The Bays Mountain Astronomy Club Newsletter

July 2024

Kingsport, TN

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Cosmic Reflections

Greg Penner - BMAC Chair

reetings BMACer's!

I really appreciate everyone's involvement at the last club meeting in which we shared stories from the solar eclipse. Also, the great participation we had from members at Astronomy Day in May was great to see as well. The key to a successful club is for the members to encourage each other and stay involved, so way to go! I also appreciate being elected your club Chair for another year. Please let me know if you have ideas for club activities or wish to share at club meetings. Everyone in the club can benefit from each other's knowledge and experiences!

The first half of 2024 has been quite a memorable time, and now at the half-way point of the year it is time for our club to take a pause from the normal meeting and have our annual picnic. This is a members-only (and families) event, so all members will receive an e-mail with info about the picnic. This will be a potluck, so everyone should bring some kind of dish to share such as a main dish, side dish, dessert, drinks, etc. Also, bring chairs for yourselves. Feel free to bring picnic-type games

such as horseshoes or corn hole. If the sky is clear, feel free to bring binoculars or telescopes (I will bring my telescope) and we can do some observing. That night will be a first quarter Moon, and there will be an interesting celestial event. At 11:25p the Moon will occult the bright star Spica, which should be pretty cool to watch if you can stay that late.

The second half of 2024 will have some great programs for us to enjoy at our club meetings! At the August meeting, we will be treated to a planetarium show in our state-of-the-art theater. For our September meeting Dr. Gary Henson, astronomer from ETSU, will be doing a program for us (topic to be announced later). Our October meeting will have another astronomer giving us a presentation, Trina Ray with NASA JPL, who is part of the Europa Clipper Mission. And then in November, we will have our annual StarFest 3-day gathering in which we will hear a number of fascinating speakers and enjoy a lot of great food and social time with people from all over the region.

Looking forward to the rest of 2024!

Clear Skies!

BMAC Notes

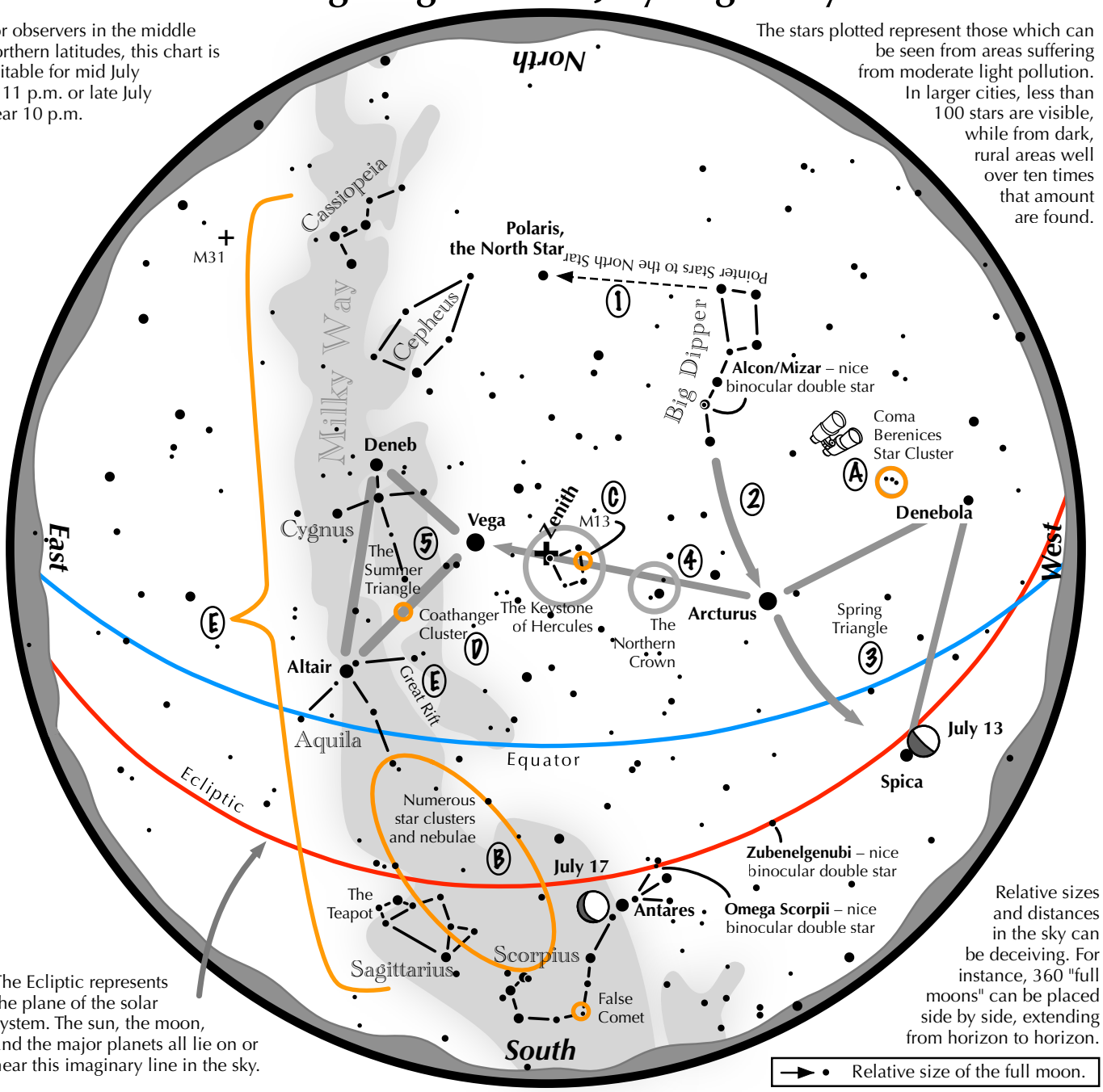
Sky News from the Astronomical League

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 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
4. Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
5. High in the East lies the Summer Triangle stars of Vega, Altair, and Deneb.

