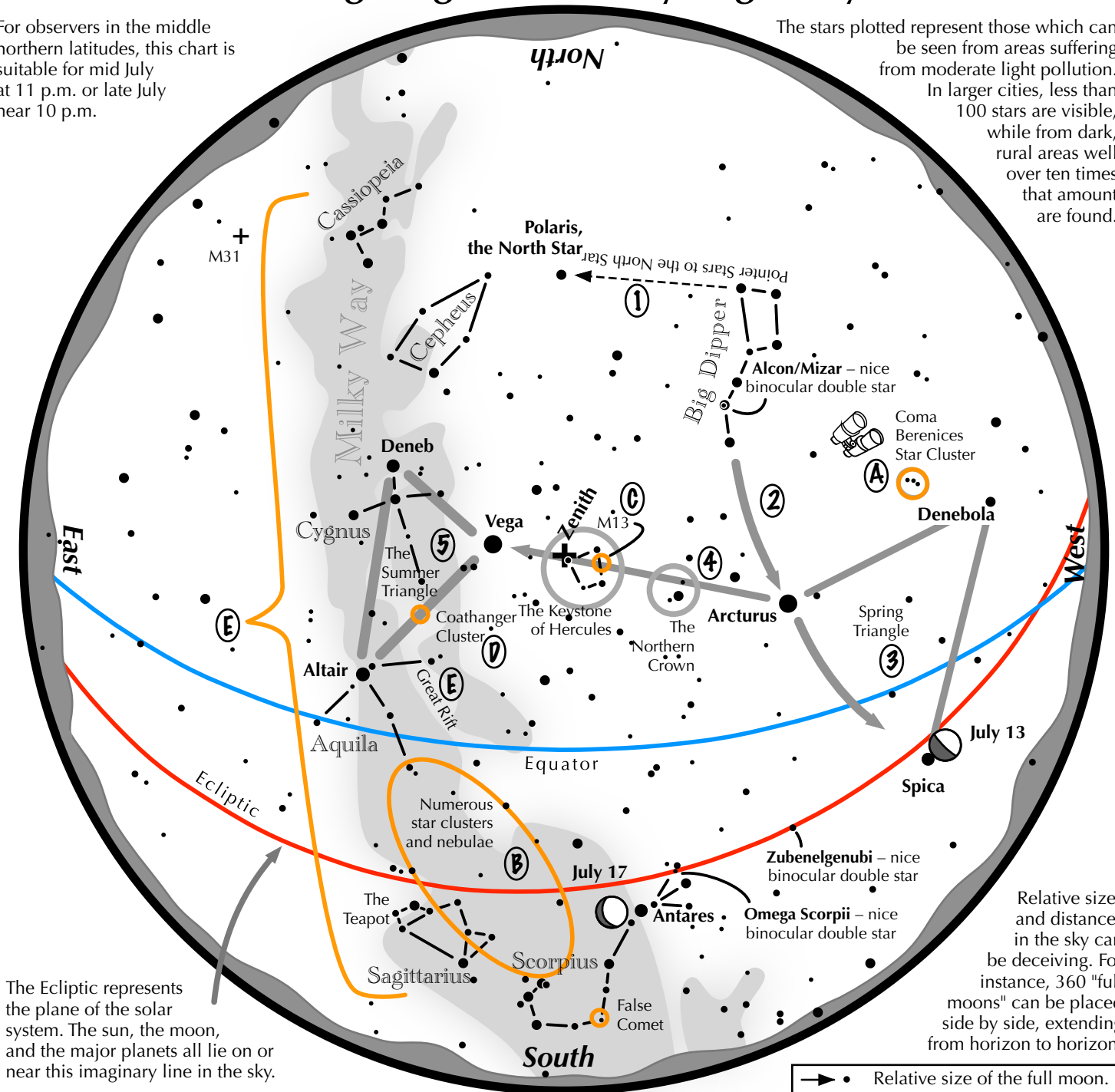


I LIKE THAT GOOGLE HAS EXISTED ALMOST LONG ENOUGH FOR US TO OBSERVE THE SOLAR CYCLE USING GOOGLE TRENDS.

Navigating the mid July Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid July at 11 p.m. or late July near 10 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

→ • Relative size of the full moon.

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

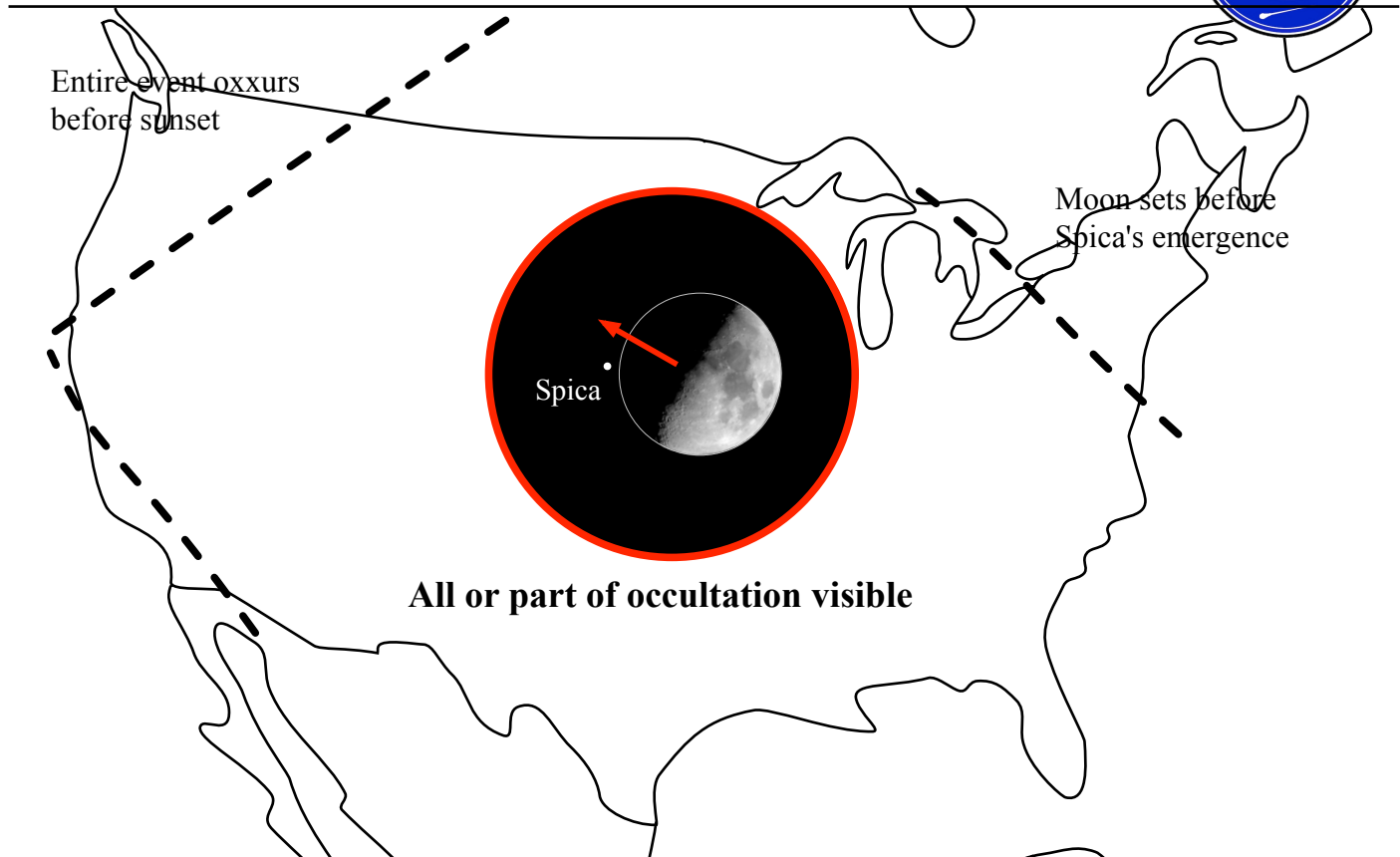
- 1 Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
- 2 Follow the arc of the Dipper's handle. It first intersects Arcturus, the brightest star in the July evening sky, then continues to Spica. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
- 3 To the northeast of Arcturus shines another star of similar brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
- 4
- 5 High in the East lies the Summer Triangle stars of Vega, Altair, and Deneb.

Binocular Highlights

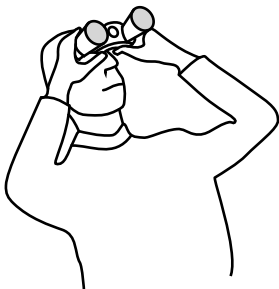
- A: Between Denebola and the tip of the Big Dipper's handle, lie the stars of the Coma Berenices Star Cluster.
- B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
- C: On the western side of the Keystone glows the Great Hercules Cluster, containing nearly 1 million stars.
- D: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
- E: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.