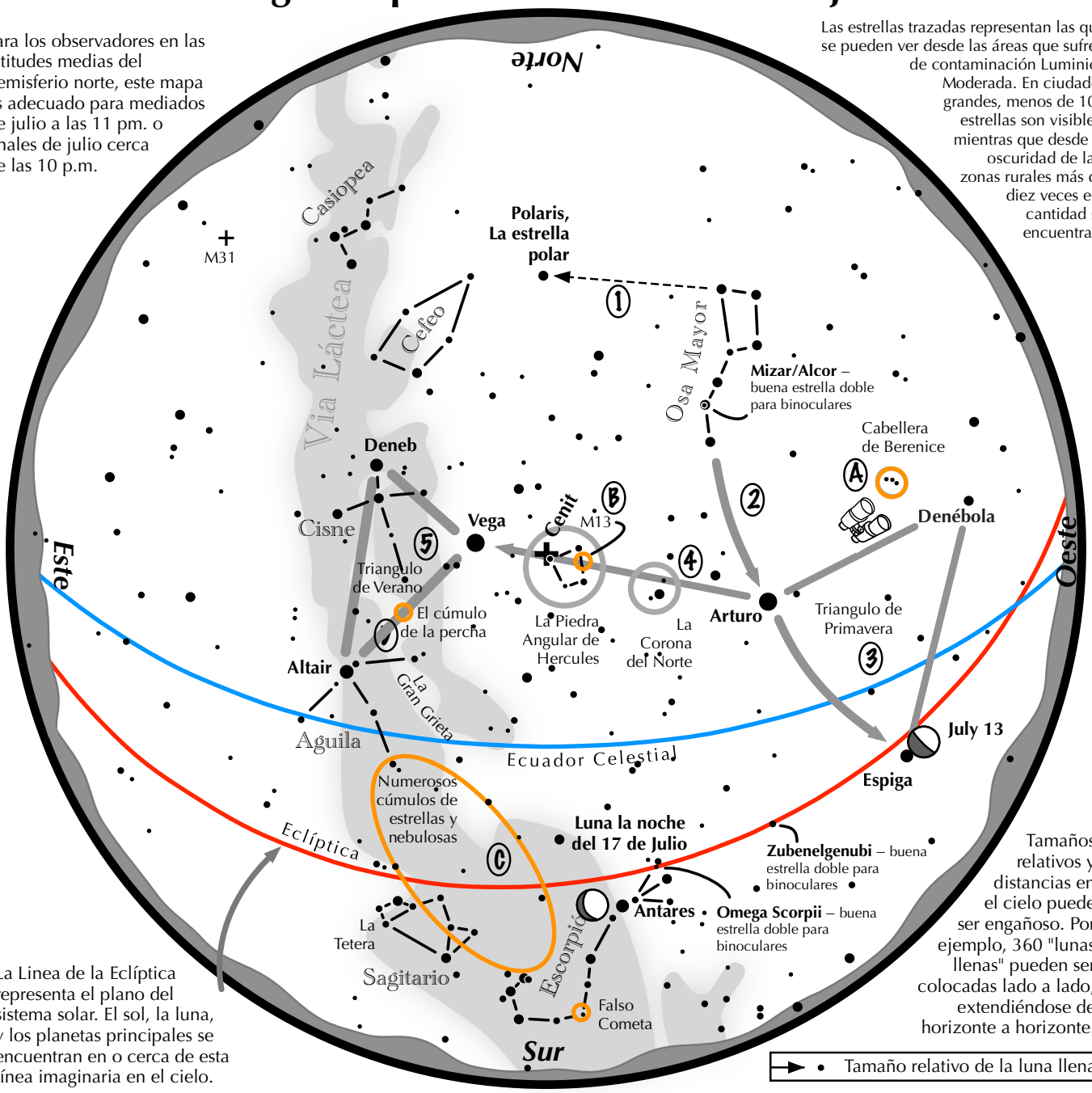
Binocular Highlights

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.

Navegando por el cielo nocturno de julio

Para los observadores en las latitudes medias del hemisferio norte, este mapa es adecuado para mediados de julio a las 11 pm. o finales de julio 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 distancias en 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.

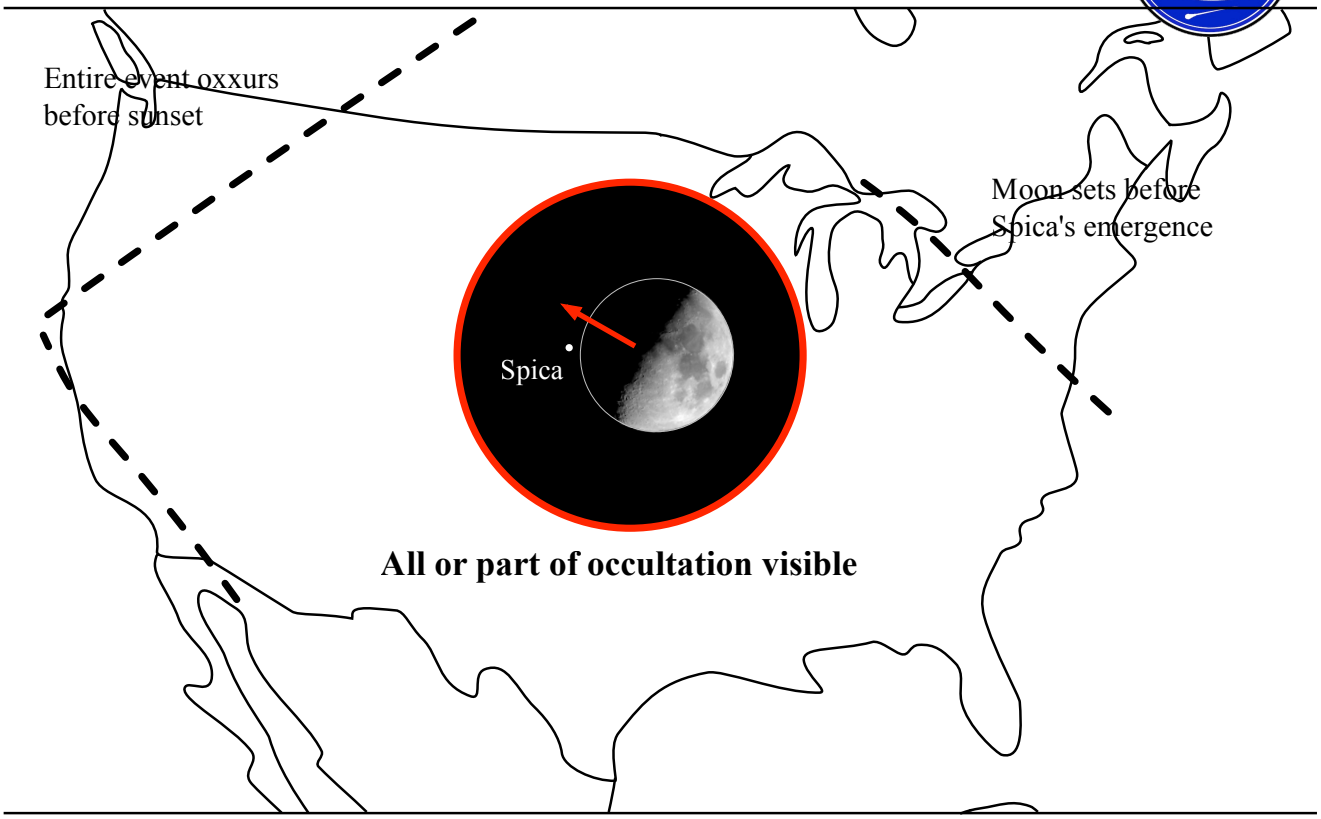
1. Haz una línea hacia el norte desde las dos estrellas en la punta de la Osa Mayor. Pasa por Polaris, la estrella polar.
2. Siga el arco del mango del tazón de la Osa Mayor. Primero cruza Arturo, luego continúa hacia Espiga.
3. Arturo, Espiga y Denébola forman el triángulo de primavera, un gran triángulo equilátero.
4. 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.
5. En lo alto del este se encuentran las tres estrellas brillantes del Triángulo de verano: Vega, Altair y Deneb.

Puntos destacados con binoculares

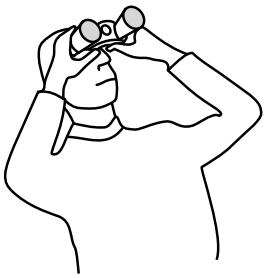
A: Mira alto en el este para ver el cúmulo de estrellas perdidas de Cabellera de Berenice. **B:** M13, un brillo redondo de un cúmulo de más de 500,000 estrellas. **C:** Entre las brillantes estrellas de Antares y Altair, se esconde un área que contiene muchos cúmulos de estrellas y nebulosas. **D:** Casi a la mitad de la distancia entre Altair y Vega, Brilla la "Percha," un grupo de estrellas que describe un perchero.