If you can see only one celestial event this month, see this one. The first quarter moon occults Spica on July 13.



Occultation of Spica occurs in the evening hours for most of the US. The moon sets before Spica's emergence for viewers in the northeast. Viewers in the northwest see the event before sunset.



A great
binocular
event



City	Start	Altitude	End	Altitude	Notes
Boston	11:24	6°	-----	----	12:03 moonset
Washington	11:26	11°	12:34	----	12:32 moonset
Atlanta	11:28	19°	12:41	5°	1:08 moonset
Miami	11:48	15°	12:54	1°	12:59 moonset
Chicago	10:10	19 ^a	11:23	8°	8:24 sunset
St Louis	10:12	23°	11:28	10°	12:25 moonset
New Orleans	10:29	24°	11:44	10°	
Minneapolis	9:57	22°	11:13	12°	
Kansas City	10:05	26°	11:23	14°	8:44 sunset
San Antonio	10:18	33°	11:37	18°	
Denver	8:48	33°	10:11	22°	8:27 sunset
Albuquerque	8:54	37°	10:17	25°	8:21 sunset
Tucson	7:54	41°	9:15	30°	7:31 sunset
Seattle	7:13	31°	8:33	28°	9:03 sunset
San Francisco	7:28	41°	8:44	36°	8:32 sunset
San Diego	7:44	44°	9:02	35°	7:57 sunset



In honor of the club's 90th anniversary we partnered with Hatch Show Print to create a unique poster that would honor the achievement of the club. For those who don't know Hatch Show has been making posters for a variety of events and concerts for 140 years. In all that time we are their first astronomy club.

On the poster at the center is the moon. This was made from a wood grained stencil that the shop has used for over 50 years. To contrast that the telescope that the people are using is a brand new stencil made for our poster. The poster has three colors. First the pale yellow color of the moon was applied. Next the small stars, circles, and figures at the bottom were colored in metallic gold. The third color is

a blue for the night sky. Where it overlaps with the metallic gold it creates a darker blue leaving the figures at the bottom looking like silhouettes. This was a one time printing so the 100 that we have are all that will be printed.

The prints are approximately 13 3/4" x 22 1/4" and are available for \$20 at our membership meetings, or \$25 with shipping by ordering through bsasnashville.com. Frame not included.



Become a Member of BSAS!
Visit bsasnashville.com to join online.

All memberships have a vote in BSAS elections and other membership votes. Also included are subscriptions to the BSAS and Astronomical League newsletters.

Annual dues:

Regular: \$25
Family: \$35
Senior/Senior family: \$20
Student*: \$15

* To qualify as a student, you must be enrolled full time in an accredited institution or home schooled.

About BSAS

Organized in 1928, the Barnard-Seyfert Astronomical Society is an association of amateur and professional astronomers who have joined to share our knowledge and our love of the sky.

The BSAS meets on the third Wednesday of each month at the Dyer Observatory in Nashville. Experienced members or guest speakers talk about some aspect of astronomy or observing. Subjects range from how the universe first formed to how to build your own telescope. The meetings are informal and time is allotted for fellowship. You do not have to be a member to attend the meetings.

Membership entitles you to subscriptions to *Astronomy and Sky & Telescope* at reduced rates; the club's newsletter, the *Eclipse*, is sent to members monthly. BSAS members also receive membership in the Astronomical League, receiving their quarterly newsletter, the *Reflector*, discounts on all astronomical books, and many other benefits.

In addition to the meetings, BSAS also sponsors many public events, such as star parties and Astronomy Day; we go into the schools on occasion to hold star parties for the children and their parents. Often the public star parties are centered on a special astronomical event, such as a lunar eclipse or a planetary opposition.

Most information about BSAS and our activities may be found at bsasnashville.com. If you need more information, write to us at info@bsasnashville.com.

Free Telescope Offer

Did someone say free telescope? Yes, you did read that correctly. The BSAS Equipment & Facilities Committee has free telescopes ranging in size from 2.6" to 8" that current members can actually have to use for up to 60 days at a time. We also have some other items in the loaner program such as a photometer, H-alpha solar telescope, educational CDs, tapes, DVDs, and books. Some restrictions apply. A waiting list is applicable in some cases. The BSAS Equipment Committee will not be held responsible for lost sleep or other problems arising from use of this excellent astronomy gear. For information on what equipment is currently available, contact info@bsasnashville.com.