Traducción al español por Dr. Salvador Aguirre

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



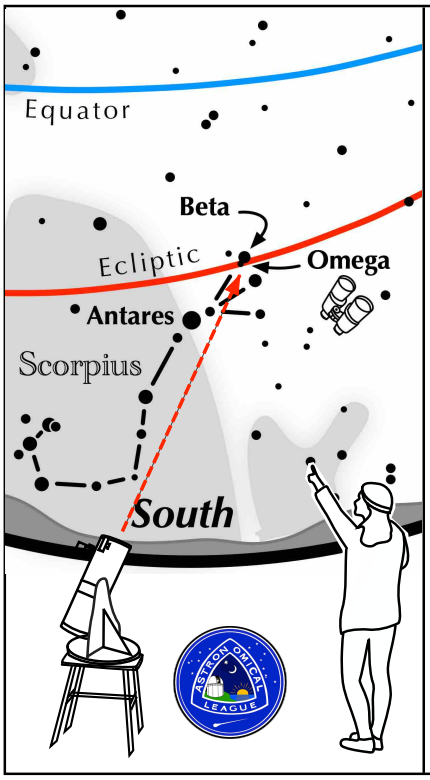
Occultation of Spica occurs in the evening hours for most of the US. The moon sets before Spica's emergence for viewers in the northeast. Viewers in the northwest see the event before sunset.



A great binocular event

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

ASTRONOMICAL LEAGUE Double Star Challenge

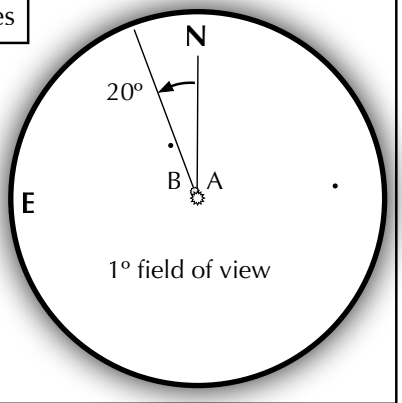


Other Suns: Beta Scorpii

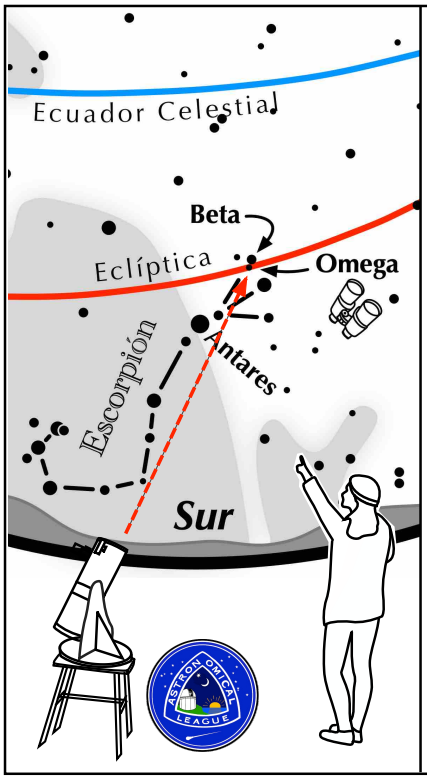
How to find Beta Scorpii on a July evening

Find the bright red star Antares low in the south. To its west shine three stars representing the claws of Scorpius. The northern star is Beta Scorpii. Immediately below Beta lies Omega, a very wide optical double star, easily separated in binoculars.

Suggested magnification: >40x
Suggested aperture: >3 inches



Beta Scorpii
A-B separation: 14 sec
A magnitude: 2.6
B magnitude: 4.5
Position Angle: 20º
A & B colors: white & blue

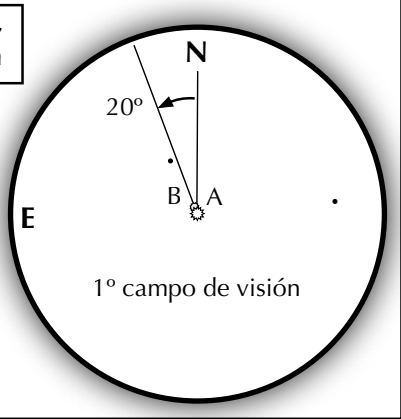


Otros Soles: Beta Scorpii

Cómo encontrar Beta Scorpii en una tarde de julio

Encuentra la brillante estrella roja Antares baja en el sur. Al oeste brillan tres estrellas que representan las garras de Escorpio. La estrella del norte es Beta Scorpii. Inmediatamente debajo de Beta se encuentra Omega, una estrella doble óptica muy ancha, que se puede distinguir fácilmente con binoculares.

Ampliación sugerida: >40x,
Apertura sugerida: >75 mm

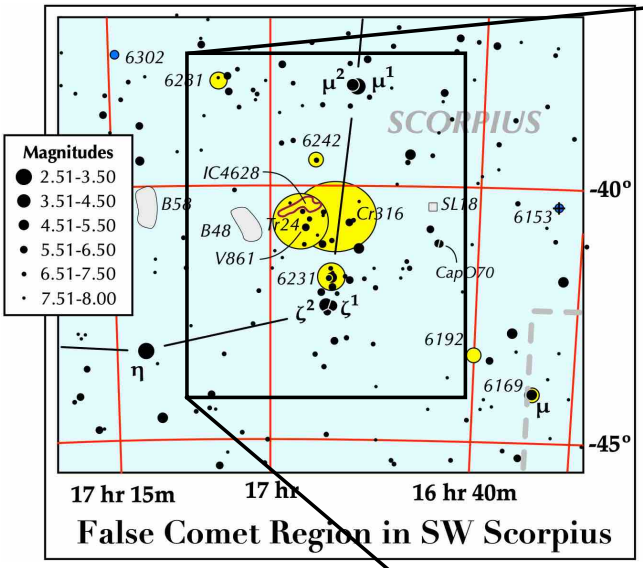


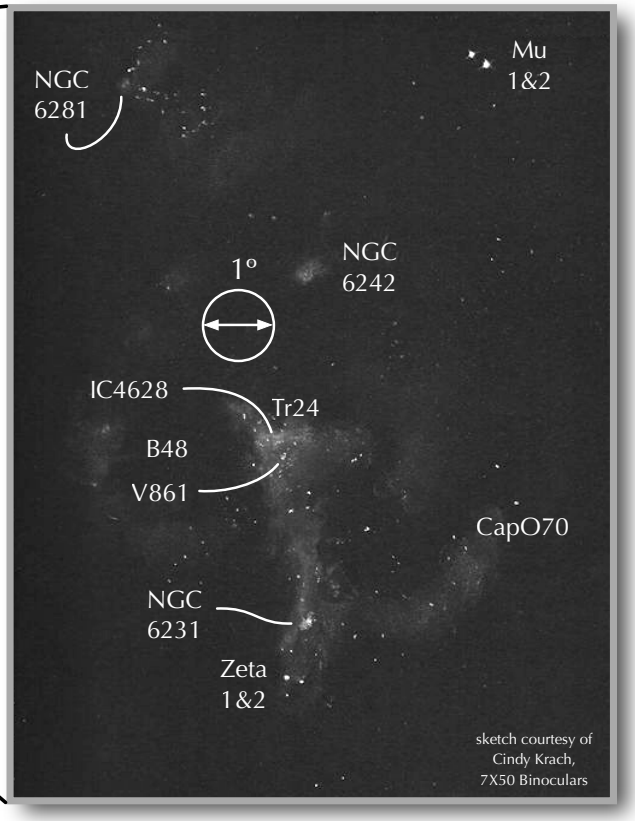
Beta Scorpii
A-B separación: 14 sec
A magnitud: 2.6
B magnitud: 4.5
PA: 20º
A & B colores: blanca & azul

Often ignored because of its southerly declination,
this is a great region for binocular observers and telescope users!

False Comet, a closer look

Take your time and explore what this area offers: Open clusters, double stars, variable stars, dark nebulae, emission nebula, & planetary nebulae.





Features to Identify

- Zeta 1 & 2, and Mu 1 & 2, binocular double stars.
- NGC 6231 (Caldwell 76), open cluster.
- Trumpler 24: open cluster, 8.6 mag., 60'
- Collinder 316: Large open cluster.
- B 48 & B 58: dark nebulae
- NGC 6242: open cluster, 6.5 mag., 40'
- NGC 6281: open cluster, 5.4 mag., 8'
- NGC 6302: planetary nebula, "Bug," 9.2 mag., 50".
- V861: eclipsing binary with period of 7.85 days, 6.1 to 6.4 mag.
- IC 4628: emission nebula, the "Prawn."
- CapO70: binocular double star, 6.1 & 6.2 mag., 97" sep.

A great region for binoculars!

- 7x50 and 10x50 work nicely.
- Best when mounted on a tripod for steady viewing.
- Best to have high contrast, dark skies.

See more detail:

- Use a high contrast or deep sky nebula filter.
- Don't forget to try high magnification, >200.

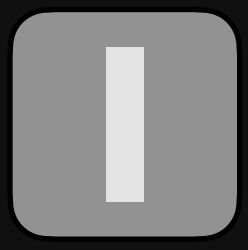
Try your hand at sketching: Lay down the bright stars first to set relative distances, lightly outline bright nebula next, then fill in cluster stars and dimmer field stars. Add shading. Note dark areas. The more you look, the more you see!

2406

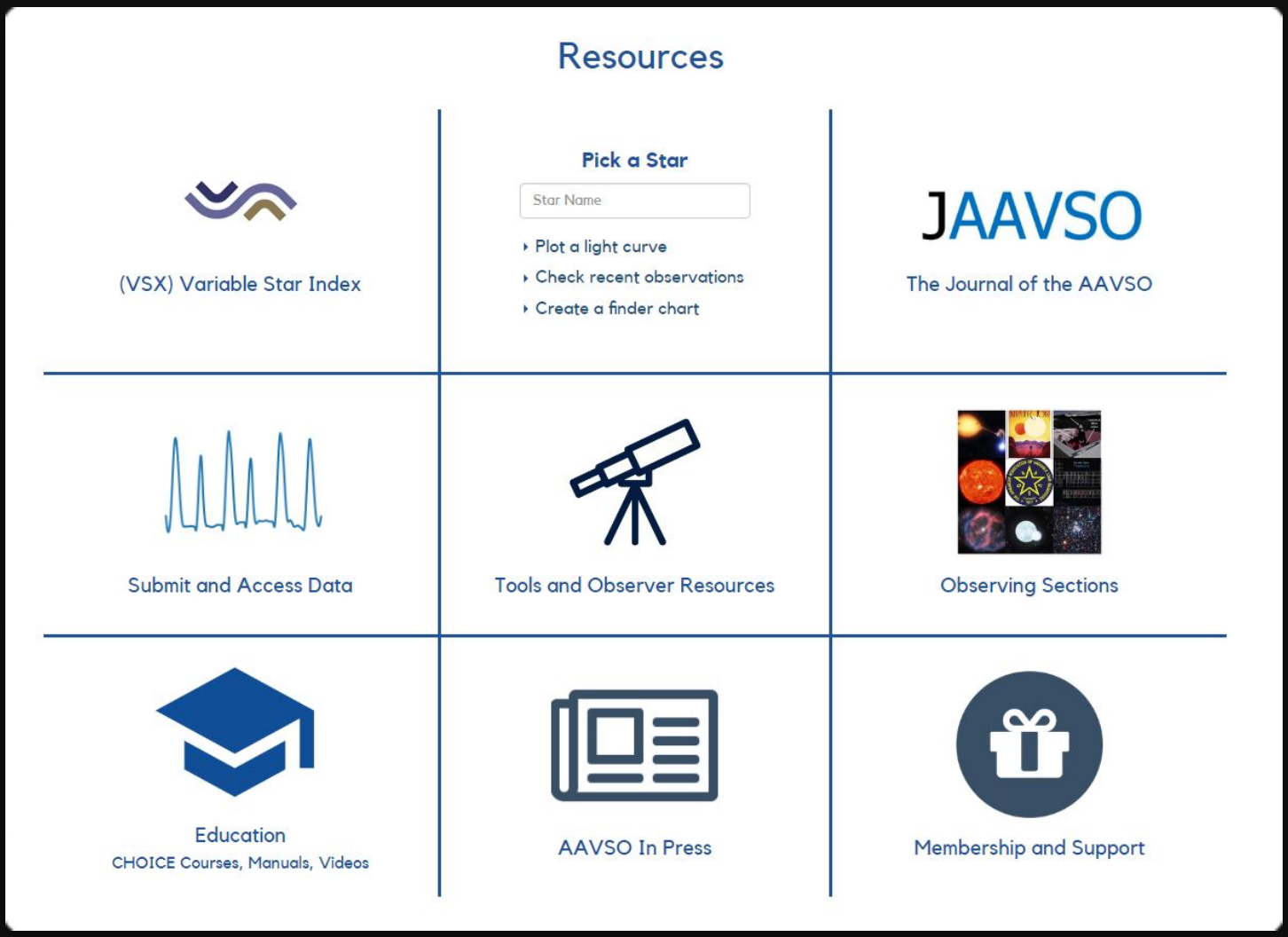
Stellar Observations

Greg Penner

Observing Variable Stars



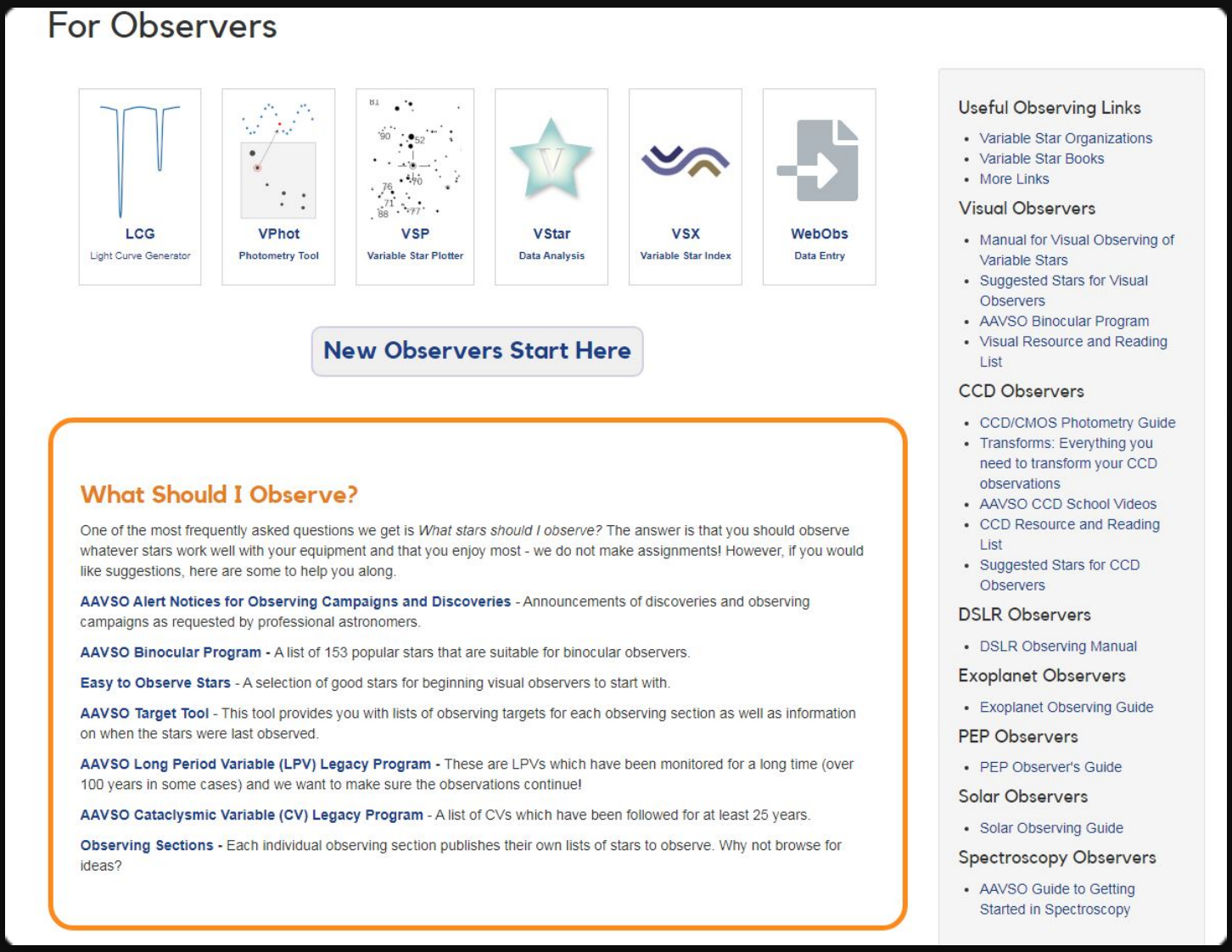
have recently taken an interest in observing variable stars. This new interest came about due to my daily/ nightly checking on the recurrent nova T Coronae Borealis (see my article in the March newsletter). By the way, T CrB still has not gone nova as of mid-June, so keep watching! Any night that is clear enough, I check on T CrB visually either with binoculars or my telescope. My other main resource for checking on it is the website of the American Association of Variable Star Observers, or AAVSO. Every morning I get on the AAVSO website and use the "recent observations" tool to see if T CrB erupted while I was sleeping or if it was too cloudy for me to observe. While on the website, I started noticing a LOT of great information about a variety of variable stars and great resources on how to observe them and submit the data to the AAVSO database. They have really done a great job to make it possible for amateur astronomers to contribute real time data that is useful to the professional astronomical community.



AAVSO home page showing resources.

When you get on the aavso.org website, one of the first things you will see is a statement regarding the AAVSO mission; "The mission of the AAVSO is to enable anyone, anywhere to participate in scientific discovery through variable star astronomy". This statement really does capture my thoughts after getting familiar with their resources. The website describes the many types of variable stars, how to find, observe

and submit reports on them, all in user friendly formats. In order to have access to all of the tools and resources, you should make an account first, which costs nothing. After you set up an account, an official AAVSO observer code will be assigned to you. The assigned observer code will be yours forever and will be used every time you submit an observation report.



AAVSO "For Observers" page.

A person who is new to variable star observing can begin by clicking on "Tools and Observer Resources." Next click on "New Observers Start Here," and you will see a few paragraphs of preliminary information and then a chart showing different types of observing such as visual, CCD, DSLR, etc.

For New Observers

If you are interested in learning how to get started making scientifically useful observations and submitting them to the AAVSO so that they can be used by researchers, you have come to the right place! We have a wealth of resources available to help you, and this page is designed to be your guide in getting started.

The preliminaries

If you have not done so already, please create an AAVSO website account. This will give you access to the tools you need to submit your data, use our forums, and much more. It is also free-of-charge. If you think you may have created an account with the AAVSO at any time in the past and you cannot remember your username or password, please contact AAVSO HQ and let us help you to get access to it again.

If you do not yet have an AAVSO observer code, you can request one by logging in to the website, clicking "My Account", then the "Profile" tab, and clicking on the link for "Request an obscode". Please note that AAVSO observer codes are *forever*, so if you ever submitted data to us in the past – even if it was 30 years ago – we will still have your code. Again, please write to us if you don't remember or aren't sure if you already have one.

What type of observing do you plan to do?

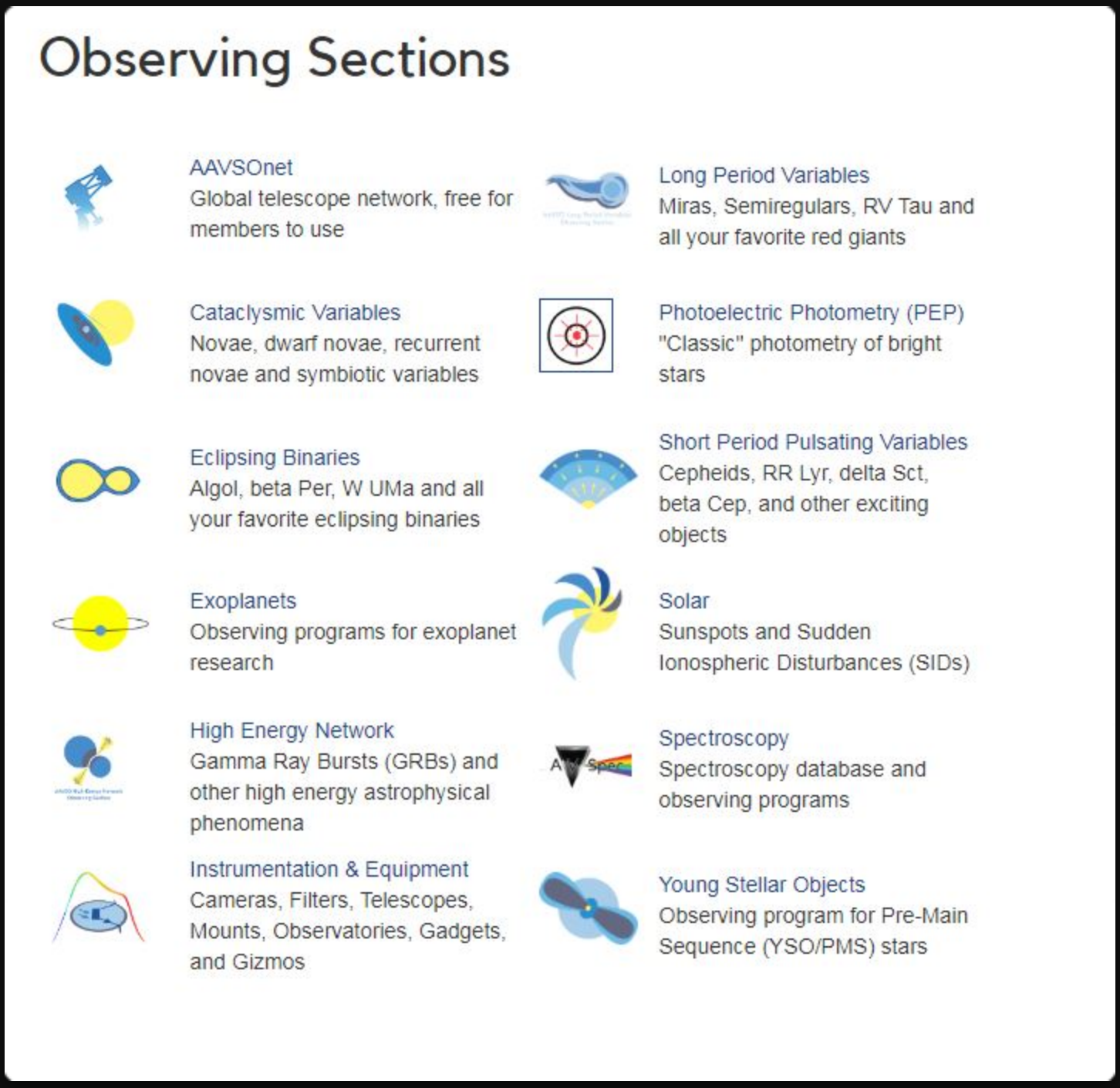
We have an abundance of resources to help you get started. The methods and techniques differ depending on what kind of sensor you plan to use, but you should take advantage of all of them for your particular observing type:

Sensor	Your eye (with telescope, binoculars or un-aided)	Monochrome CCD or CMOS camera	Color CCD or DSLR camera	Photoelectric photometer
Reading	Visual Observing Manual 10-Star Tutorial	Guide to CCD/CMOS Photometry with Monochrome Cameras	DSLR Observing Manual	PEP Observing Guide
CHOICE Courses	Developing a Visual Observing Program	CCD Photometry 1 & 2 Photometry with VPhot Fundamental Statistics for Photometry	Photometry with VPhot Fundamental Statistics for Photometry	Photoelectric Photometry in the 21st Century Fundamental Statistics for Photometry
Videos	Visual Photometry of Variable Stars	How to Understand Star Photometry: How it Works How to Start with CCD Photometry	How to do Variable Star Photometry with your DSLR	Photoelectric Photometry Observing Section Webinar
Forums	Visual Observing	Photometry Instrumentation and Equipment	Photometry Instrumentation and Equipment	Photometry
Other	How to Make a Visual Estimate (PowerPoint)			

AAVSO "New Observers" page.

As a beginner, you will most likely only need to review the information under visual (eye, binocular, telescope). You will see two very helpful items at the top of that column, "Visual Observing Manual" and "10-Star Tutorial." The Visual Observing Manual is a very thorough downloadable pdf that gives you all the information you will need to start. The 10-Star Tutorial is more of a quick-start guide highlighting a few easy to find variable stars and the basic steps for observing and reporting.

The next area of the AAVSO website to explore is "Observing Sections." Here is where you will find all the various categories of variable stars with suggested targets to observe. You will also see some interesting other types of non-traditional variable star targets, such as Exoplanets and Young Stellar Objects. Following is a brief synopsis of each of the traditional variable star categories.



AAVSO "Observing Sections" page.

Eclipsing Binaries are two stars that are so close to each other that gravity binds them together as a system orbiting around each other. The "pinpoint" of light that we see from such a

system is actually the combined light of both stars (they are too far away and/or too close together to resolve as separate points of light). If Earth lies in the orbital plane of the binary system, as they orbit each other one star will pass in front of (eclipse) the other as viewed from Earth. As the one star is eclipsing the other, the magnitude of light being observed will noticeably dim for a period of time and then return to normal brightness. The most famous eclipsing binary is Algol (beta Persei), which is visible to the unaided eye and dims visibly every 3 days for several hours.

Cataclysmic Variables are binary systems in which one star is a white dwarf (a collapsed star with the mass of the Sun's core in the volume of the Earth). The other component is a red dwarf, smaller than our Sun and redder. The two stars orbit very closely to each other, completing an orbit in only a few hours. Due to their small masses, their Roche lobes (gravipotential boundaries) are small. This allows the red dwarf star to exceed its lobe and transfer material onto the white dwarf. As the excess material accretes onto the white dwarf, interesting

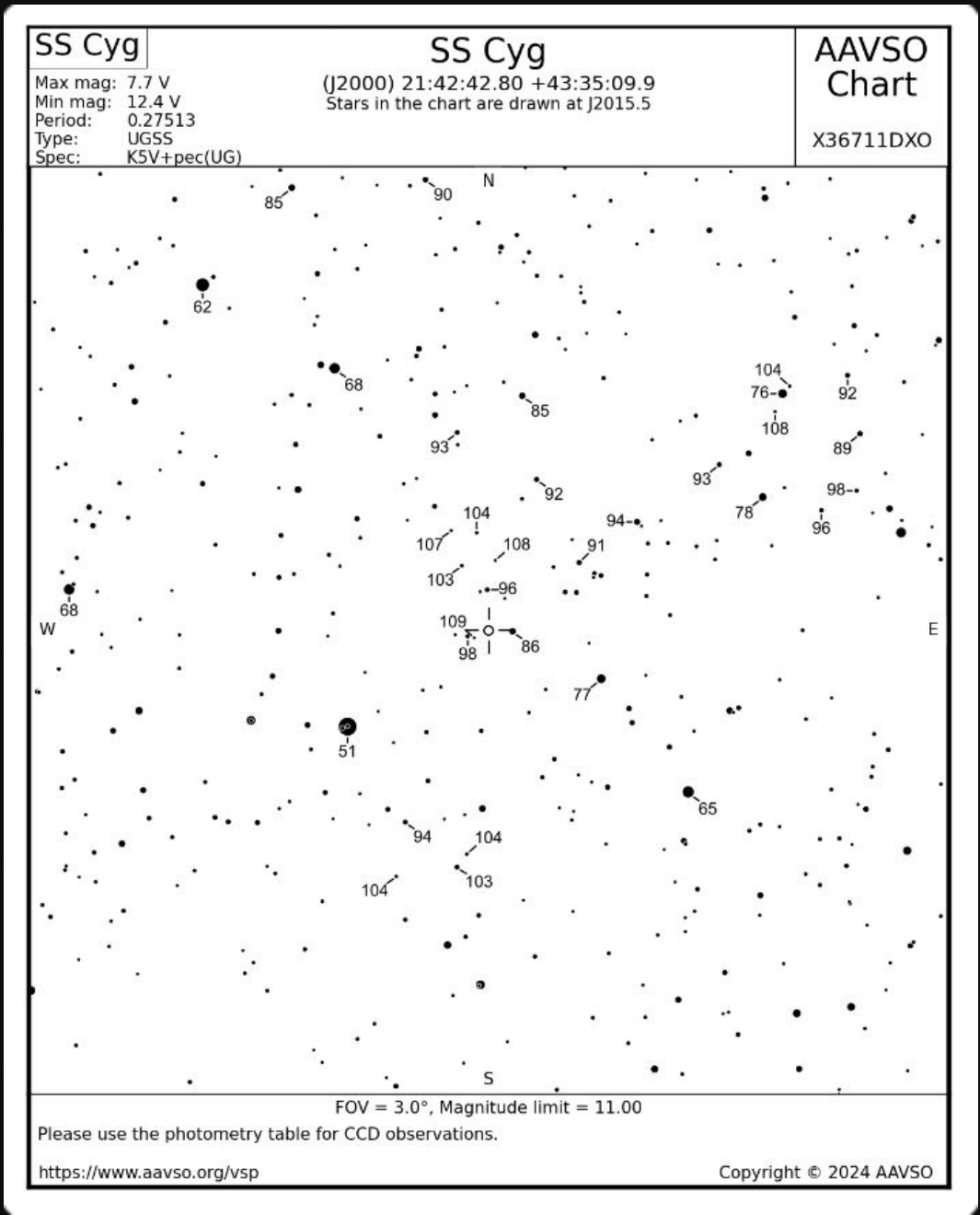
effects occur (such as explosions) that can be observed as brightness variations. These are referred to as novae, dwarf novae, recurrent novae and symbiotic variables. One excellent and very current example is the star T Coronae Borealis, which we have been following this year in anticipation of a nova event.

Long Period Variables include Pulsating Red Giant Stars such as Miras, Semi-regulars, Irregulars and Pulsating Yellow Supergiants. LPV's are cool giant or supergiant stars that are pulsating in brightness as part of their evolutionary process. The pulsation periods can be from around a hundred days to over a thousand days. Over many decades astronomers have observed the periods of LPV's to change. Much can be learned about these stars based on the changes in their behavior, so it is important to continue observing and recording the brightness characteristics. The prototype LPV star is Mira, or Omicron Ceti, which has been observed for centuries to be a variable star, easily observed with the unaided eye.

Short Period Pulsating Variables are pulsating stars driven by internal layers that trap energy and cause the star to expand and change temperature. As the star expands, the internal conditions change and the trapped energy is released. Gravity then pulls the layers back down. Then the entire process repeats. That is why these stars are called pulsating stars. The stars in this section of AAVSO's database pulsate with periods of hours to a few weeks. The most famous result of studying these variables is the discovery of the period-luminosity relationship, which made it possible to use Cepheid variables as distance indicators.

Observing variable stars can be a very rewarding way to spend time with your telescope or binoculars. Beginning with easy to find naked-eye variables and progressing until you can find faint variables with a telescope can be a fun way to learn to navigate the night sky. Learning to make magnitude estimates of stars by comparing them to other stars, then reporting the observation to AAVSO is a great way to improve your observing skills while also contributing to data used by research

astronomers. I now have a list of Long Period Variables along with charts saved in my phone so anytime I'm stargazing I can easily make a few observations: maybe that's something you will want to try too!



AAVSO Sample variable star chart.

The Queen Speaks

Robin Byrne

Happy Birthday Friedrich Bessel

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.

Friedrich Wilhelm Bessel, 1843

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 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.

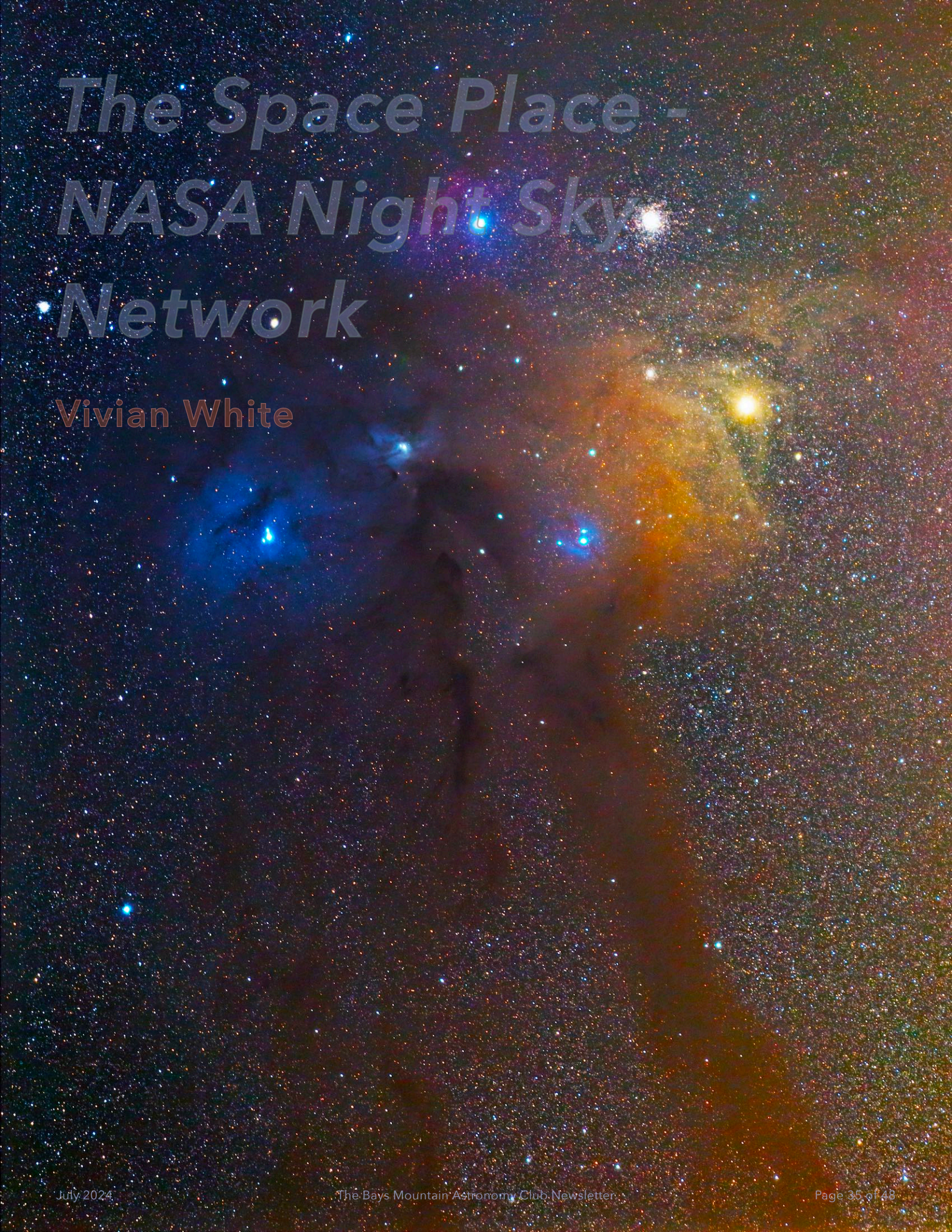
References:

Wikipedia - Friedrich Wilhelm Bessel

MacTutor Math History - Friedrich Wilhelm Bessel

American Museum of Natural History; Friedrich Bessel and the Companion of Siruis, 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

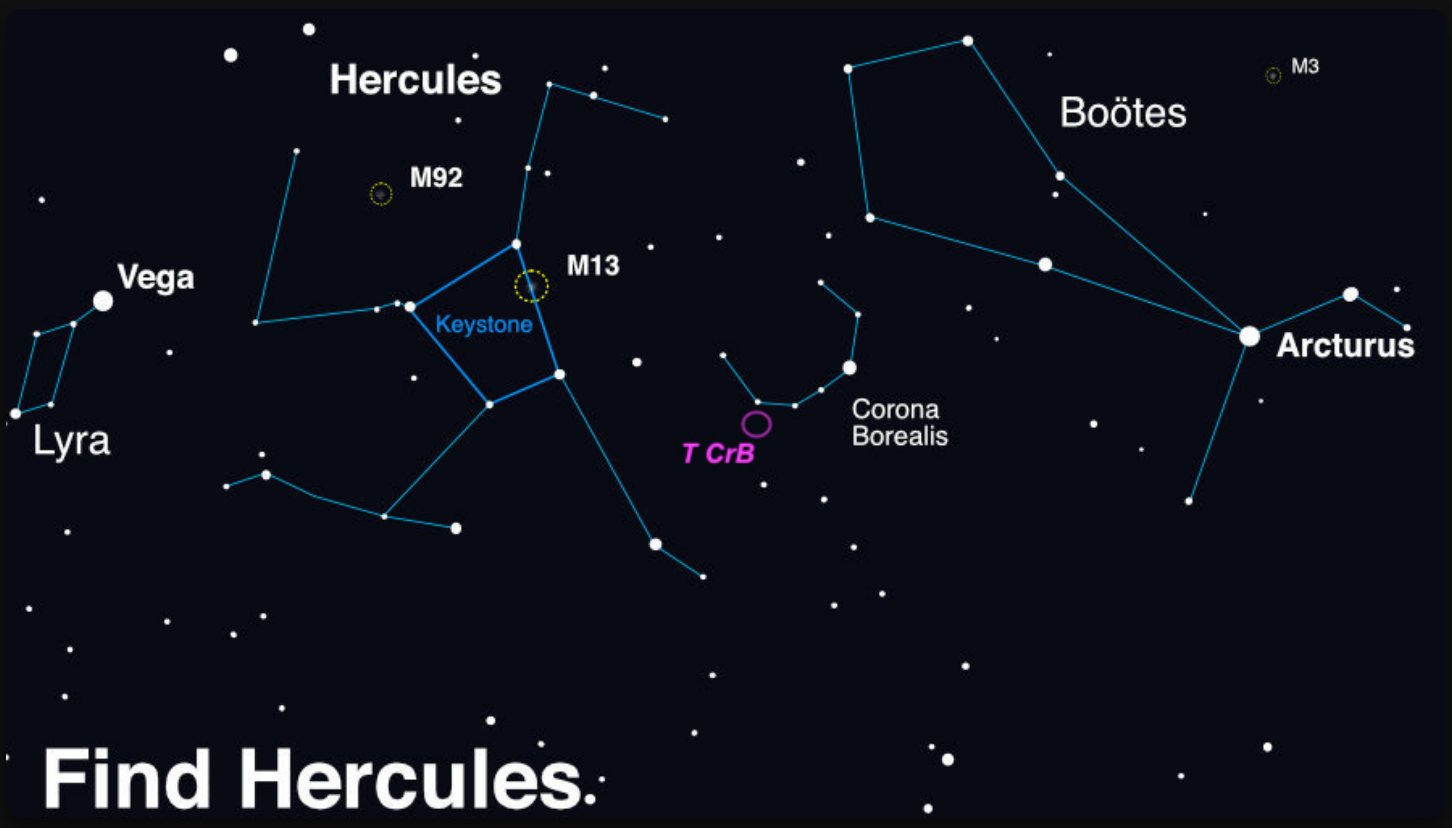


The Space Place - NASA Night Sky Network

Vivian White

A Hero, a Crown and Possibly a Nova!

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 [in a dark sky], you can find a most magnificent jewel - the Great Globular Cluster of Hercules, also known as **Messier 13**.



Look up after sunset during summer months to find Hercules! Scan between Vega and Arcturus, near the distinct pattern of Corona Borealis. Once you find its stars, use binoculars or a telescope to hunt down the globular clusters M13 (and a smaller globular cluster M92). If you enjoy your views of these globular clusters, you're in luck - look for another great globular, M3, in the nearby constellation of Boötes. ***Image*** *created with assistance from* ***Stellarium****.*

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.

A red giant star and white dwarf orbit each other in this animation of a nova similar to T Coronae Borealis. The red giant is a large sphere in shades of red, orange, and white, with the side facing the white dwarf the lightest shades. The white dwarf is hidden in a bright glow of white and yellows, which represent an accretion disk around the star. A stream of material, shown as a diffuse cloud of red, flows from the red giant to the white dwarf. When the red giant moves behind the white dwarf, a nova explosion on the white dwarf ignites, creating a ball of ejected nova material shown in pale orange. After the fog of material clears, a small white spot remains, indicating that the white dwarf has survived the explosion. NASA/Goddard Space Flight Center

[Ed. Apologies for the following rant, though I think some of the above text was meant for alt text.: I've tried to adjust for general misconceptions in this article, but I must state that this image and description needs attention. Please understand that in any binary system with stars, planets, galaxies, etc., you must account for the mathematics of equipotential boundaries. On a flat plane, the points of equal gravity (or force de votre choix) are called Lagrange points. In three dimensions, they reveal themselves as Roche lobes. Two lobes that connect at the singular L1 point. In this case, when one of the stars expands (the red giant) and fills its Roche lobe, it will then (and only then) flow towards the white dwarf and create a small accretion disk around it. When the dwarf has been encased enough by the overflow of the red giant, the pressure gets too great. The built up interior heat and pressure will then make the white dwarf flare. Don't even get me started on the "when the red giant moves behind the white dwarf" part.]

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 five 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! [As Jack Horkheimer says,] "Keep looking up!"

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, August 2, 2024 - 7p - A planetarium program will be presented. Show & Tell will follow.
- Friday, September 6, 2024 - 7p - Dr. Gary Henson, Professor in the Department of Physics and Astronomy will present. Topic TBA.
- Friday, October 4, 2024 - 7p - Trina L. Ray, Europa Clipper Deputy Science Manager and REASON Investigation Scientist, will present. Topic TBA.
- Friday, December 6, 2024 - 7p - Topic TBA.
- Friday, February 7, 2025 - 7p - Topic TBA.
- Friday, March 7, 2025 - 7p - Topic TBA.
- Friday, April 4, 2025 - 7p - Topic TBA.
- Friday, May 2, 2025 - 7p - Topic TBA.
- Friday, June 6, 2025 - 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:

- October 5 & 12, 2024 - 7:30p
- October 19, 26 & November 2, 2024 - 7p
- November 9, 16, 23 & 30, 2024 - 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:

- **Annual Club Picnic - July 2024**
  - 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 2024 - November 1-3, 2024**
  - Our 39th 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. 2024 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 2025**
  - This event is for members and their families. Look for an e-mail in January with all the information.
- **Astronomy Day - ?, 2025 - 12p-3p; 8:30p-9:30p**
  - Come help share the fun of astronomy with the public. There will be tables with different themed topics plus solar and night viewing.

Regular Contributors:

Greg Penner

Robin Byrne

Adam Thanz

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).

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 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.*
- **All background images used with permission by their authors.**